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Tropical Ocean Climate Study

"TOCS"

KY 00-06 Cruise Report

August 20 , 2000 – October 5 , 2000

Japan Marine Science and Technology Center (JAMSTEC)

TOCS KY00-06 Cruise Report

1. Cruise Summary

1. Cruise Summary

Ship : R/V KAIYO
Chief Investigator : Leg 1 : Norifumi Ushijima (JAMSTEC)
Leg 2 and 3 : Yuji Kashino (JAMSTEC)
Co-Chief Investigator : Ikhsan Wahyono (BPPT)
Cruise Code : KY00-06
Project Title : Tropical Ocean Climate Study
Period : August 20, 2000 – October 1, 2000
Ports of call : Yokosuka (Japan)
Chuuk (Federal State of Micronesia)
Kavieng (Papua New Guinea)
Koror (Republic of Palau)
Institute : JAMSTEC (Japan Marine Science and Technology Center)
BPPT (Badan Pengkajian dan Penerapan Teknologi)
University of Hawaii
University of Philippines
MWJ (Marine Work Japan Co. LTD)
NME (Nippon Marine Enterprise Co. LTD)
RD Instruments Co. Ltd
SEA Co. Ltd

Purpose: The purpose of this cruise is to observe currents, temperature, salinity etc., in the western equatorial Pacific to understand the ENSO (El Nino/Southern Oscillation) phenomena. Because El Nino is occurred with migration of the warm water pool in the western equatorial Pacific, variability of the warm water pool is focused in this study. Additionally, a sea water flow from the Pacific to the Indian Ocean in the Indonesian Seas, i.e., the Indonesian Throughflow is also focused because this flow might be related to the warm water pool variability.

Observation Summery :

(Leg 1)

A TRITON buoy at 5N, 147E was recovered.

One CTD cast using SBE 911 plus was conducted until 1000m depth to check temperature, salinity values derived from CT sensors of the TRITON buoy.

These observations were conducted in the Micronesia EEZ.

(Leg 2)

A TRITON buoy at 0N, 147E was recovered.

Six TRITON buoys at 8N, 5N, 2N, 0N, 2S and 5S along 156E were repaired.

An ADCP buoy at 0N, 147E was recovered and re-installed.

One current meter provided by Ocean Research Institute (ORI, Tokyo Univ.) was installed in this mooring at 700m depth at this site.

Eight CTD casts were conducted near TRITON buoys until 1000m depth to check temperature, salinity values derived from CT sensors of the TRITON buoy.

CTD sensors test for ARGO float was conducted at CTD casts comparing with SBE 911 CTD.

Sea water at 1000m depth were sampled by Niskin bottles at CTD casts to check CTD salinity.

20 XCTD casts were conducted along 156E line to measure vertical profiles of temperature and salinity

Current along the cruise track was measured by a shipboard ADCP from 30m depth to 800m depth.

These observations were conducted in the open sea, Micronesia EEZ and Papua New Guinea EEZ.

(Leg 3)

Two TRITON buoys at 0N, 138E and 2N, 138E were recovered.

Two ADCP buoys at 2-30S, 142E and 6-48N, 126-42E were recovered and re-installed.

One current meter provided by Ocean Research Institute (ORI, Tokyo Univ.) was installed in the mooring at 2-30S, 142E at the depth of 700m.

70 CTD casts were conducted using SBE 911 plus and Sontek Lowered ADCP (LADCP) to measure vertical profiles of temperature, salinity and current until 2000m depth

Sea water at 400m, 500m, 600m, 700m, 800m and 1000m depths was sampled by Niskin bottles at CTD casts to measure dissolved oxygen concentration at the intermediate layer, and to check CTD salinity.

19 XCTD casts were conducted along 156E line to measure vertical profiles of

temperature and salinity

Current along the cruise track was measured by a shipboard ADCP from 30m depth to 1000m depth.

These observation were conducted in the open sea, Papua New Guinea EEZ, Micronesia EEZ, Indonesian EEZ, Palau EEZ and Philippines EEZ and territorial water.

Preliminary Results

This KY00-06 cruise has been carried out under the end of a La Nina stage. Weather and sea state were almost good for CTD observations and buoy works. In particular, it is very quite in the Philippine Sea, where is usually rough sea state during winter.

This TOCS cruise is the first cruise for TRITON buoy maintenance using R/V Kaiyo. Basically, TRITON buoys are maintained by R/V Mirai, but Kaiyo is used for this purpose because of limited Mirai ship time.

Because of good weather and sea state during this cruise, maintenance works of the TRITON buoys were successfully finished. Four TRITON buoys were recovered and six were maintained during this cruise. Altough almost buoys along 156E line had some problems maybe due to vandalism before this cruise, they revived through this maintenance works. In particular, it was excellent work to recover the underwater cable of TRITON #4 at 0N, 156E by divers in spite of sharks' appearance. We strongly hope that these works will contribute to improvement of the TRITON buoy system.

Three ADCP buoys were replaced during this cruise. These buoy works also did well except for lost of rotor of ORIs' (Ocean Research Institute, Tokyo University) current meter installed at 700m depth at 0N, 147E because rope twined the current meter. Top (ADCP float) and bottom (acoustic releaser) of this buoy came up to the sea surface very nearly due to weak current and probably it resulted in this twining.

It is notable that the ADCP buoy at and 6-48N, 126-42E near Mindanao (Philippines) was recovered successfully: there is the current axis of the Mindanao Current, which supplies source water of the Indonesian Throughflow. Because no time series observation results of the Mindanao Current has published, data from this mooring will be largely contribute to study of the low-latitude western boundary current and Indonesian Throughflow.

Following troubles occurred during CTD, XCTD and LADCP observations:

(1) Flaw of CTD wire was found during CTD observation at 5N, 147E (Leg 1). We cut

the wire with length of about 1300m. Until next TOCS cruise, CTD wire should be maintained.

(2) Connectors of cable and battery of LADCP were broken during Leg 2. Although they were fixed, spare should be taken.

(3) Data from CTD primary sensors became bad at St.100 (8-00N, 126-52E). Because secondary sensors were available, we used data from the secondary sensors and replaced primary sensors for spare sensors. After this cruise, these sensors should be fixed and calibrated.

(4) On-board computer for XCTD (IBM-PC) sometimes suddenly shut down and XCTD data was lost then. This computer should be checked and it seems better to use another computer.

(5) Two XCTD probes were not good: these probes did not work after they launched to the launcher. We will send these probes to the maker (Tsurumi Seiki Co. Ltd) and ask them to check.

In spite of above troubles, observations using CTD, XCTD and LADCP were successfully and will give us interesting results such as the distribution of water masses in the southernmost Philippine Sea and current structure of the Mindanao current.

A New shipboard ADCP with frequency of 38kHz was installed to R/V Kaiyo during the last Kaiyo's maintenance in the dock from this March to April. This ADCP firstly worked from this cruise. Scientists of University of Hawaii and technicians of RDI Co. Ltd and SEA Co. Ltd checked its performance and data. Their results show that the new ADCP worked very well and measured currents until 1000m depth. Because of this deep measurement range, it become possible to measure currents intermediate layer such as the Mindanao Undercurrent, which was not clear during this cruise.

Thus, we can say that TOCS KY00-06 cruise finished successfully.

Acknowledgments:

We would like to express special thanks to Captain F. Saito and crew of R/V Kaiyo. During the cruise, technicians of Marine Work Japan Co. Ltd. and Nihon Marine Enterprise Co. Ltd., participated in this cruise and helpfully supported us.

This cruise was a joint cruise by Japan Marine Science and Technology Center (JAMSTEC), Japan, and Badan Pengkajian Dan Penerapan Teknologi (BPPT), Indonesia, under the Tropical Ocean Climate Study (TOCS) project. We thank our colleagues in JAMSTEC and BPPT for their efforts in conducting this cruise.

To get the clearances from Indonesia, Micronesia, Papua New Guinea, Philippines and Republic of Palau, many persons in these countries and of Japanese Government worked. We would also like to say thanks for their works.

2. List of Instruments

2.List of Instruments

(1) CTD (Conductivity-Temperature-Depth profiler)

SBE9-11 plus system, Sea-Bird Electronics,Inc.,USA

CTD Fish for 10,500m S/N 09P8010-0319

St.001-St.106

C-Sensor	S/N 041045 (Primary)
	S/N 041174 (Secondary)
T-Sensor	S/N 031462 (Primary)
	S/N 031465 (Secondary)
P-Sensor	S/N 41223

St.107-St.118

C-Sensor	S/N 041174 (Primary)
	S/N 040960(Secondary)
T-Sensor	S/N 031465 (Primary)
	S/N 031207 (Secondary)
P-sensor	S/N 41223

* Observing CTD in St.106, We found that C-sensor (S/N041045) and T-sensor (S/N031462) is broken. So We changed C-sensor (S/N041045) and T-sensor (S/N031462) to C-sensor (S/N 040960) and T-sensor (S/N 031207) after observed in St.106.

(2) Shipboard ADCP (Acoustic Doppler Current Profiler)

Ocean Surveyor,RD Instruments,USA

(3) LADCP (Lowered Acoustic Doppler Current Profiler)

Sontek dual ADP-250 LADP System

S/N C117,C118

(4) Salinity

Guildline Autosal Model 8400B

(5) Dissolved Oxygen

D.O.meter:TOA portable Dissolved Oxygen Meter Model DO-25A

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

Detector:Pt Electrode/6.0401.100

Software:Data acquisition/Metrohm,METRODATA/6.6040.100

3. Participants List

Participants List

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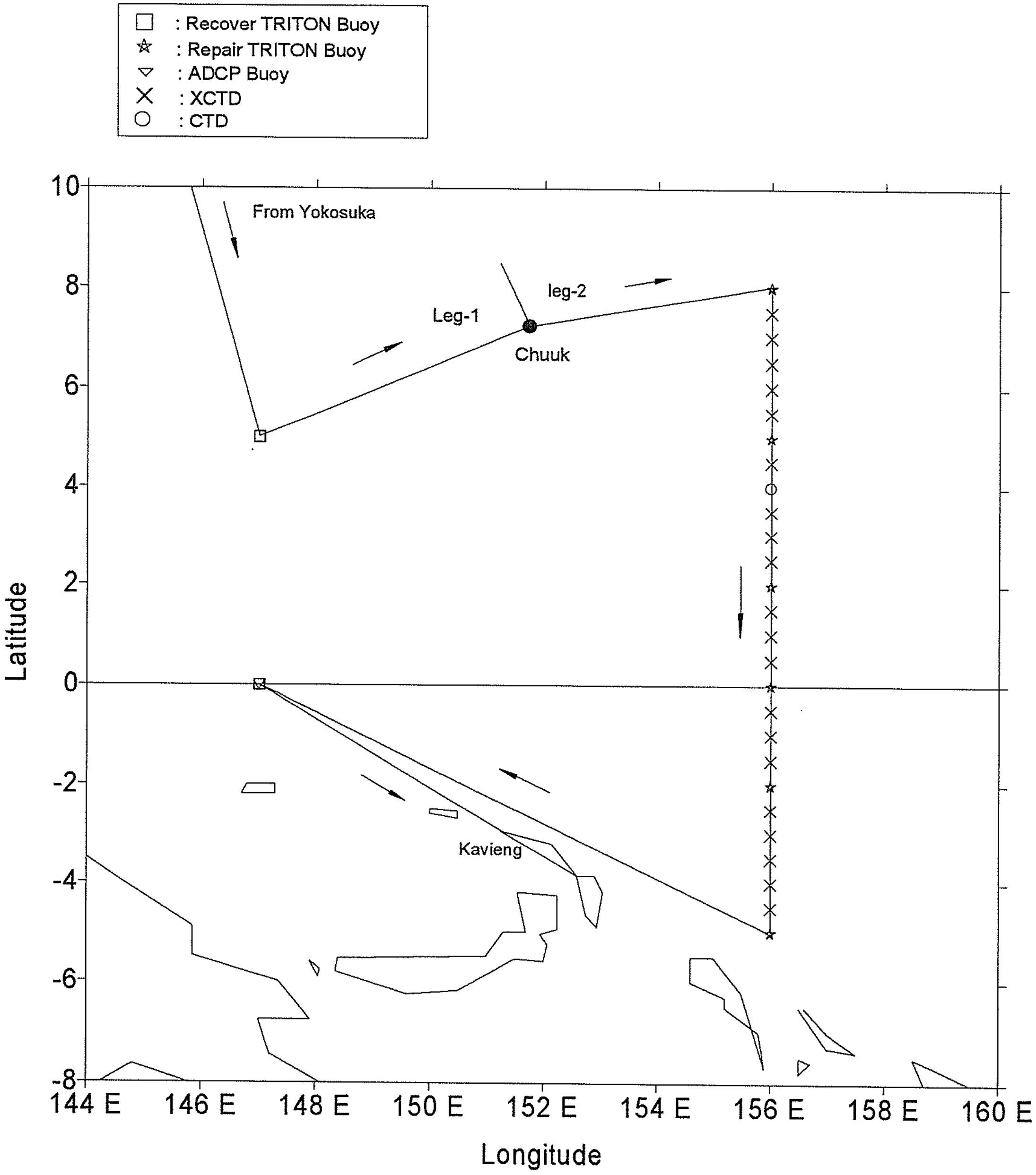
Takayoshi Seike	MWJ
Kaori Akizawa	MWJ
Taeko Ohama	MWJ
Kiyofumi Numaya	MWJ
Toru Koizumi	MWJ

R/V KAIYO Crew Menbers

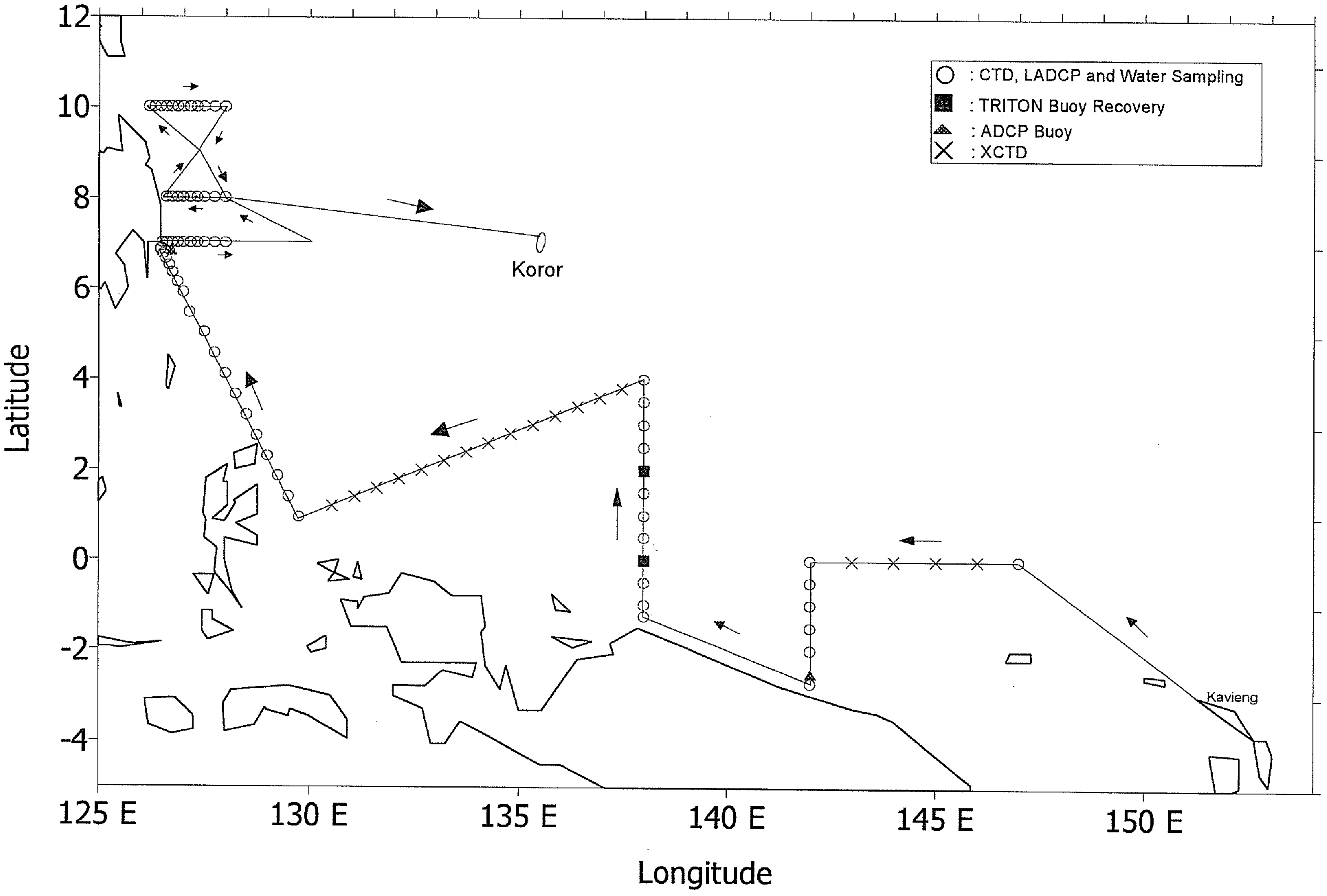
Captain	Fusao Saito
Chief Offcer	Masayosi Ishiwatari
Second Offcer	Masaaki Kikuchi
Third Offcer	Yoichi Goto
Jr Third Offcer	Daisuke Sasaki
Chief Engineer	Toshiichi Hirose
First Engineer	Minoru Tsukada
Second Engineer	Yosinobu Hiratsuka
Third Engineer	Kazuhito Yoshiura
Third Engineer	Masaya Sumida
Chief Radio Offcer	Masahiro Aimono
Second Radio Offcer	Hidehiro Ito
Third Radio Offcer	Jun Suenaga
Boatswain	Makio Nakamura
Able Seaman	Mikio Ishimori
Able Seaman	Susumi Kanzaki
Able Seaman	Yasuyoshi Kyuki
Able Seaman	Yutaka Sato
Able Seaman	Tadahiko Toguchi
Able Seaman	Takashi Kiyohara
No.1 Oiler	Akira Terai
Oiler	Moriji Takahashi
Oiler	Kazuaki Nakai
Oiler	Masaru Kitano
Oiler	Hiroshi Yamamoto
Chief Steward	Kiyotoshi Teranishi
Steward	Teruyuki Yoshikaaw
Steward	Tadayuki Takatsu
Steward	Shinsuke Tanaka
Steward	Satoshi Kawata

4. Hydrographic Measurements

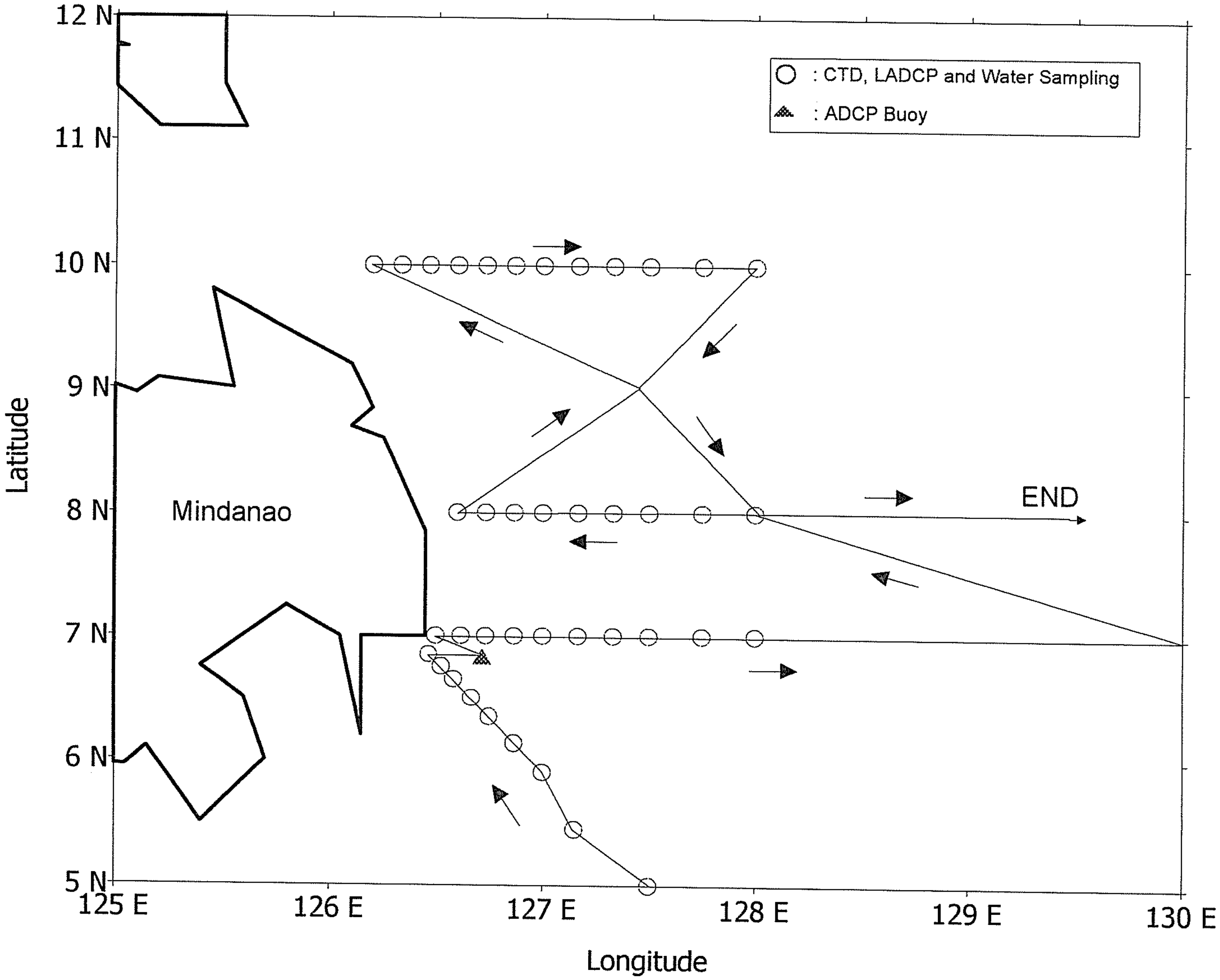
4.1 Cite Map



KY00-06 TOCS Leg-2



TOCS KY00-06 Leg-3



TOCS KY00-06 Leg-3

4.2 Cast table

4.2.1 CTD

St.	Date	Time(GMT)	Latitude	Longitude
001C	26-Aug-00	20:57	05-01.0683N	146-58.2654E
002C	31-Aug-00	23:41	08-00.5845N	156-56.9063E
008C	01-Sep-00	20:34	04-58.1762N	156-04.9167E
010C	02-Sep-00	4:58	04-00.0016N	156-00.0468E
014C	02-Sep-00	23:35	01-57.3685N	157-57.3609E
018C	03-Sep-00	22:09	00-01.1623S	155.58.1085E
022C	04-Sep-00	22:52	01-59.7876S	155.59.8523E
028C	05-Sep-00	19:51	04-57.5831S	156-00.5514E
029C	08-Sep-00	06:22	00-00.2556S	147-00.2190E
030C	14-Sep-00	02:09	00-00.0630N	146-59.8743E
035C	15-Sep-00	1:49	00-00.0020N	141-59.8878E
036C	15-Sep-00	5:30	00-29.9885S	141-59.9587E
037C	15-Sep-00	9:18	01-00.0288S	141-59.9209E
038C	15-Sep-00	12:57	01-29.9873S	141-59.8927E
039C	15-Sep-00	16:40	02-00.0530S	141-59.8702E
040C	16-Sep-00	6:04	02-29.3792S	141-57.3021E
041C	15-Sep-00	22:41	02-43.0441S	142-00.0315E
042C	17-Sep-00	1:44	01-15.0209S	137-59.9406E
043C	17-Sep-00	4:09	01-00.0562S	137-59.7298E
044C	17-Sep-00	8:47	00-30.0023S	137-59.8483E
045C	17-Sep-00	21:00	00-04.6662N	138-01.7032E
046C	18-Sep-00	4:17	00-29.9790N	137-59.9704E
047C	18-Sep-00	7:34	01-00.0162N	137-59.9790E
048C	18-Sep-00	11:01	01-30.0188N	137-59.9972E
049C	18-Sep-00	22:40	02-03.6247N	138-03.5447E
050C	19-Sep-00	05:51	02-30.0208N	138-00.0212E
051C	19-Sep-00	09:16	03-00.0734N	138-00.0652E
052C	19-Sep-00	12:50	03-29.9900N	138-00.0660E
053C	19-Sep-00	16:14	03-59.9660N	138-00.0592E
069C	21-Sep-00	11:01	00-56.9507N	129-44.9837E
070C	21-Sep-00	14:35	01-24.0093N	129-30.0000E
071C	21-Sep-00	18:31	01-50.9796N	129-15.0284E
072C	21-Sep-00	21:47	02-18.0152N	128-59.9339E
073C	22-Sep-00	1:15	02-44.9456N	128-44.9998E
074C	22-Sep-00	4:40	03-12.0389N	128-30.0079E
075C	22-Sep-00	8:18	03-38.9589N	128-14.9799E
076C	22-Sep-00	11:12	04-05.9803N	127-44.9892E
077C	22-Sep-00	14:28	04-32.9390N	127-44.9892E
078C	22-Sep-00	17:55	05-00.0080N	127-29.9791E
079C	22-Sep-00	21:33	05-27.0012N	127-14.9862E
080C	23-Sep-00	0:58	05-53.9922N	127-00.0059E
081C	23-Sep-00	3:22	06-07.9644N	126-51.9790E
082C	23-Sep-00	5:35	06-20.9979N	126-45.0175E
083C	23-Sep-00	7:38	06-29.9542N	126-39.9988E
084C	23-Sep-00	9:38	06-38.9850N	126-35.0229E
085C	23-Sep-00	20:55	06-48.6704N	126-42.8083E
086C	24-Sep-00	5:22	06-51.0090N	126-27.9761E

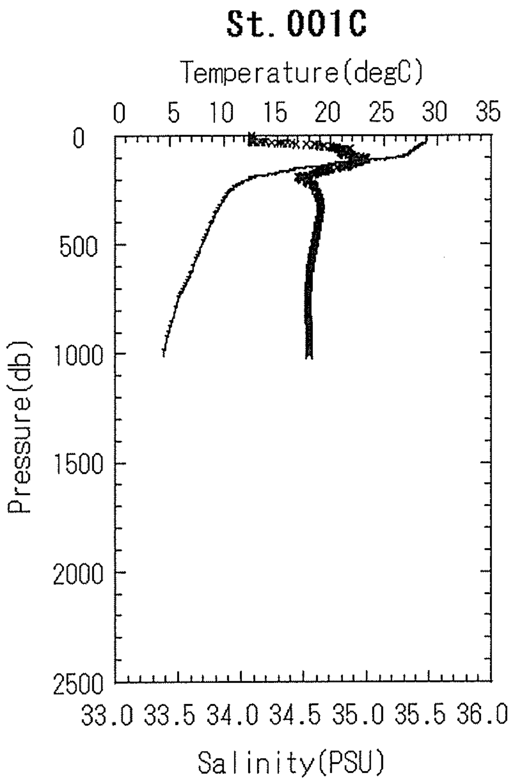
087C	23-Sep-00	20:59	06-48.6704N	126-42.8083E
088C	24-Sep-00	7:34	06-59.9946N	126-30.0437E
089C	25-Sep-00	7:45	06-59.9645N	126-37.0899E
090C	25-Sep-00	5:51	06-59.9942N	126-43.9917E
091C	25-Sep-00	4:00	07-00.0021N	126-52.0312E
092C	25-Sep-00	2:01	06-59.9637N	127-00.0573E
093C	25-Sep-00	0:05	07-00.0257N	127-10.0355E
094C	24-Sep-00	22:09	06-59.9792N	127-20.0145E
095C	24-Sep-00	19:58	06-59.9563N	127-29.9998E
096C	24-Sep-00	17:28	06-59.9732N	127-45.0740E
097C	24-Sep-00	14:54	07-00.0007N	127-59.0618E
098C	27-Sep-00	4:59	07-59.9726N	126-36.0158E
099C	27-Sep-00	2:48	07-59.9577N	126-44.0600E
100C	27-Sep-00	0:52	07-59.9615N	126-52.0116E
101C	26-27-Sep-00	22:56	07-59.9550N	127-00.0394E
102C	26-Sep-00	21:02	07-59.9396N	127-09.9839E
103C	26-Sep-00	19:02	07-59.9400N	127-20.0242E
104C	26-Sep-00	16:55	07-59.9683N	127-30.0094E
105C	26-Sep-00	14:37	07-59.9709N	127-45.0128E
106C	26-Sep-00	12:04	08-00.0054N	127-59.9866E
107C	27-Sep-00	22:57	10-00.0204N	126-11.9881E
108C	28-Sep-00	0:52	10-00.0237N	126-20.0472E
109C	28-Sep-00	2:36	10-00.0010N	126-27.9862E
110C	28-Sep-00	4:30	10-00.0333N	126-35.9984E
111C	28-Sep-00	6:16	09-59.9789N	126-43.9985E
112C	28-Sep-00	8:14	09-59.9991N	126-52.0091E
113C	28-Sep-00	10:09	09-59.9866N	126-59.9568E
114C	28-Sep-00	12:16	10-00.0159N	127-10.0071E
115C	28-Sep-00	14:11	09-59.9920N	127-19.9932E
116C	28-Sep-00	16:05	10-00.0124N	127-29.9965E
117C	28-Sep-00	18:32	10-00.0244N	127-44.9590E
118C	28-Sep-00	20:50	09-59.9924N	128-00.0018E

4.2.2 XCTD

St.	Date	Time(GMT)	Latitude	Longitude
003X	01-Sep-00	03:54	07-29.9693N	155-59.9770E
004X	01-Sep-00	06:44	06-59.9316N	156-00.0056E
005X	01-Sep-00	09:33	06-29.9692N	156-00.0000E
006X	01-Sep-00	12:25	05-59.9764N	156-00.0001E
007X	01-Sep-00	15:18	05-29.5838N	156-00.0274E
009X	02-Sep-00	02:03	04-29.9773N	156-00.0222E
011X	02-Sep-00	08:37	03-29.8734N	156-00.0035E
012X	02-Sep-00	11:29	02-59.9848N	156-00.0027E
013X	02-Sep-00	14:19	02-29.9815N	156-00.0303E
015X	03-Sep-00	03:38	01-29.9835N	156-00.0025E
016X	03-Sep-00	06:38	00-59.9937N	156-00.0035E
017X	03-Sep-00	09:35	00-29.9795N	156-00.082E
019X	04-Sep-00	02:33	00-32.9692S	156-00.0199E
020X	04-Sep-00	05:05	01-00.0242S	155-59.9774E
021X	04-Sep-00	07:59	01-30.0546S	155-59.9909E
023X	05-Sep-00	03:02	02-30.0254S	155-59.9843E
024X	05-Sep-00	05:50	03-00.0354S	155-59.9735E
025X	05-Sep-00	08:34	03-30.0148S	156-00.0011E
026X	05-Sep-00	11:23	04-00.0073S	155-59.9977E
027X	05-Sep-00	14:10	04-30.0147S	155-59.9849E
031X	14-Sep-00	07:35	00-00.0046S	145-59.9410E
032X	14-Sep-00	12:01	00-00.0081S	144-59.9807E
033X	14-Sep-00	16:36	00-00.0151N	143-59.9749E
034X	14-Sep-00	21:07	00-00.0076N	142-59.8877E
054X	19-Sep-00	20:48	03-47.6528N	137-27.1713E
055X	19-Sep-00	22:48	03-36.0002N	136-55.9928E
056X	20-Sep-00	1:31	03-23.9939N	136-23.9893E
057X	20-Sep-00	4:18	03-11.9705N	135-51.9403E
058X	20-Sep-00	7:02	03-00.0059N	135-20.0014E
059X	20-Sep-00	9:49	02-48.0002N	134-48.0047E
060X	20-Sep-00	12:44	02-35.5656N	134-14.8548E
061X	20-Sep-00	15:17	02-23.9881N	133-43.9919E
062X	20-Sep-00	17:55	02-11.9726N	133-11.9813E
063X	20-Sep-00	20:31	02-00.0240N	132-39.9987E
064X	20-Sep-00	23:03	01-48.0024N	132-07.9942E
065X	21-Sep-00	1:39	01-35.9968N	131-36.0082E
066X	21-Sep-00	4:15	01-23.9944N	131-03.9760E
067X	21-Sep-00	6:58	01-12.0119N	130-31.9777E
068X	21-Sep-00	9:40	01-00.0102N	129-59.9987E

4.3 Plofile

4.3.1 CTD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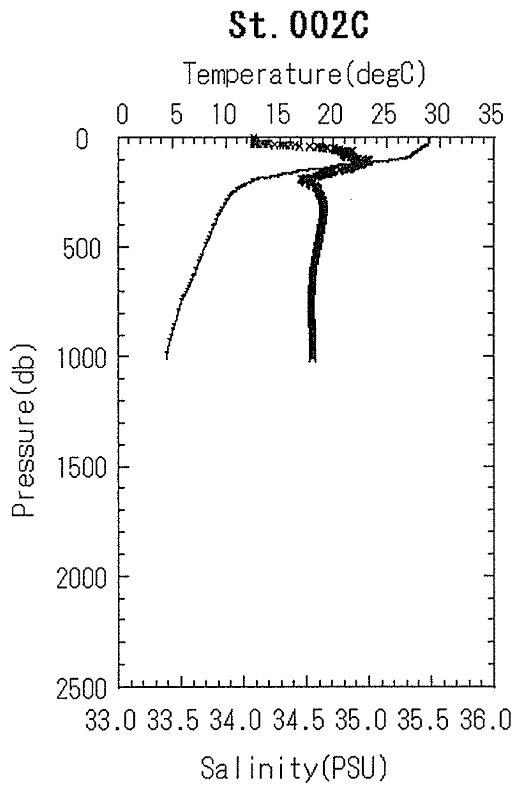
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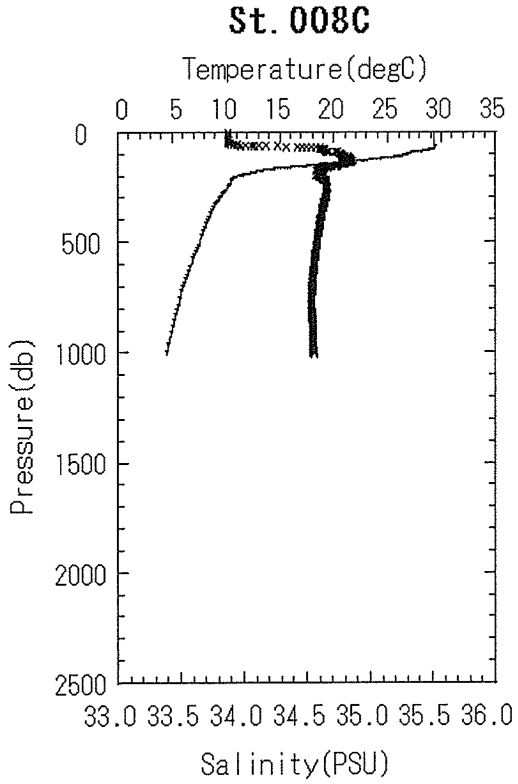
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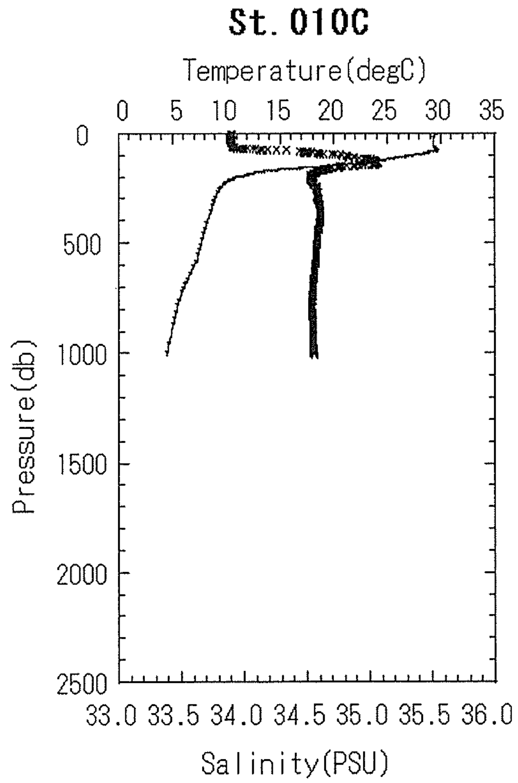
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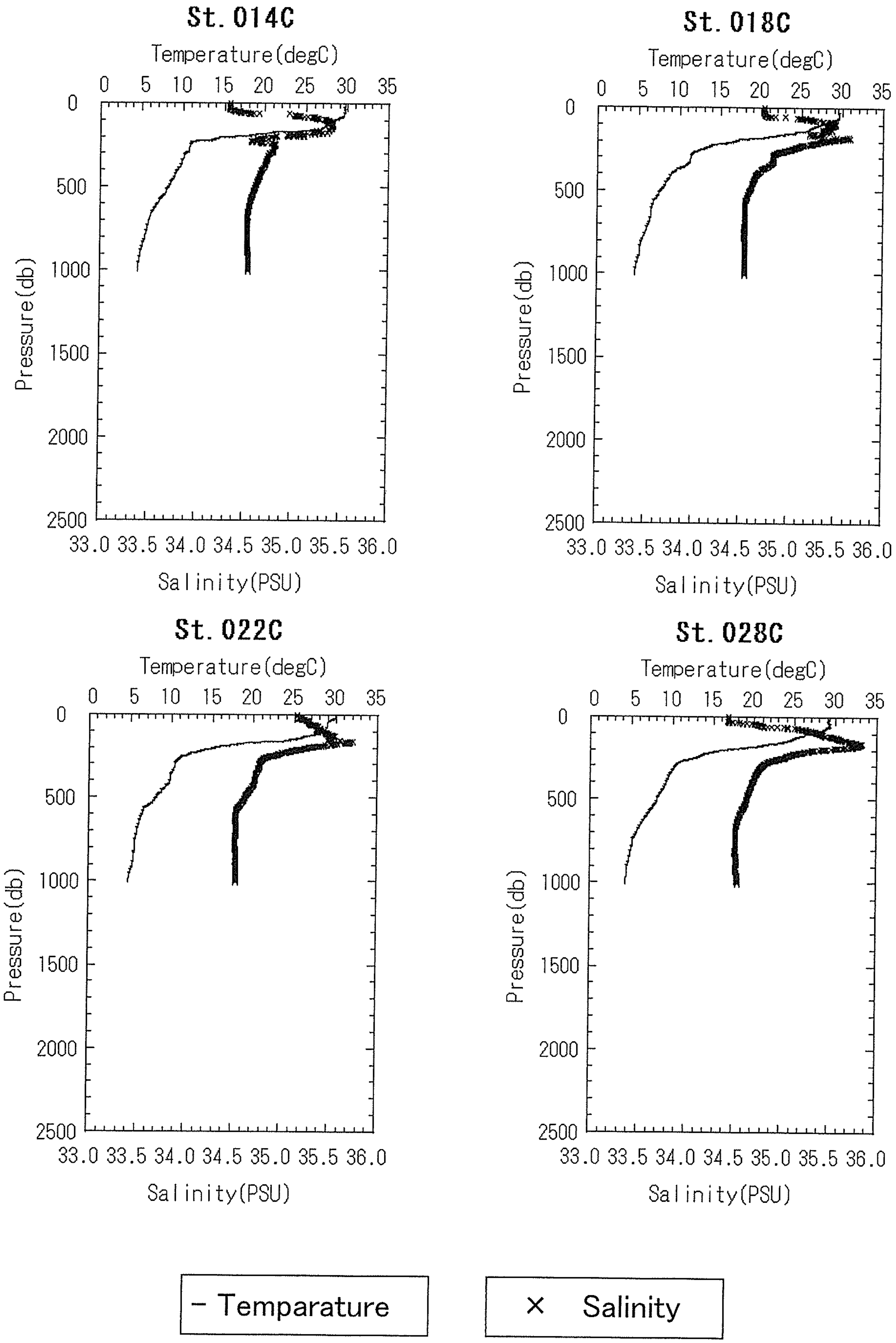
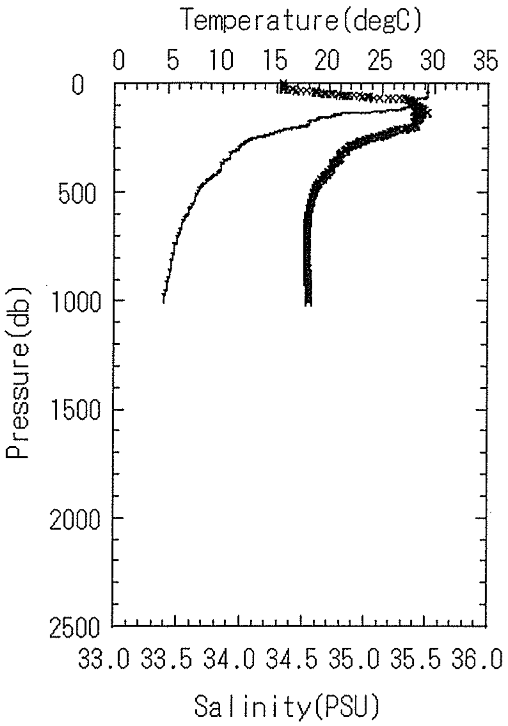
– Temparature

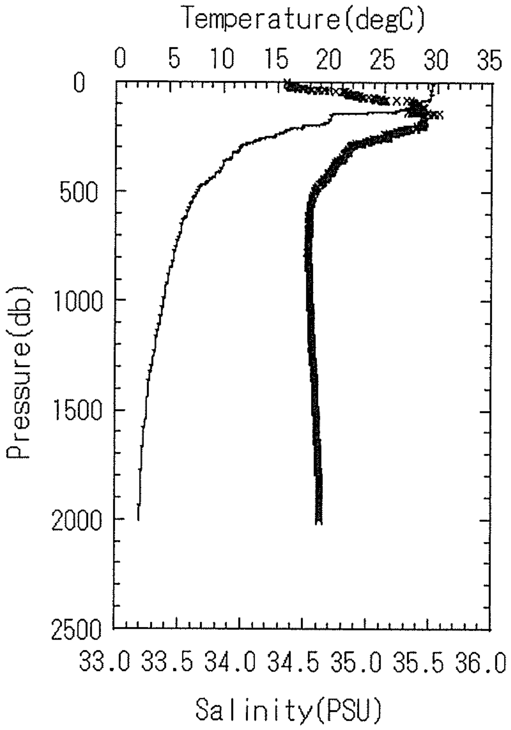
× Salinity


St. 014C
St. 018C
St. 022C
St. 028C
Temperature(degC)
0 5 10 15 20 25 30 35
Pressure(db)
0
500
1000
1500
2000
2500
33.0 33.5 34.0 34.5 35.0 35.5 36.0
Salinity(PSU)
– Temparature
× Salinity

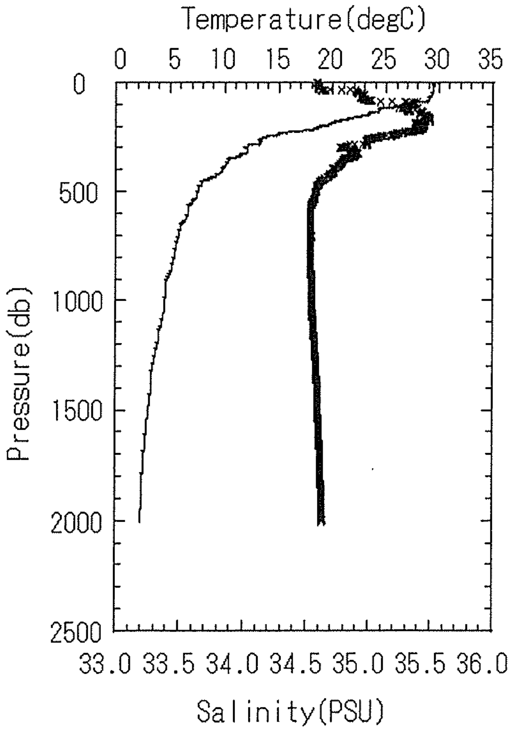
St. 029C



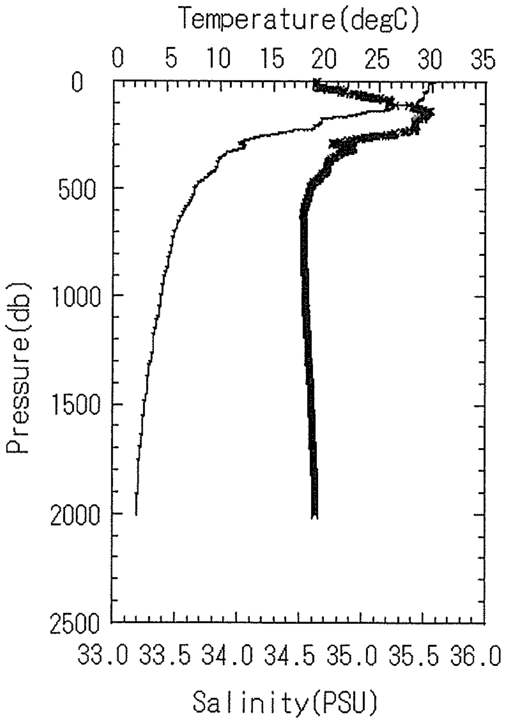
St. 030C



St. 035C



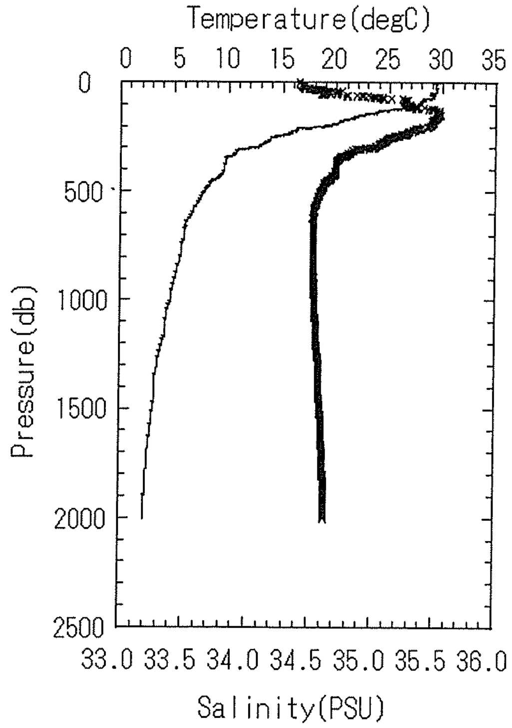
St. 036C



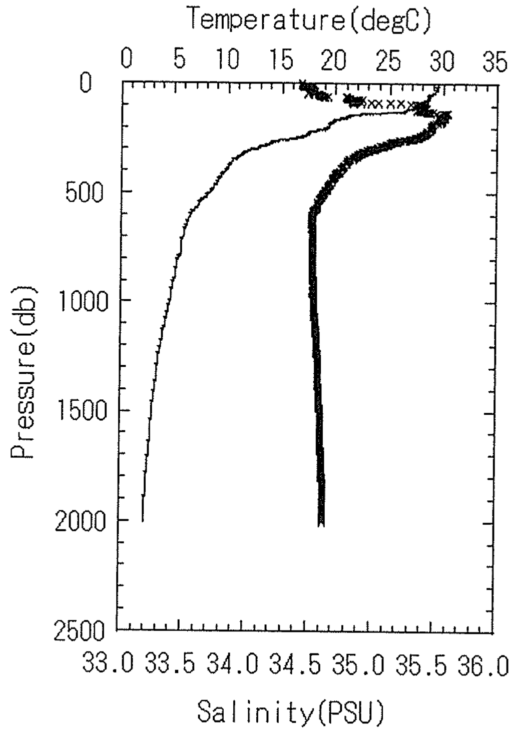
− Temparature

× Salinity

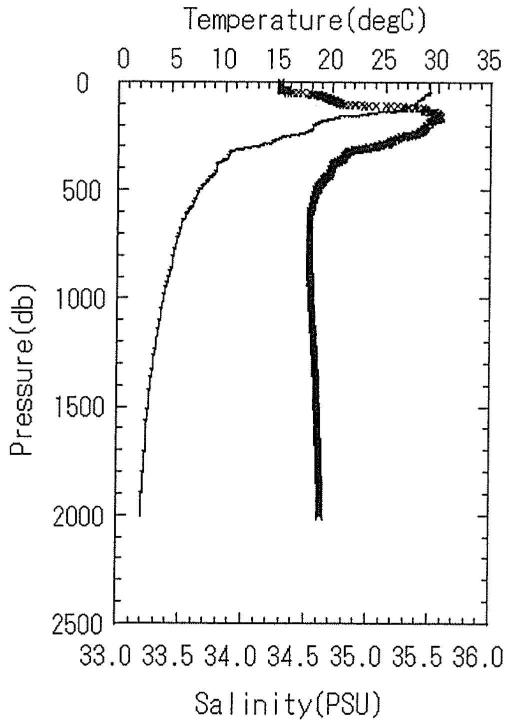
St. 037C



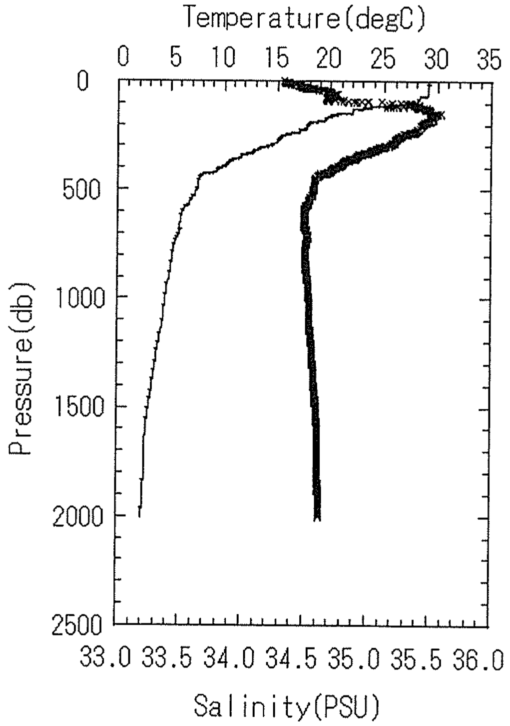
St. 038C



St. 039C



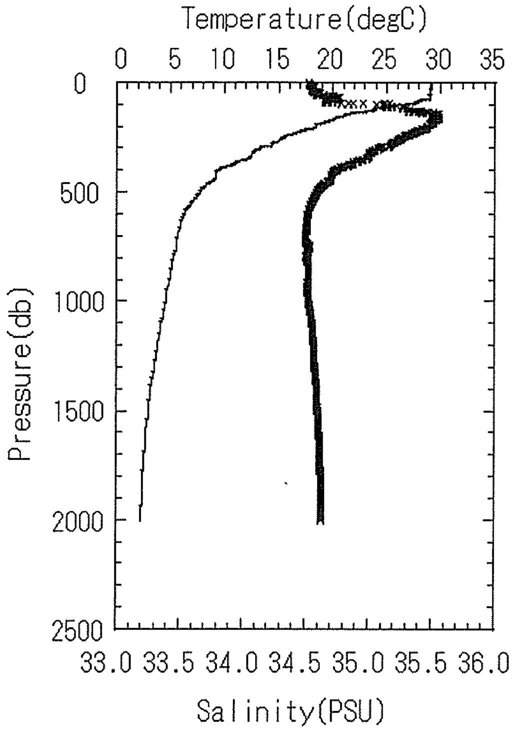
St. 040C



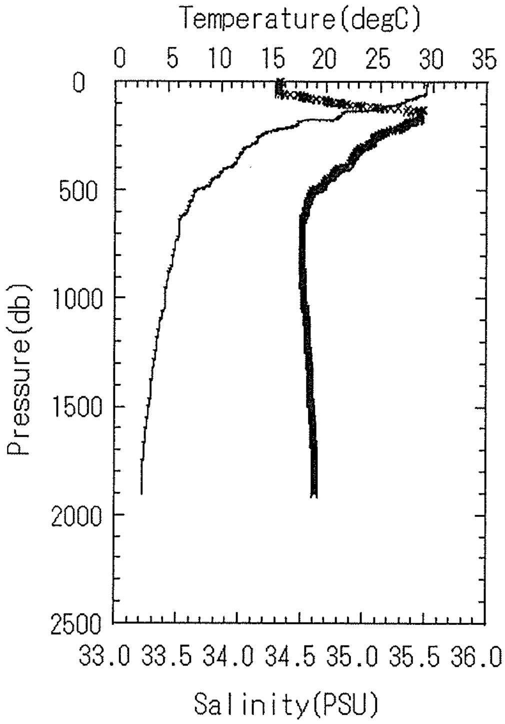
− Temparature

× Salinity

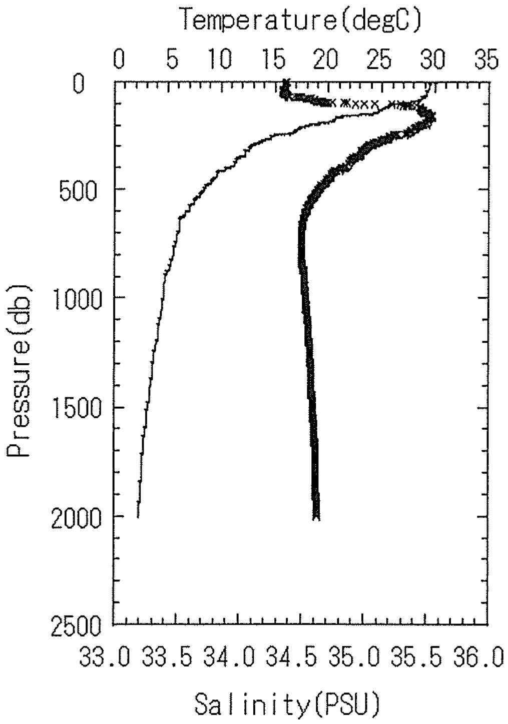
St. 041C



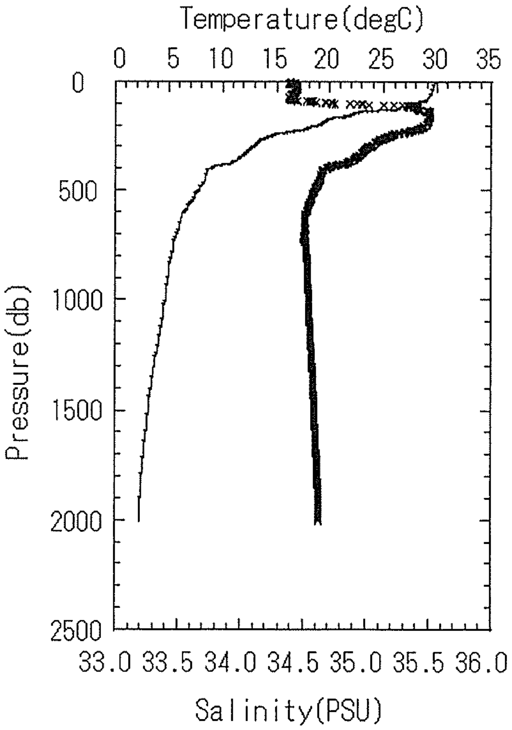
St. 042C



St. 043C



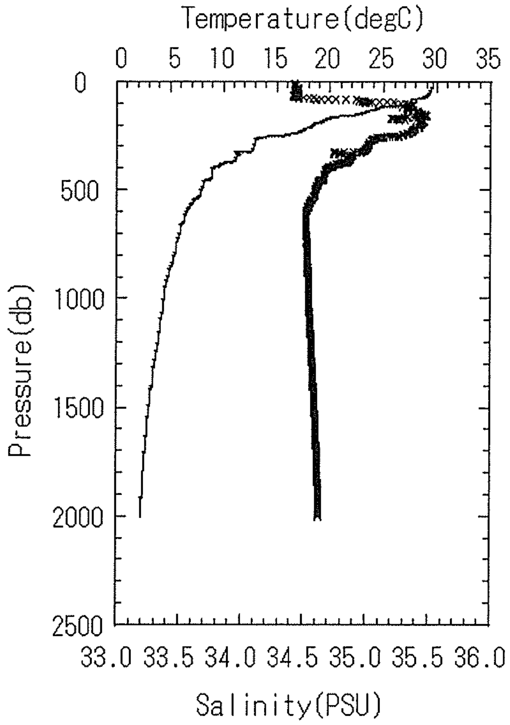
St. 044C



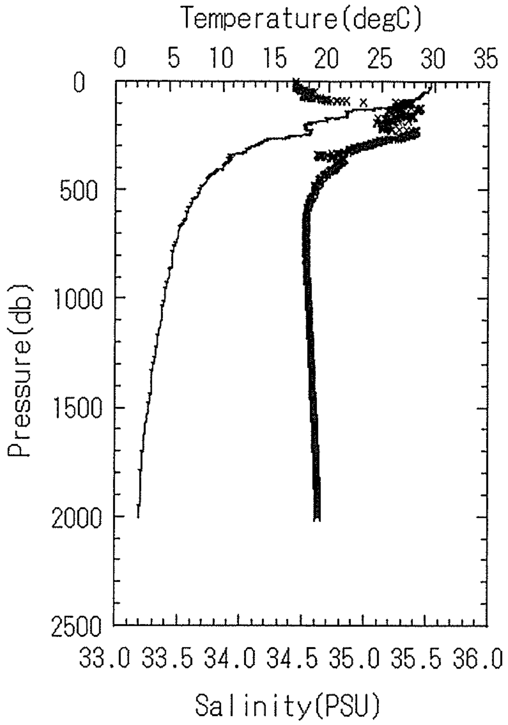
− Temparature

× Salinity

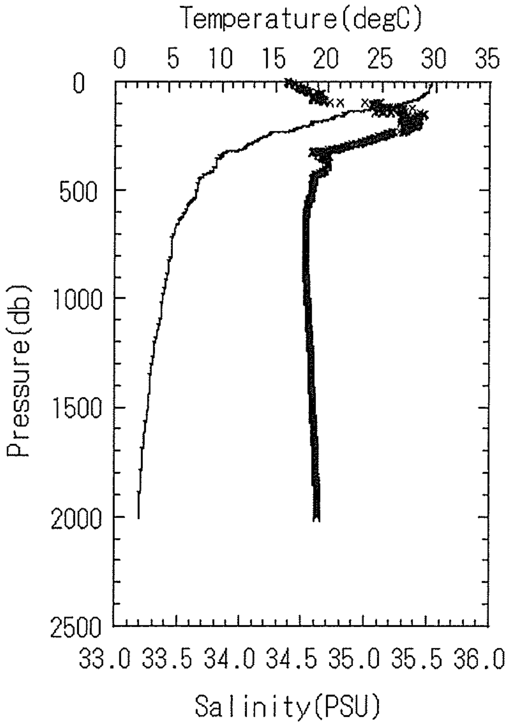
St. 045C



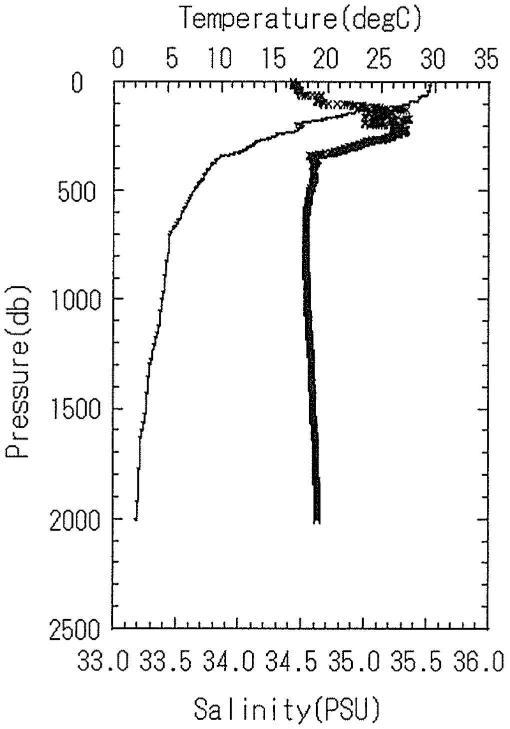
St. 046C



St. 047C



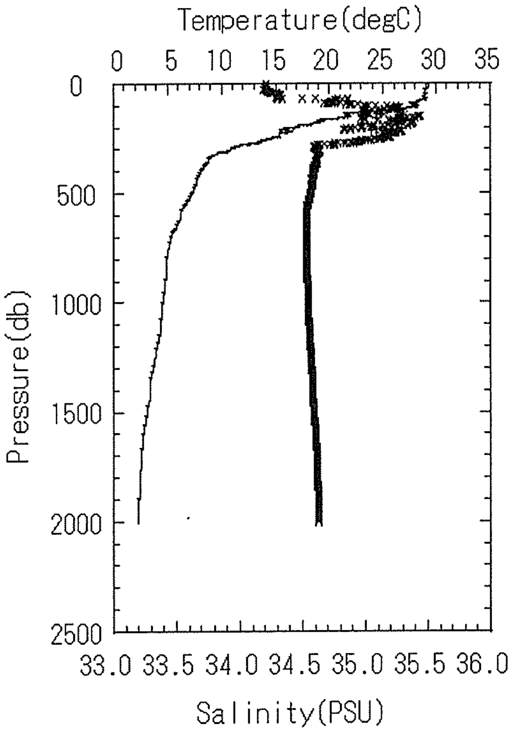
St. 048C



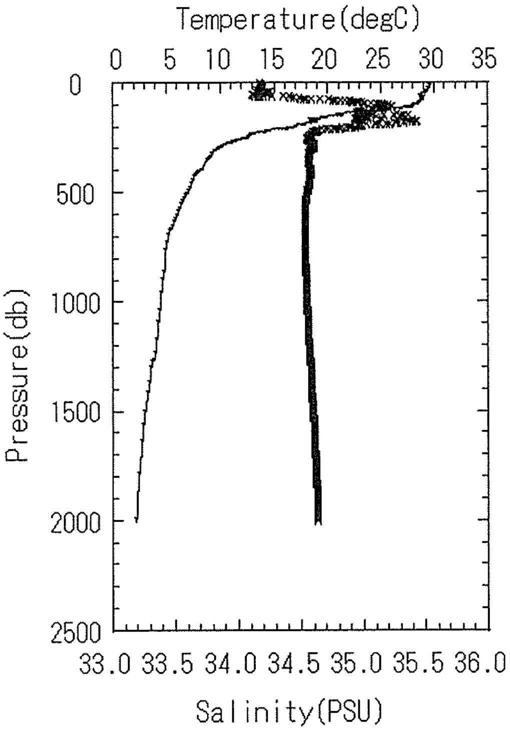
– Temparature

× Salinity

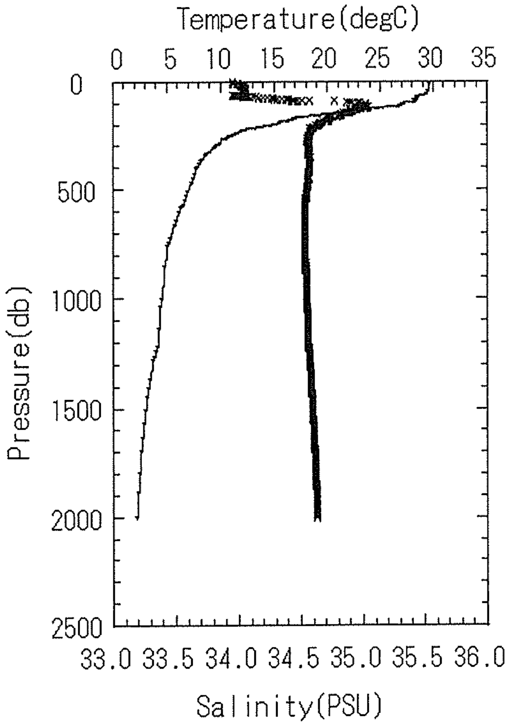
St. 049C



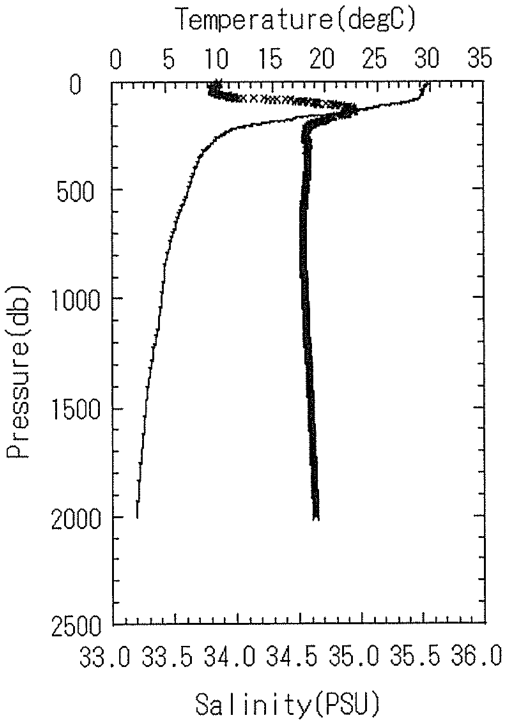
St. 050C



St. 051C



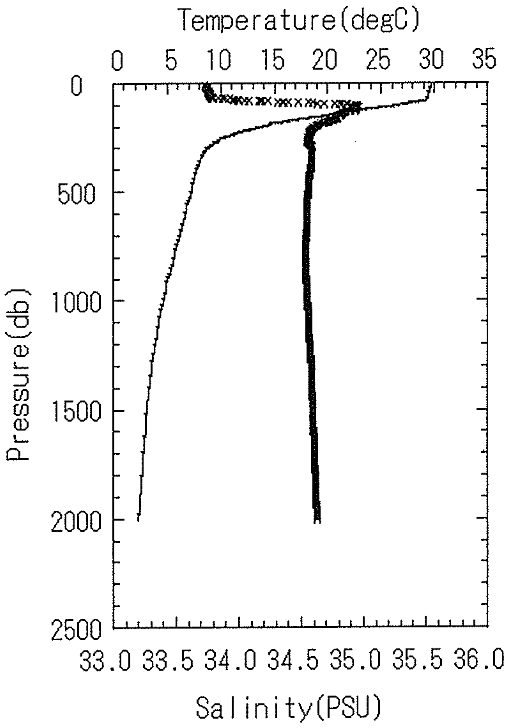
St. 052C



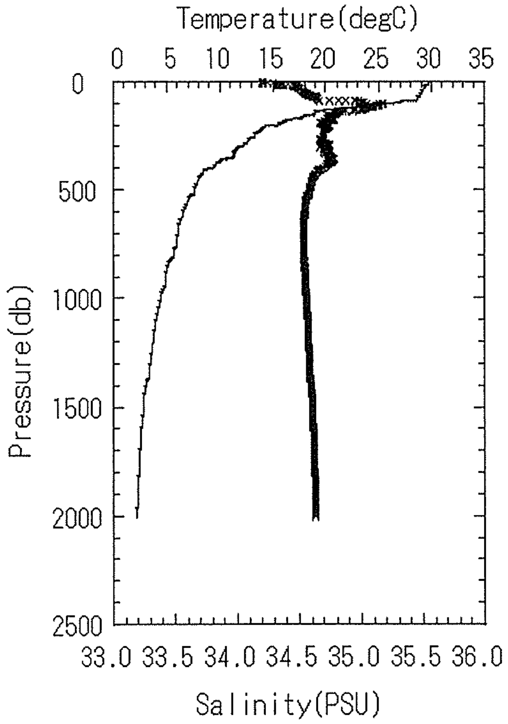
– Temparature

× Salinity

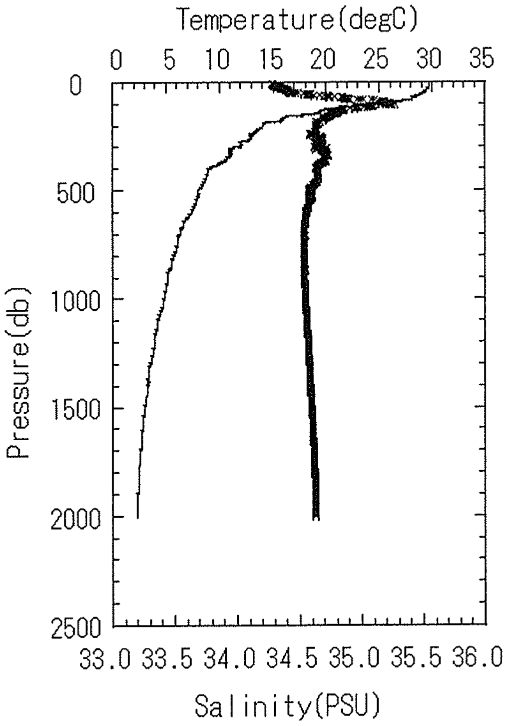
St. 053C



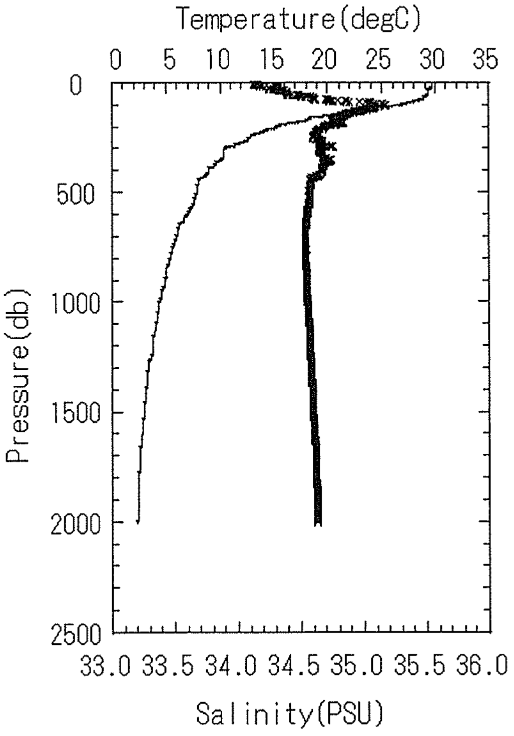
St. 069C



St. 070C



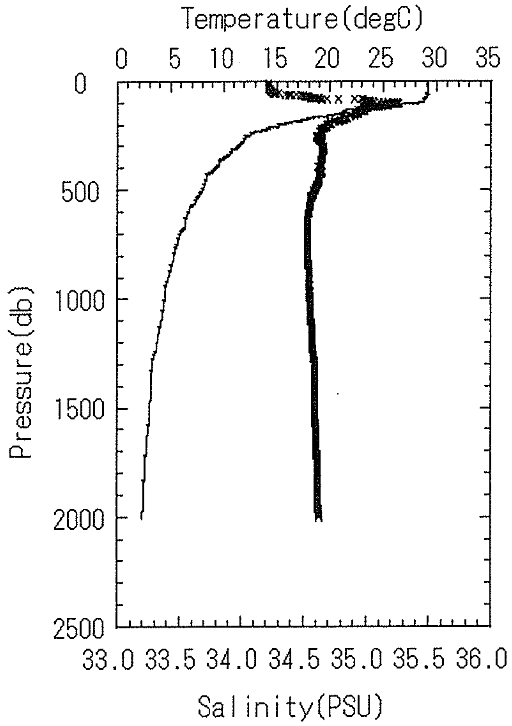
St. 071C



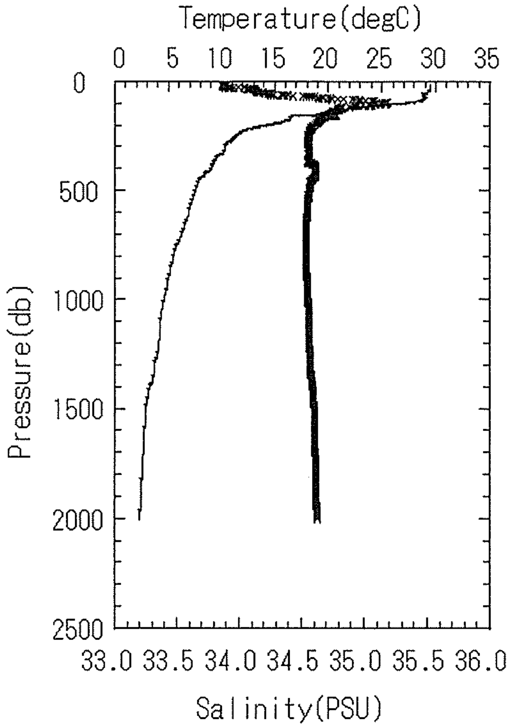
− Temparature

× Salinity

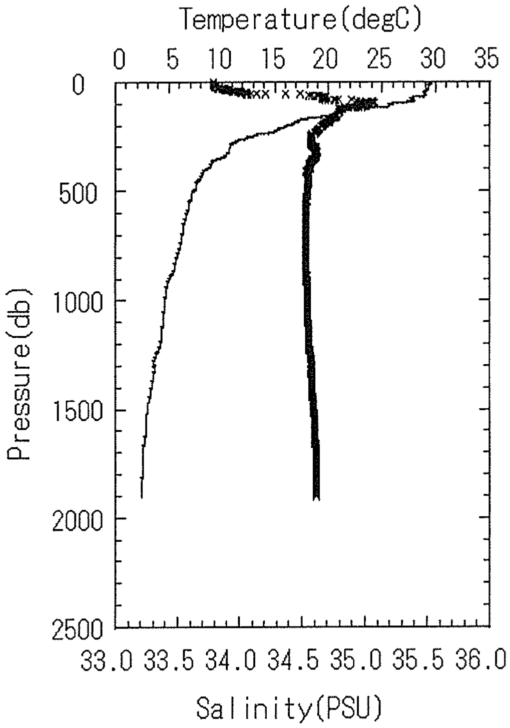
St. 072C



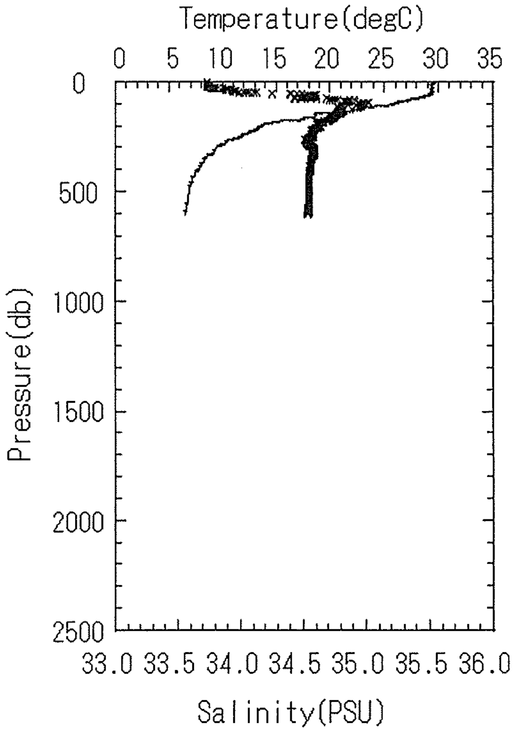
St. 073C



St. 074C



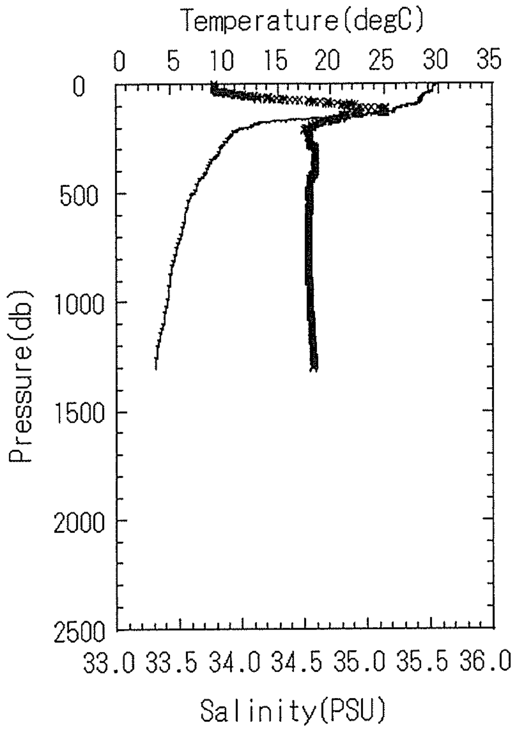
St. 075C



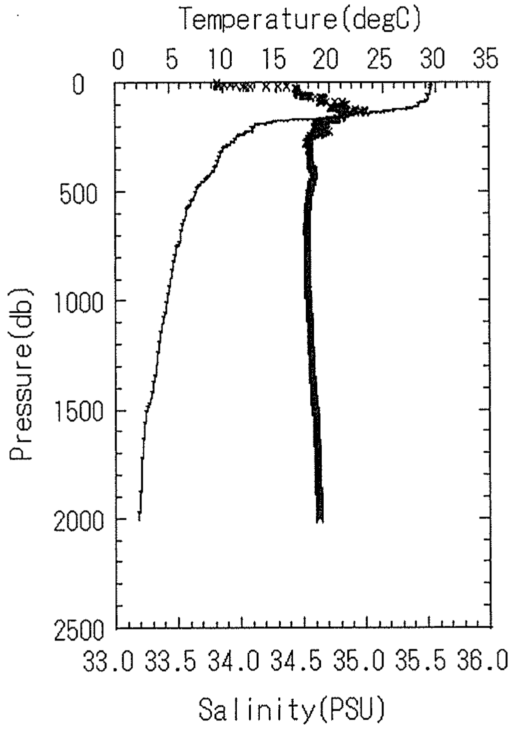
– Temparature

× Salinity

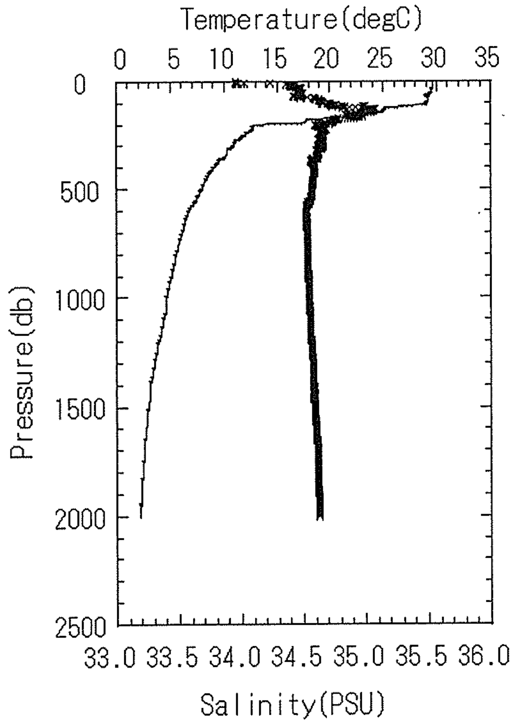
St. 076C



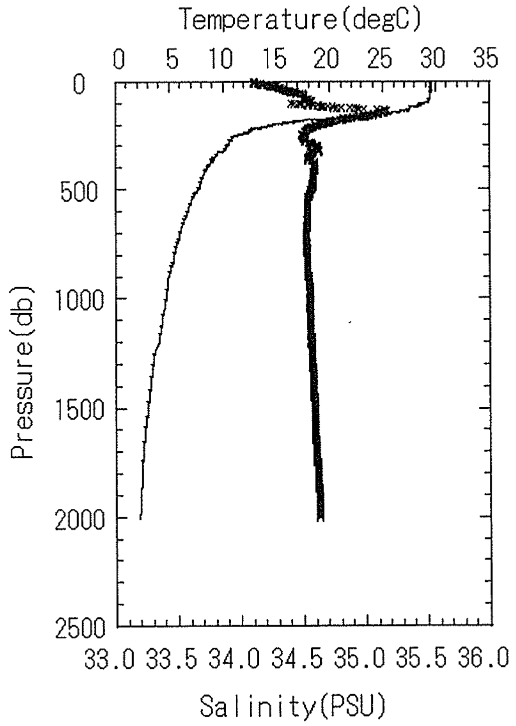
St. 077C



St. 078C



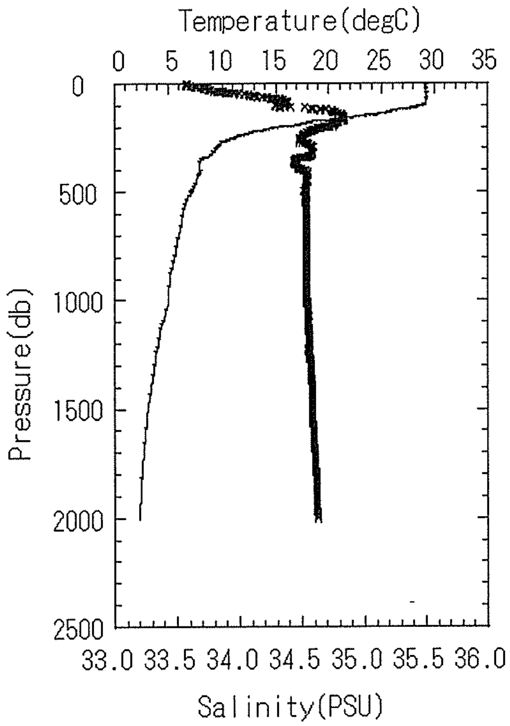
St. 079C



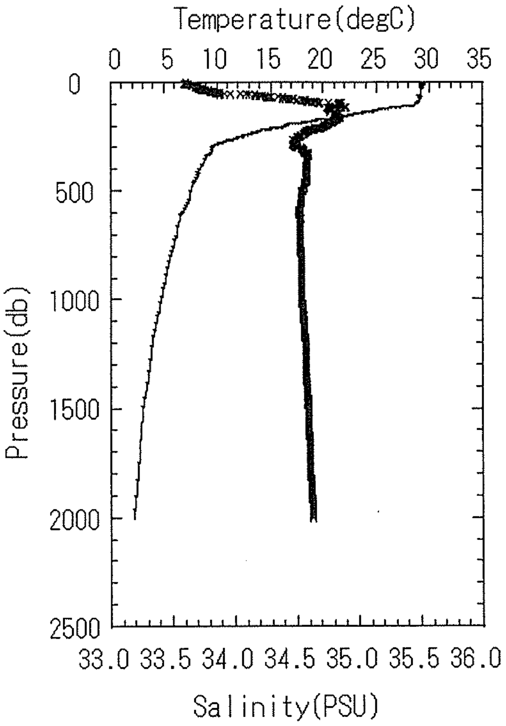
– Temparature

× Salinity

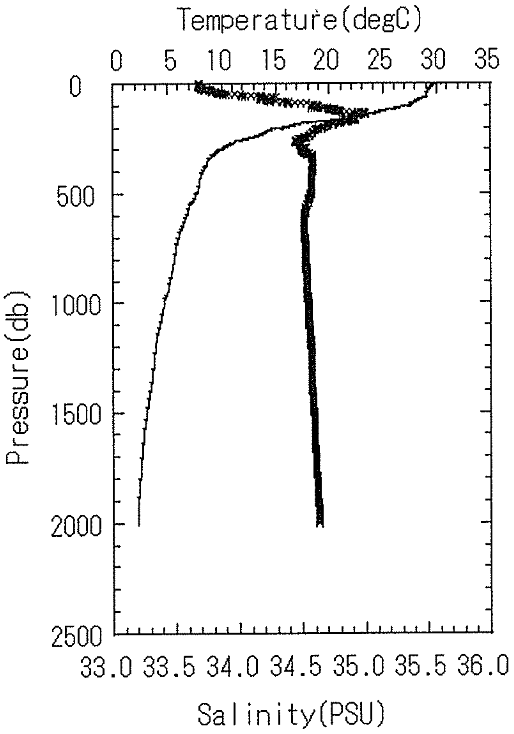
St. 080C



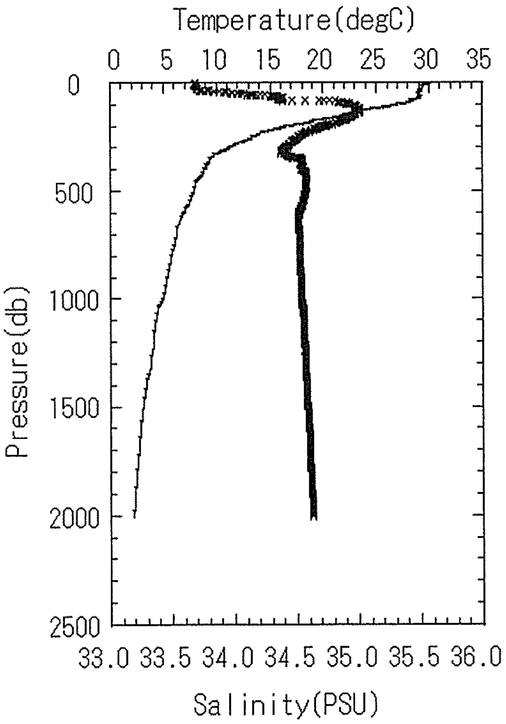
St. 081C



St. 082C



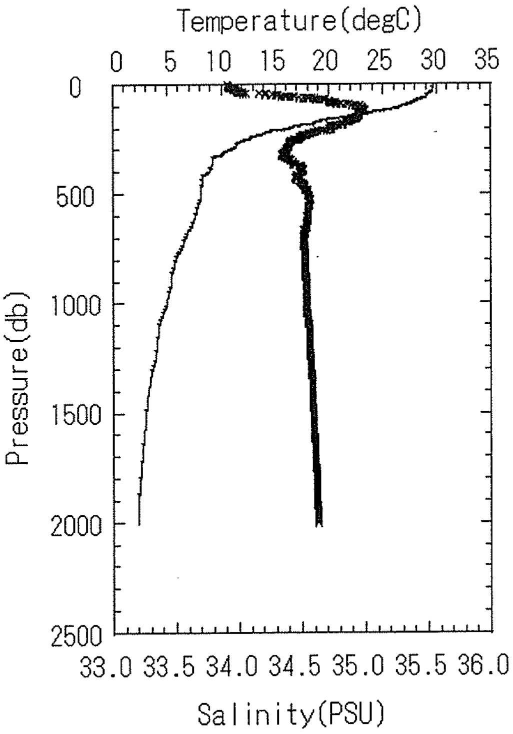
St. 083C



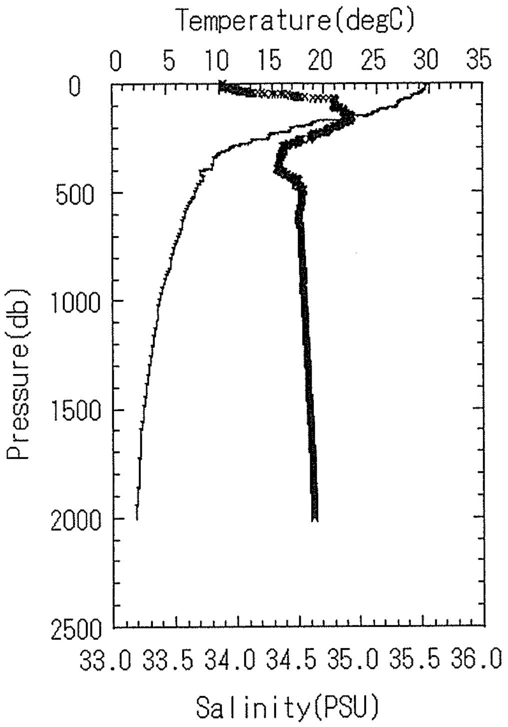
– Temparature

× Salinity

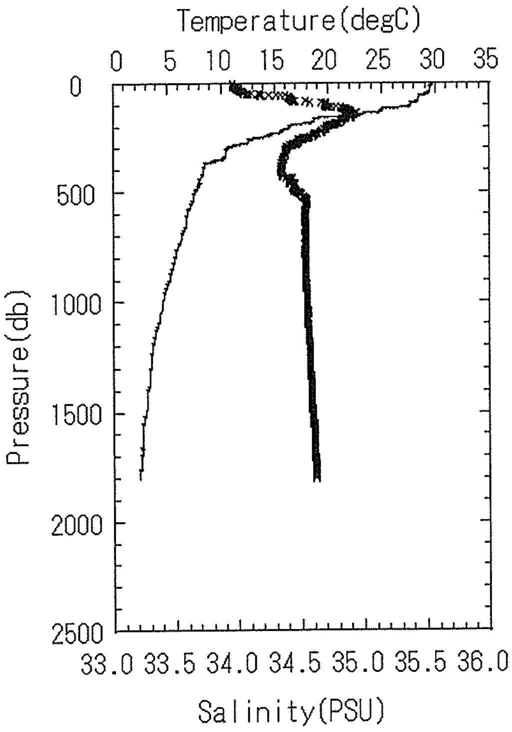
St. 084C



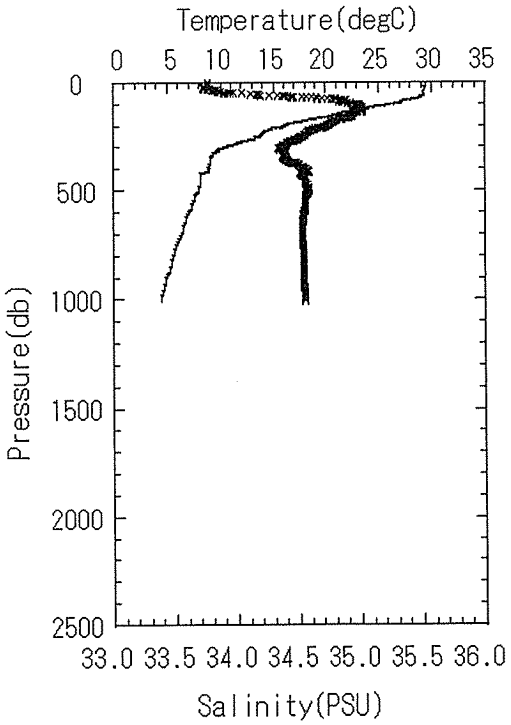
St. 085C



St. 086C

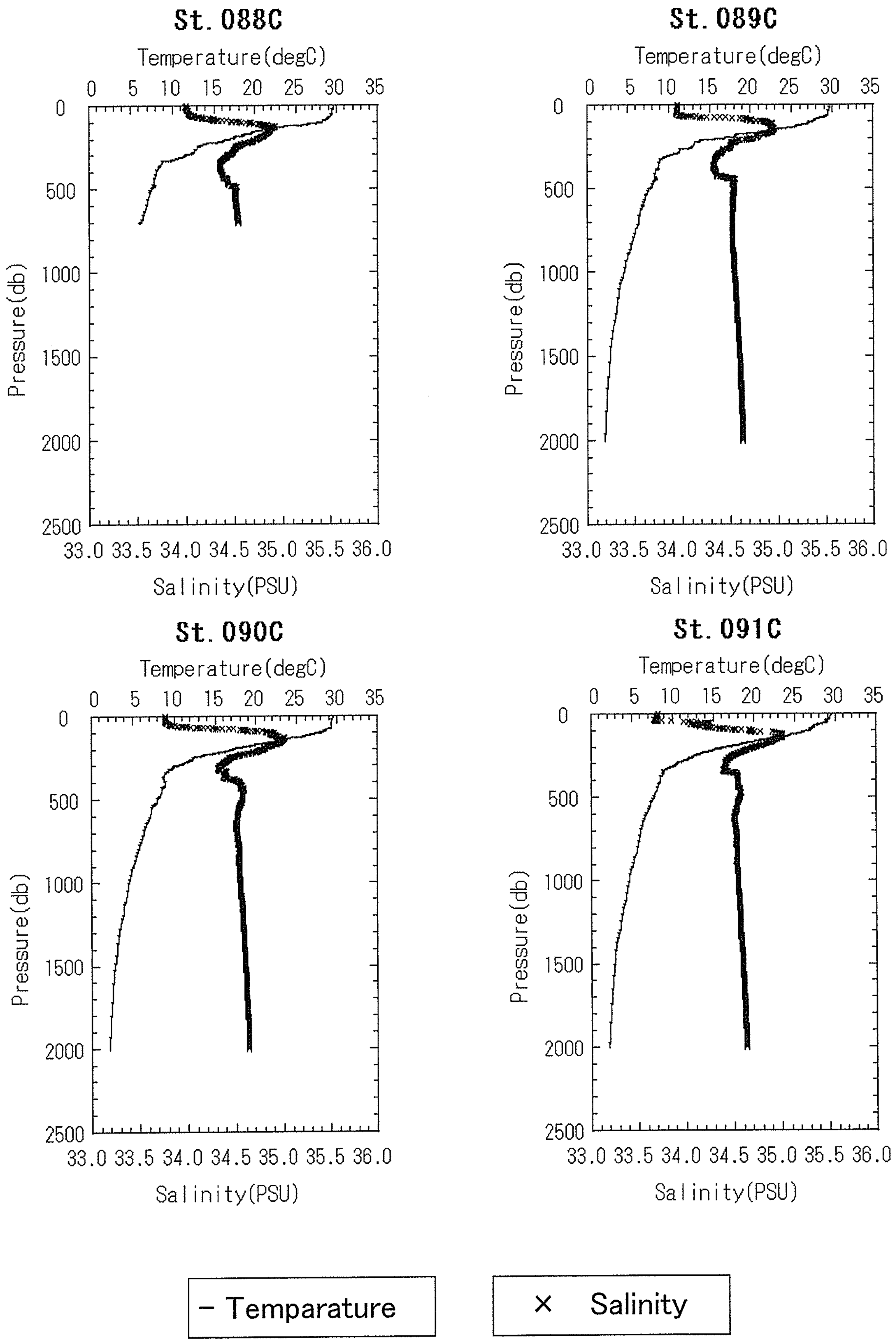


St. 087C

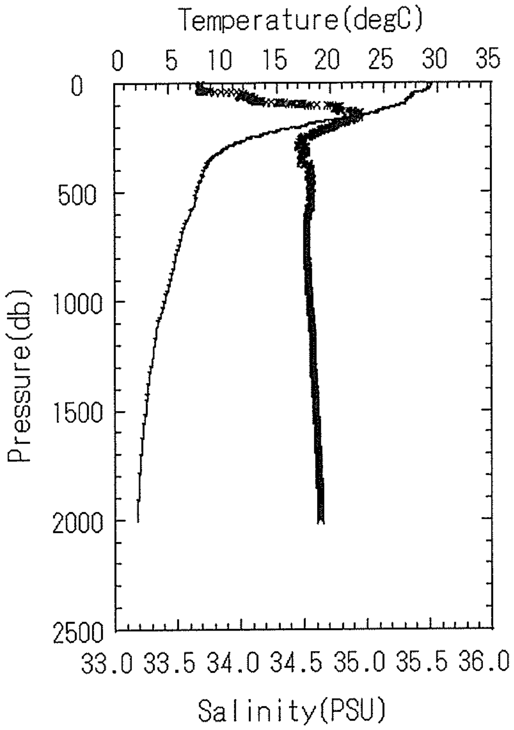


– Temparature

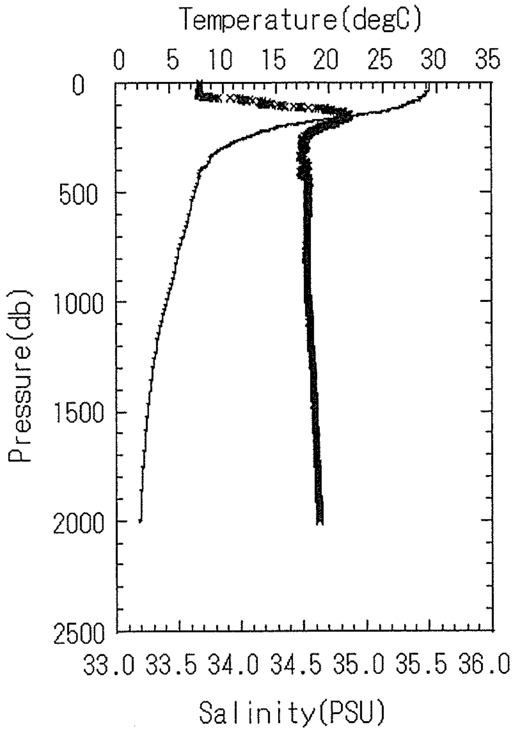
× Salinity


St. 088C
Temperature(degC)
0 5 10 15 20 25 30 35
Pressure(db)
0 500 1000 1500 2000 2500
33.0 33.5 34.0 34.5 35.0 35.5 36.0
Salinity(PSU)
St. 089C
Temperature(degC)
0 5 10 15 20 25 30 35
Pressure(db)
0 500 1000 1500 2000 2500
33.0 33.5 34.0 34.5 35.0 35.5 36.0
Salinity(PSU)
St. 090C
Temperature(degC)
0 5 10 15 20 25 30 35
Pressure(db)
0 500 1000 1500 2000 2500
33.0 33.5 34.0 34.5 35.0 35.5 36.0
Salinity(PSU)
St. 091C
Temperature(degC)
0 5 10 15 20 25 30 35
Pressure(db)
0 500 1000 1500 2000 2500
33.0 33.5 34.0 34.5 35.0 35.5 36.0
Salinity(PSU)
– Temparature
× Salinity

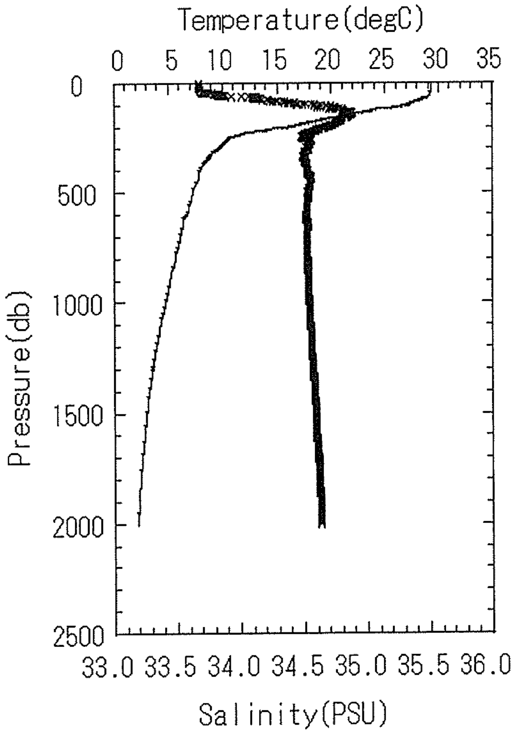
St. 092C



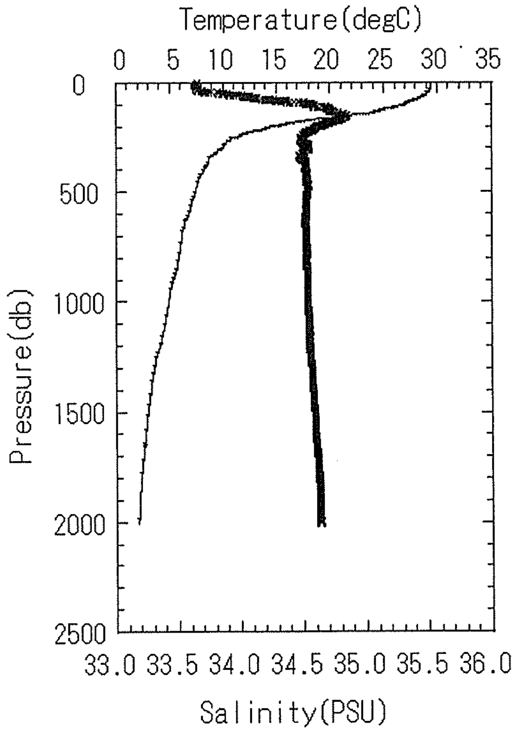
St. 093C



St. 094C



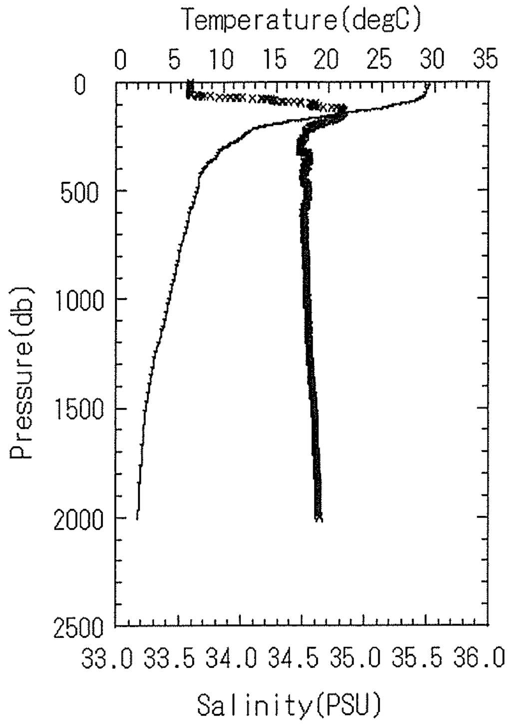
St. 095C



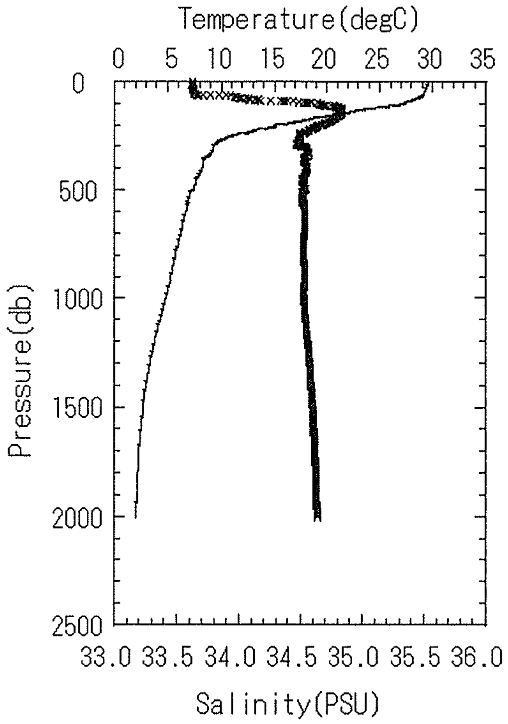
– Temparature

× Salinity

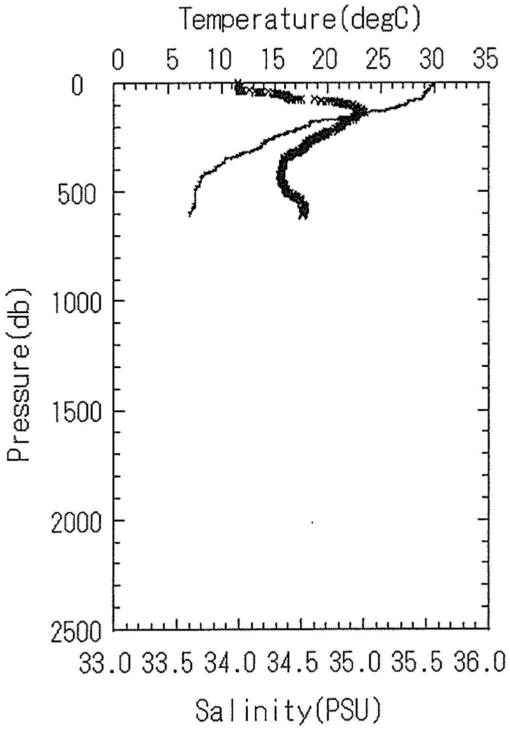
St. 096C



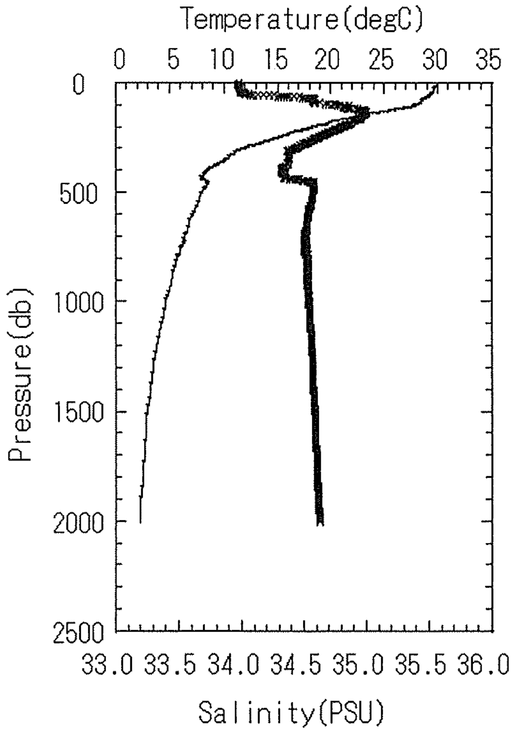
St. 097C



St. 098C

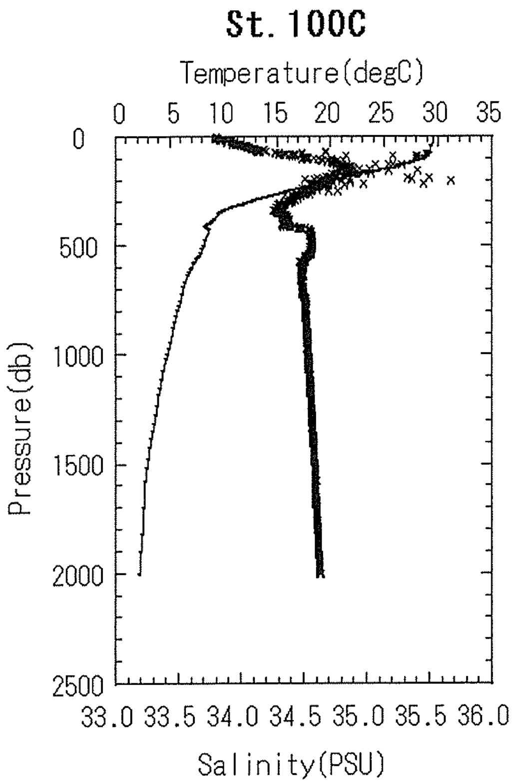


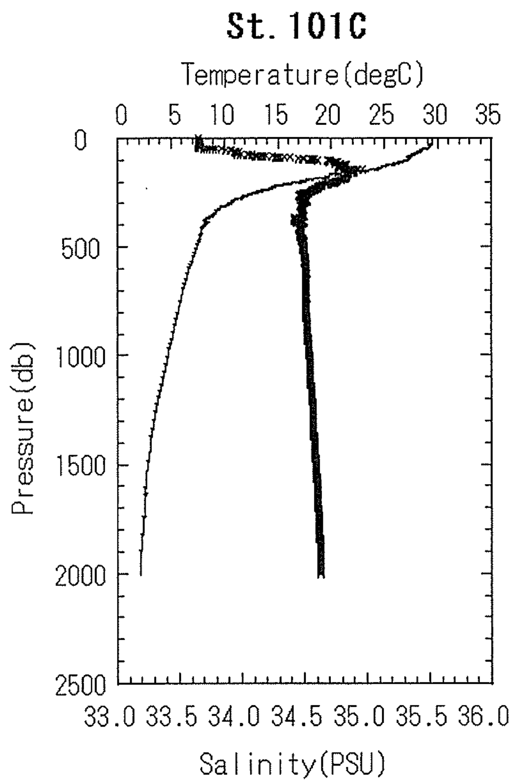
St. 099C

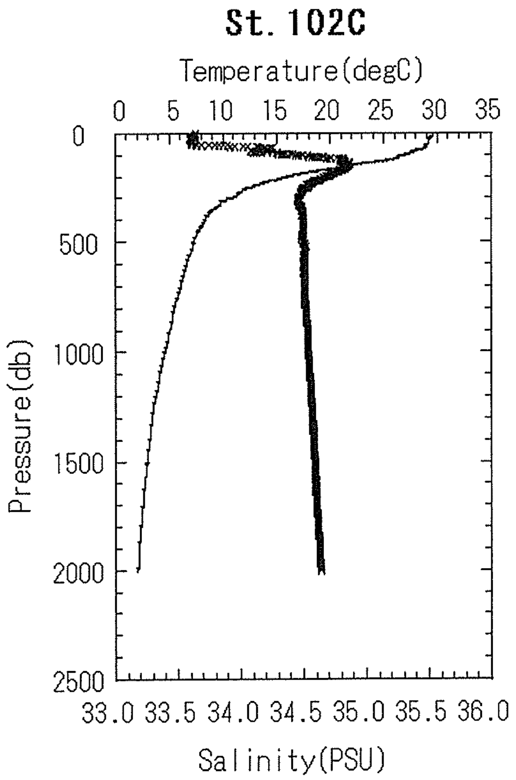


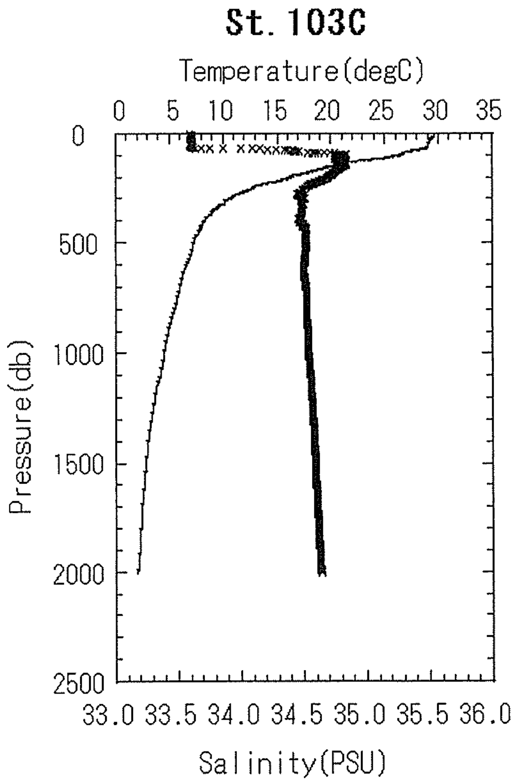
– Temparature

× Salinity





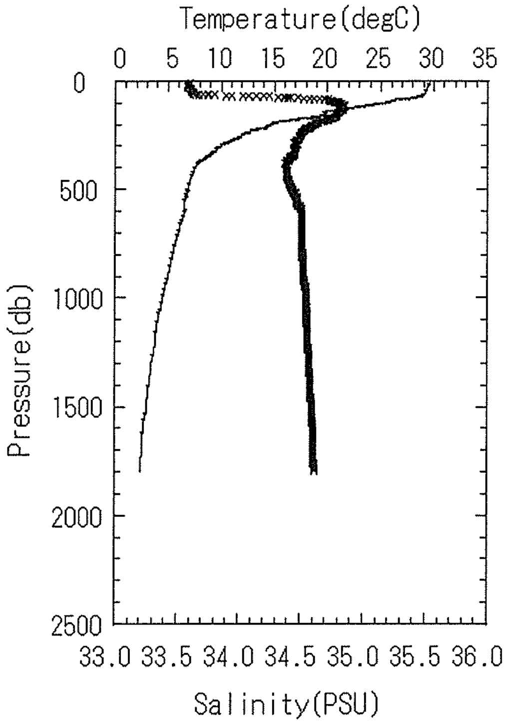




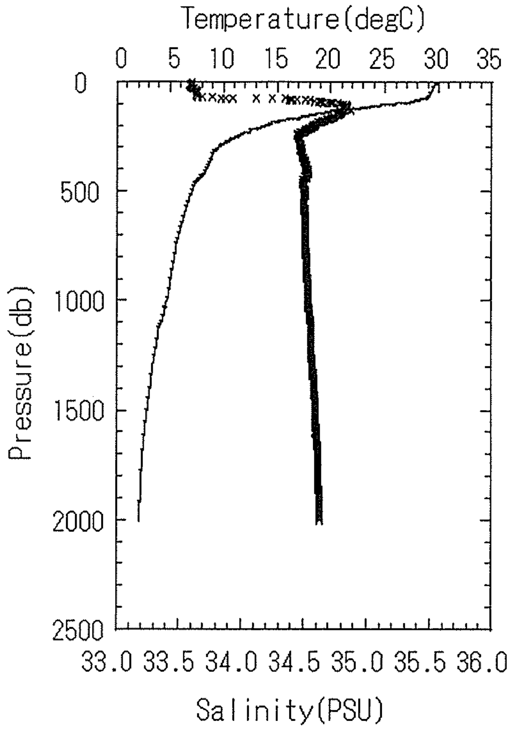
− Temparature

× Salinity

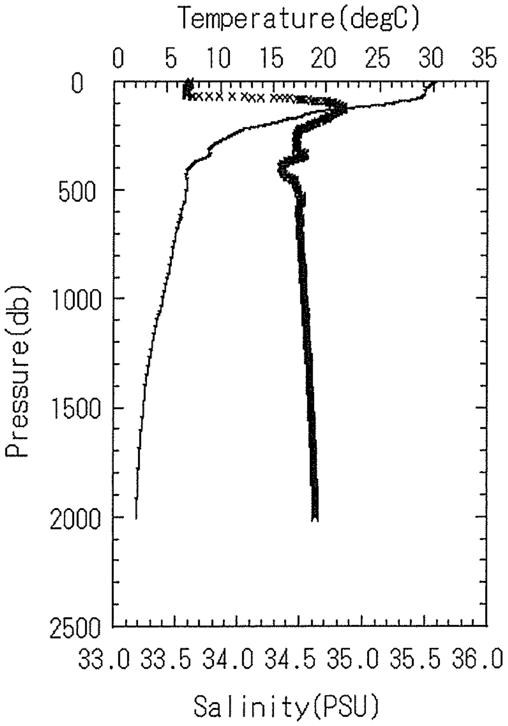
St. 104C



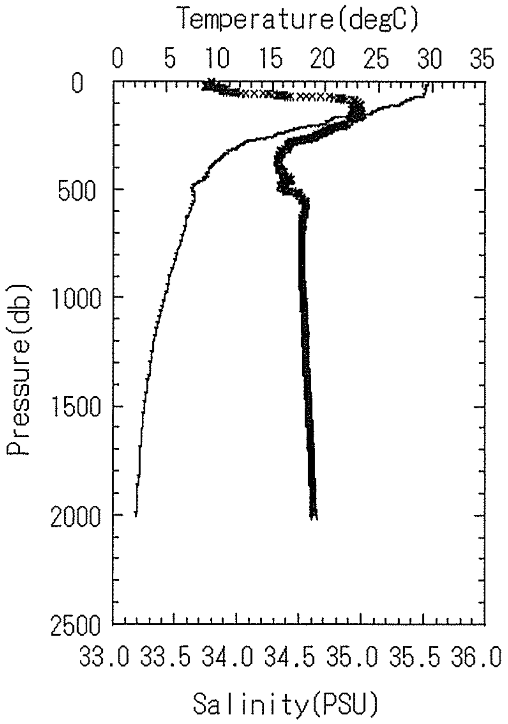
St. 105C



St. 106C



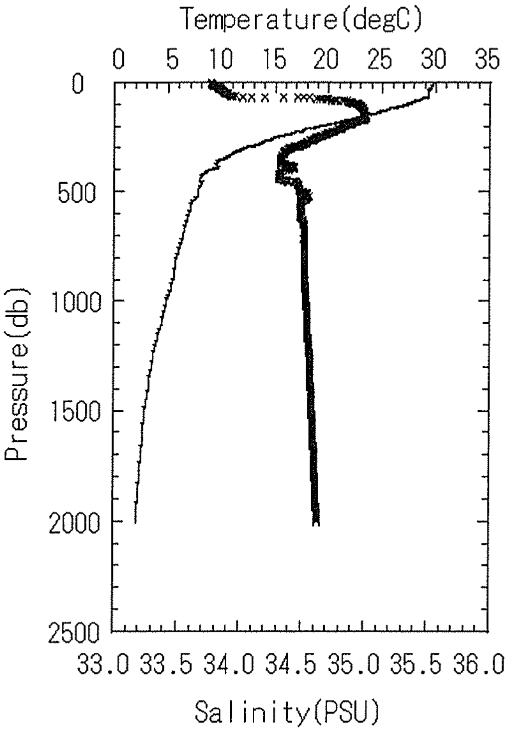
St. 107C



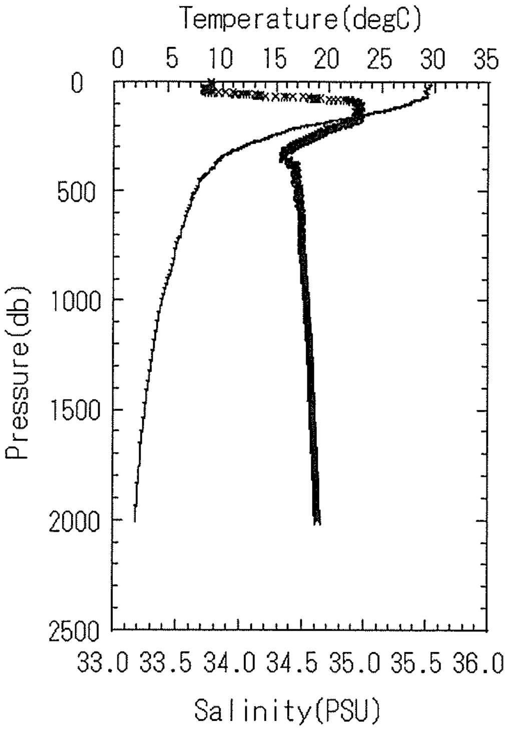
– Temparature

× Salinity

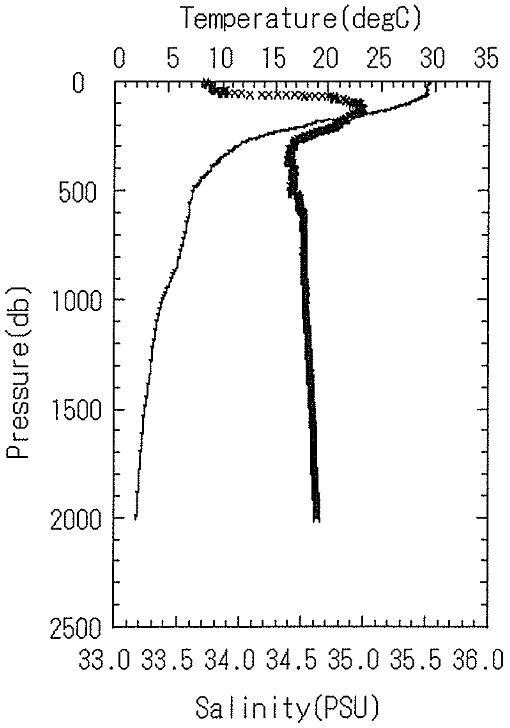
St. 108C



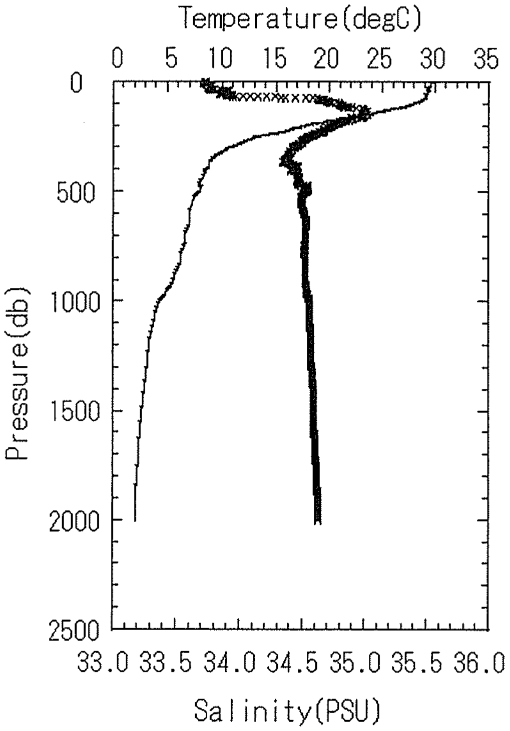
St. 109C



St. 110C



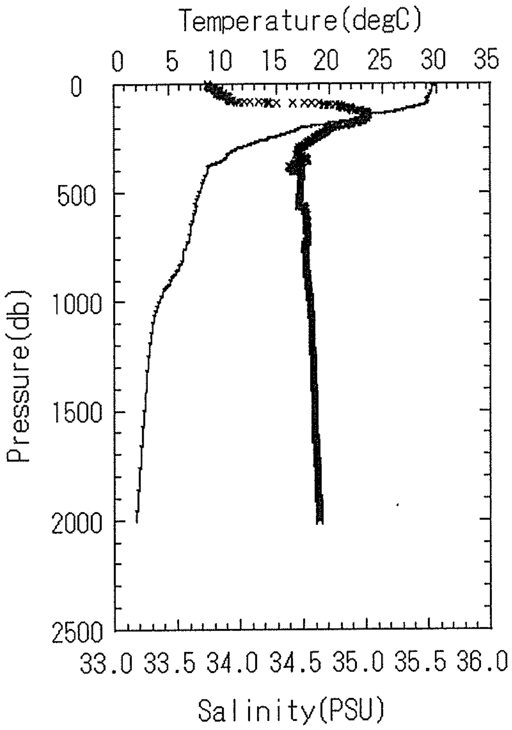
St. 111C



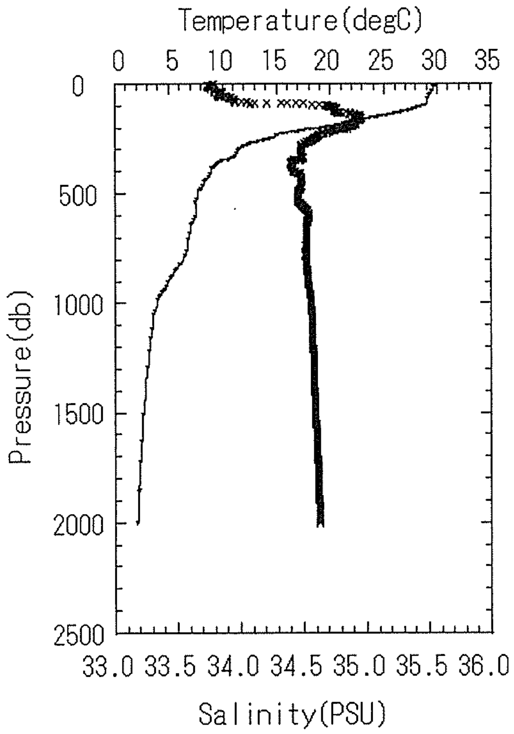
− Temparature

× Salinity

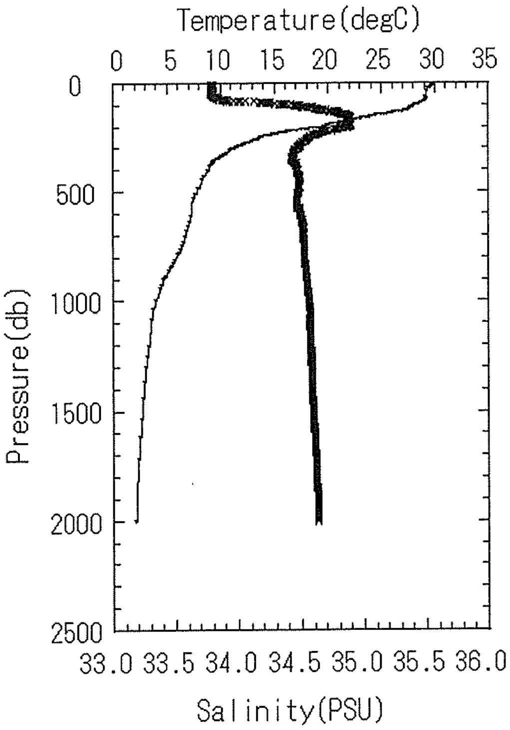
St. 112C



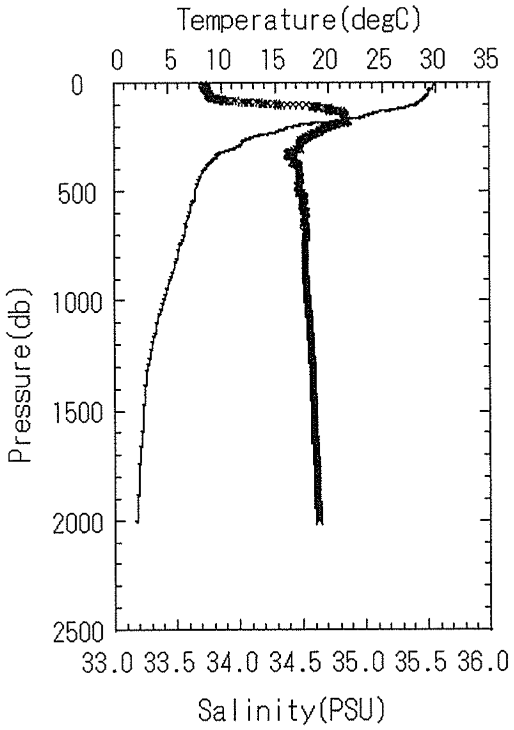
St. 113C



St. 114C



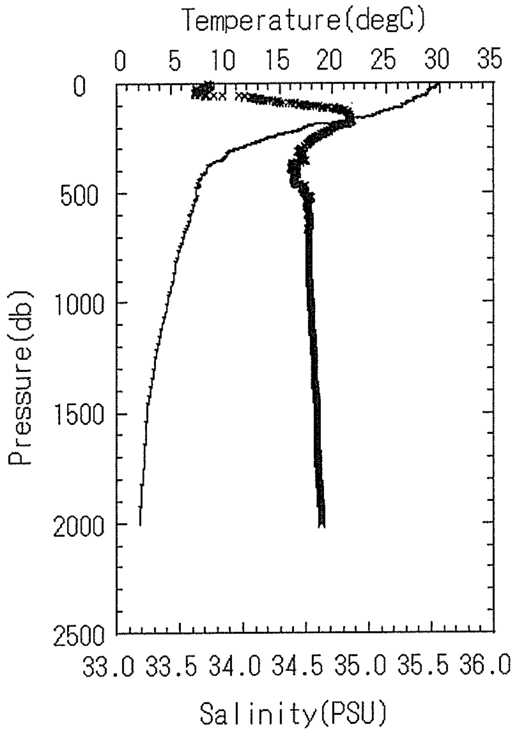
St. 115C



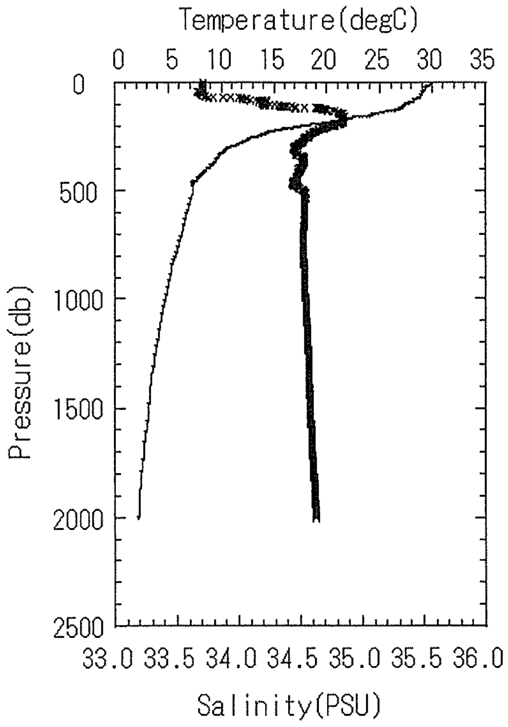
– Temparature

× Salinity

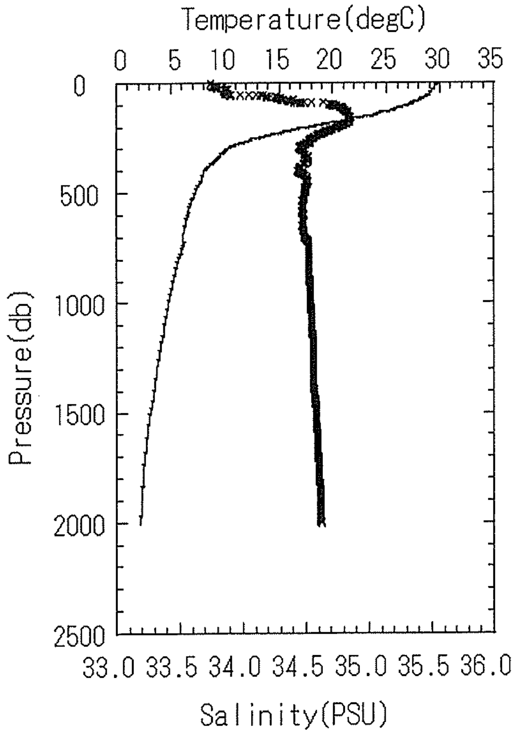
St. 116C



St. 117C

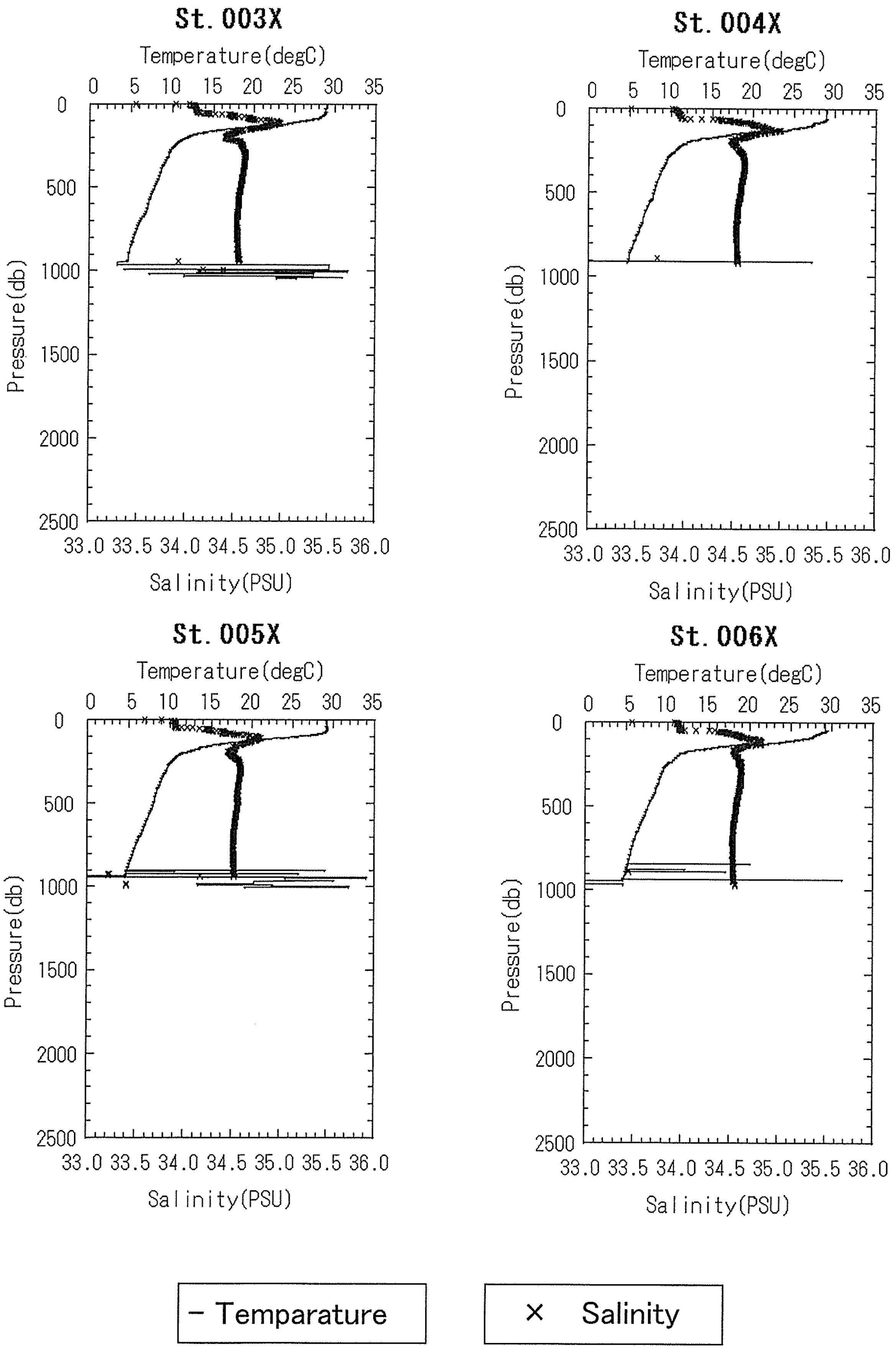


St. 118C

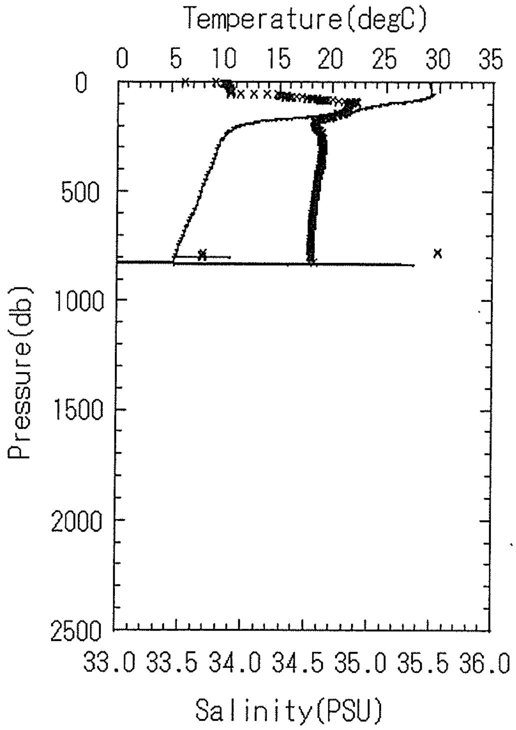


– Temparature	× Salinity

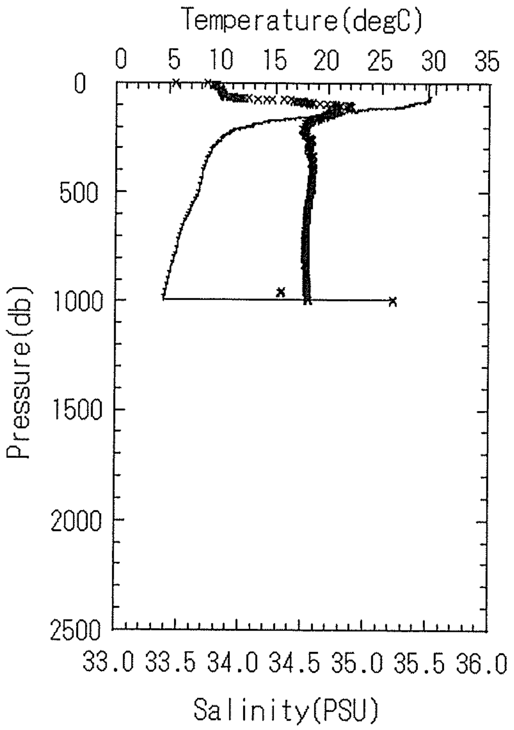
4.3.2 XCTD


St. 003X
St. 004X
St. 005X
St. 006X
Temperature(degC)
0 5 10 15 20 25 30 35
Pressure(db)
0
500
1000
1500
2000
2500
33.0 33.5 34.0 34.5 35.0 35.5 36.0
Salinity(PSU)
– Temparature
× Salinity

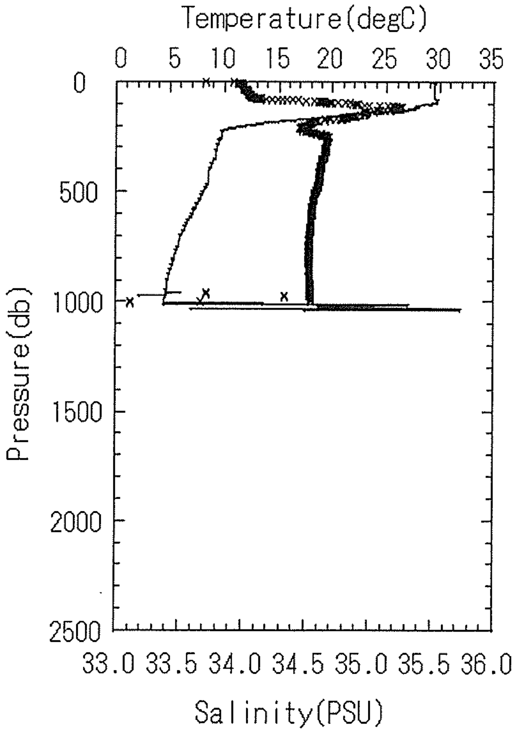
St. 007X



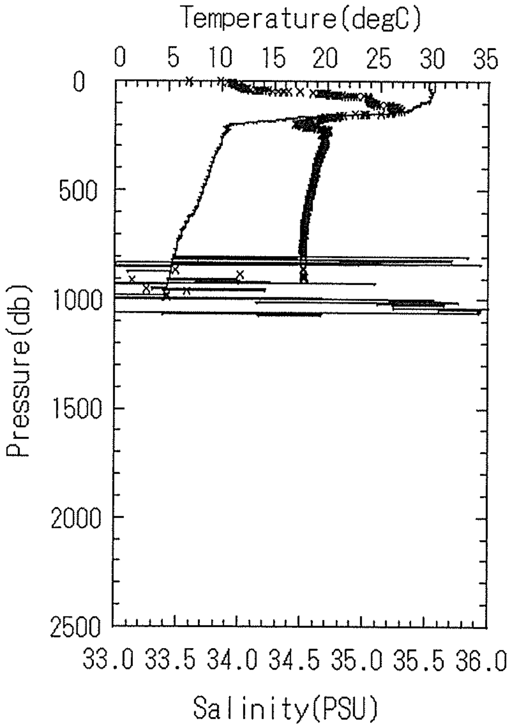
St. 009X



St. 011X



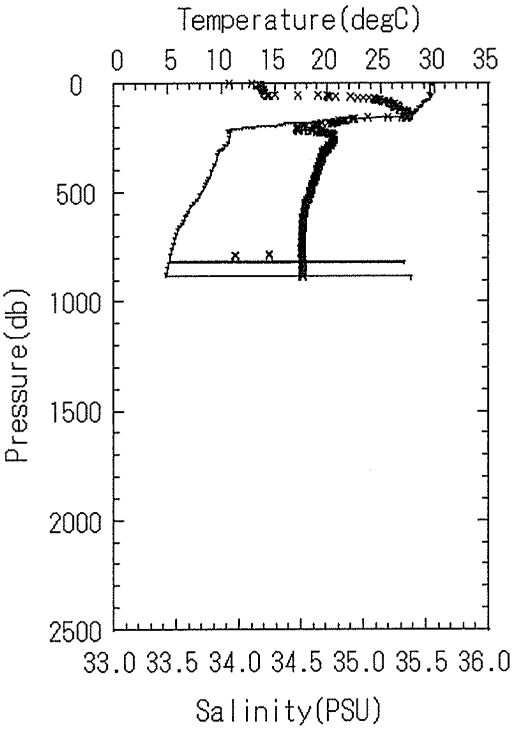
St. 012X



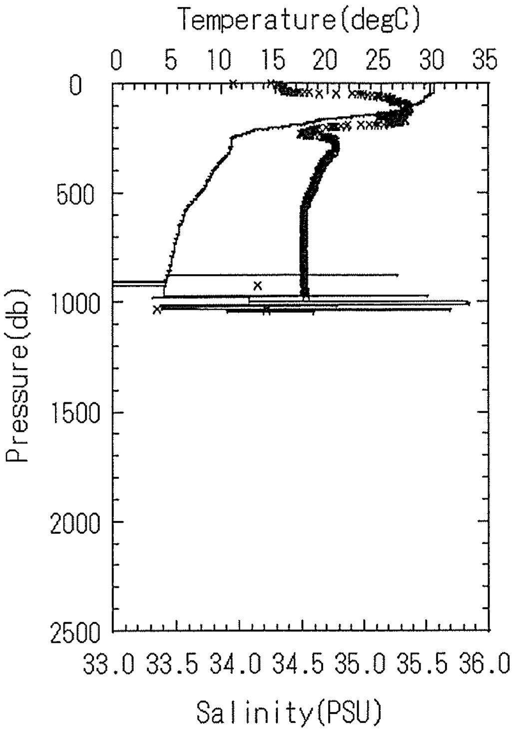
– Temparature

× Salinity

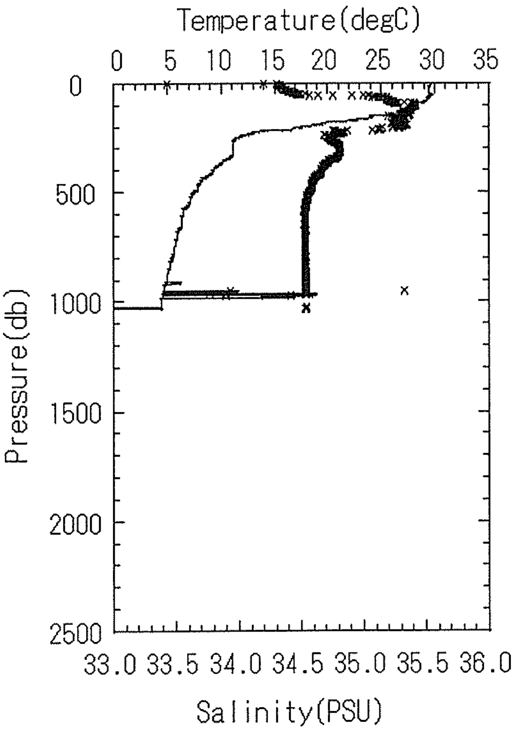
St. 013X



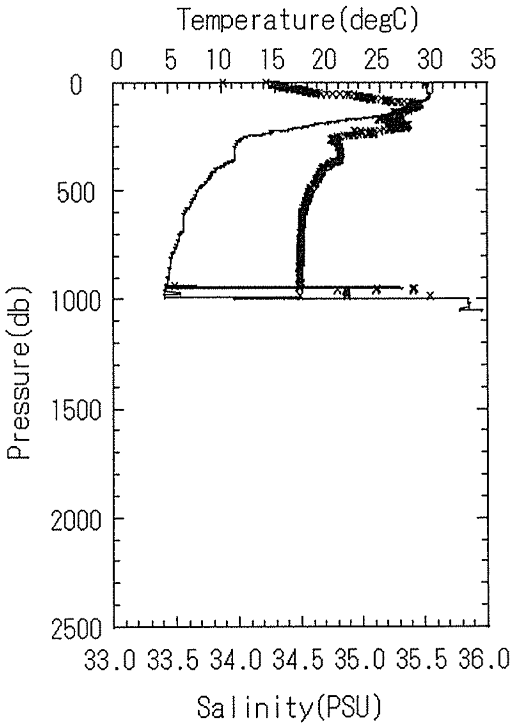
St. 015X



St. 016X

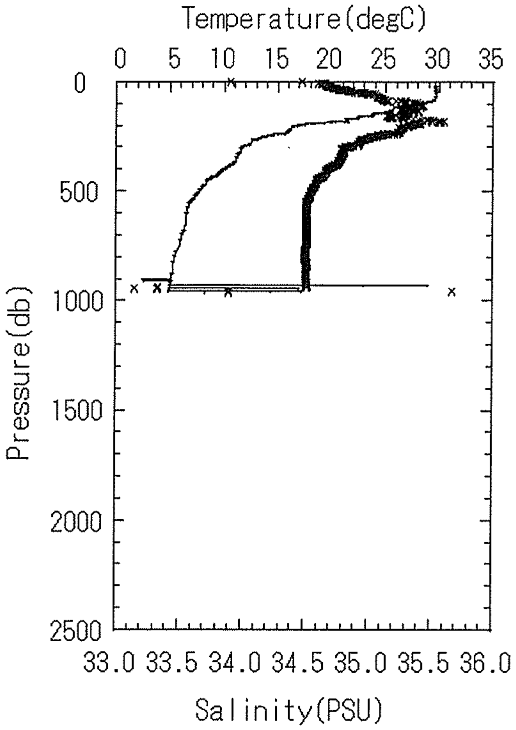


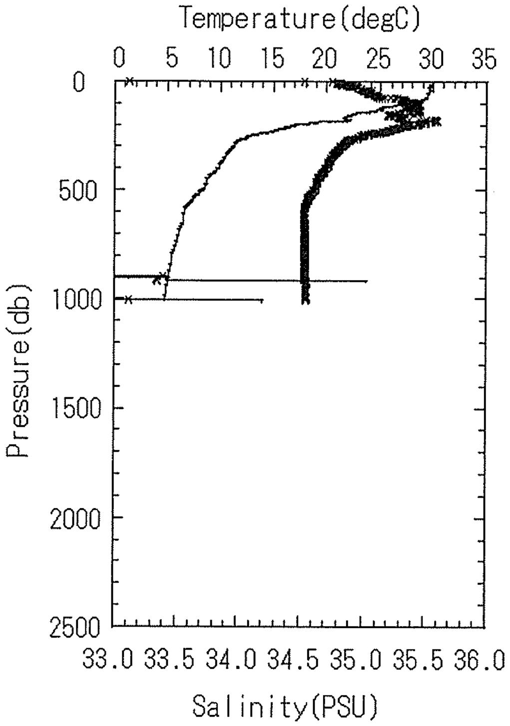
St. 017X

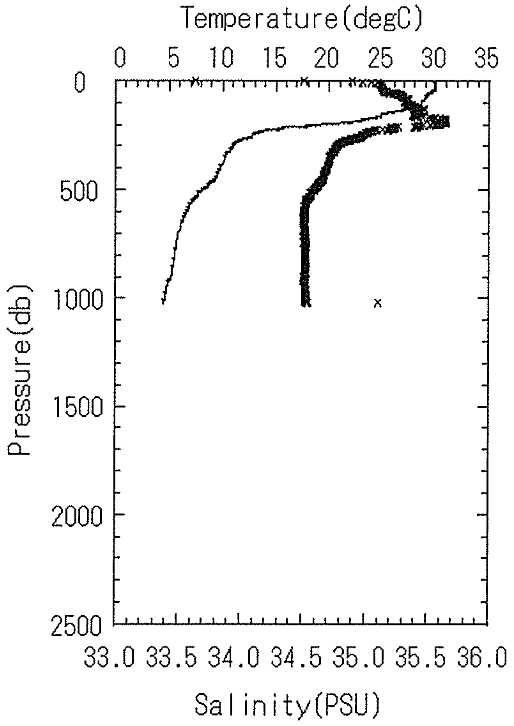


− Temparature

× Salinity


St. 019X


St. 020X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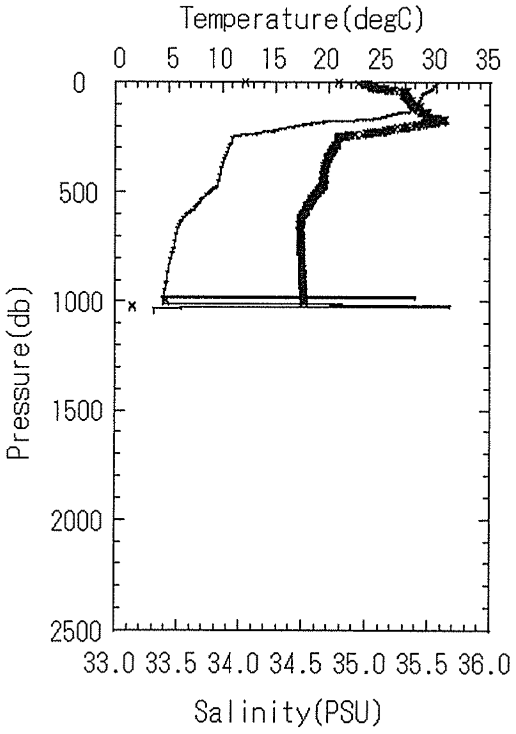
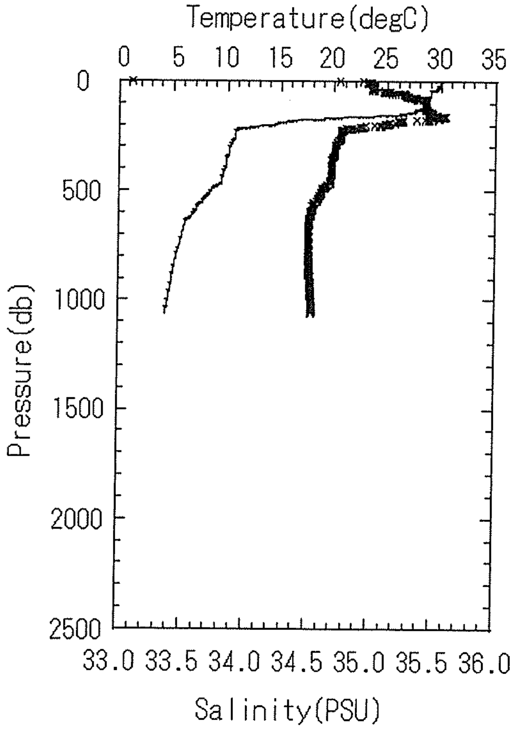

St. 023X

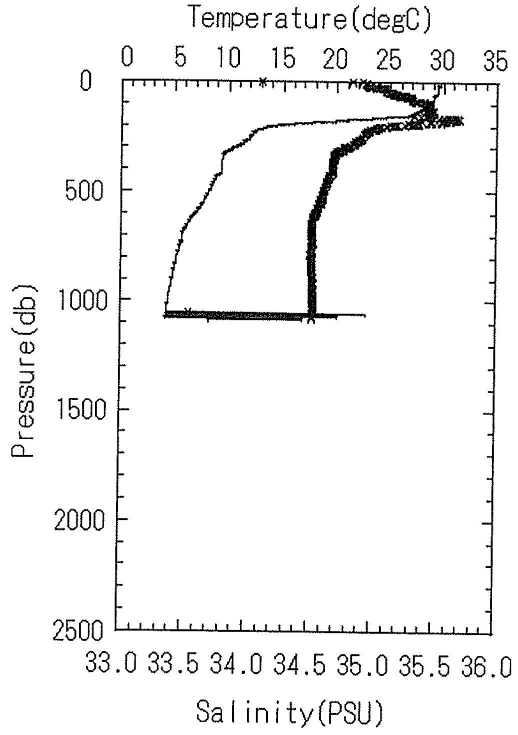
– Temparature

× Salinity

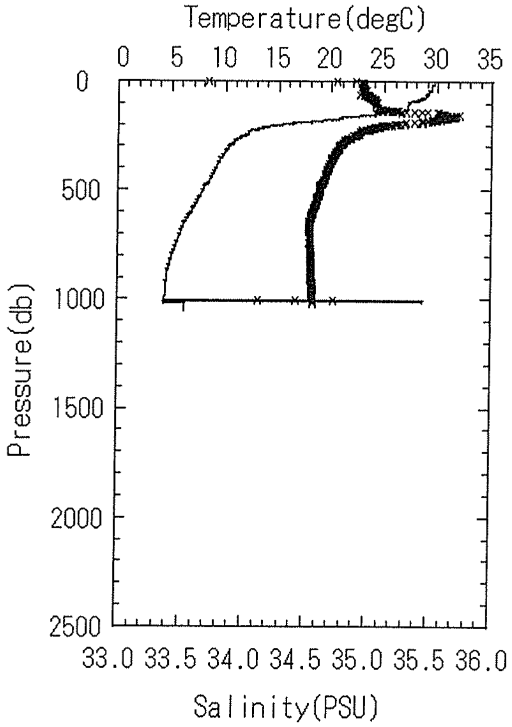
St. 024X



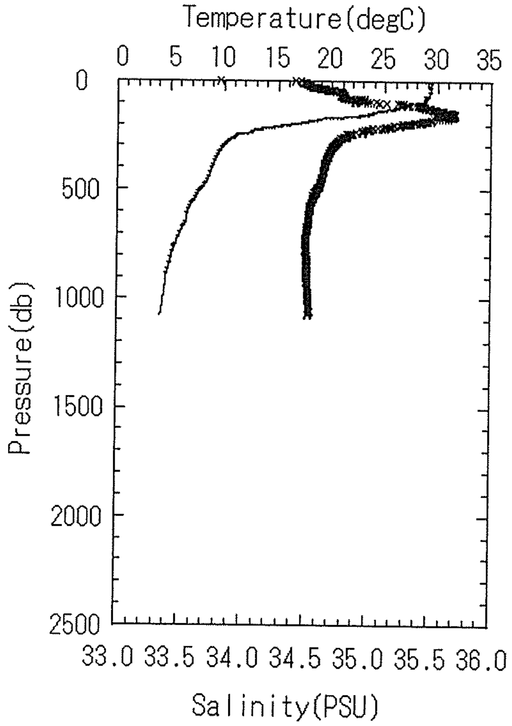
St. 025X



St. 026X



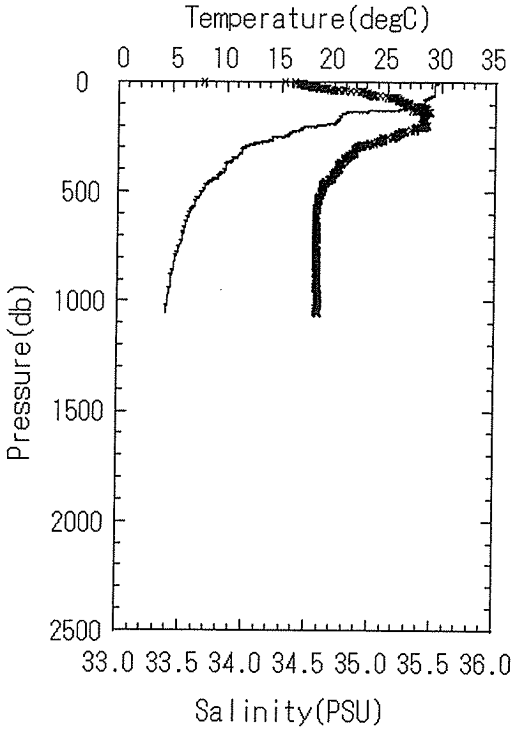
St. 027X



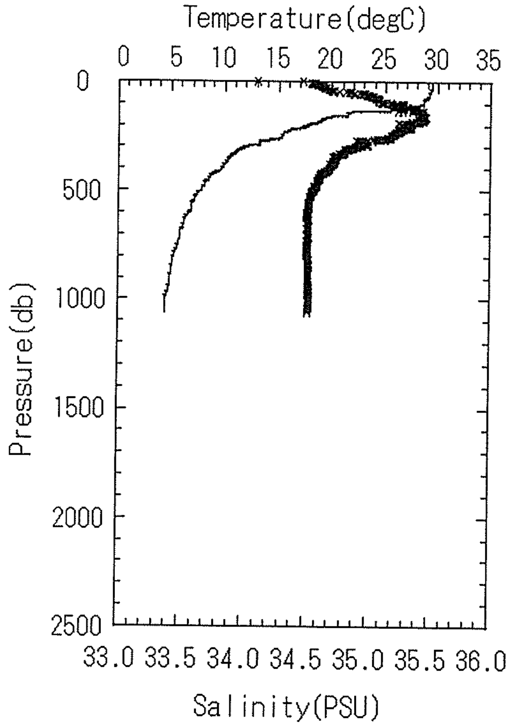
− Temparature

× Salinity

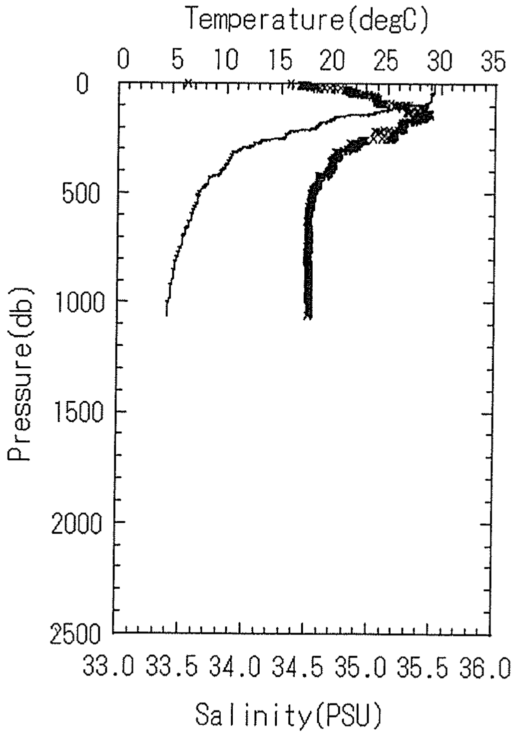
St. 031X



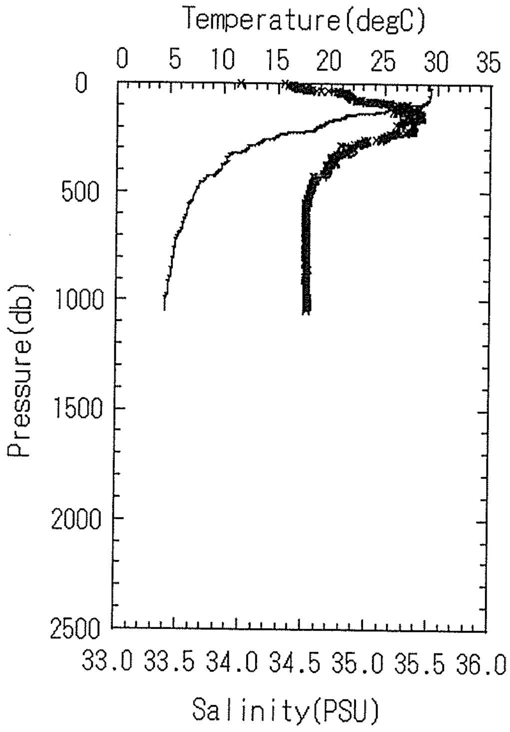
St. 032X



St. 033X



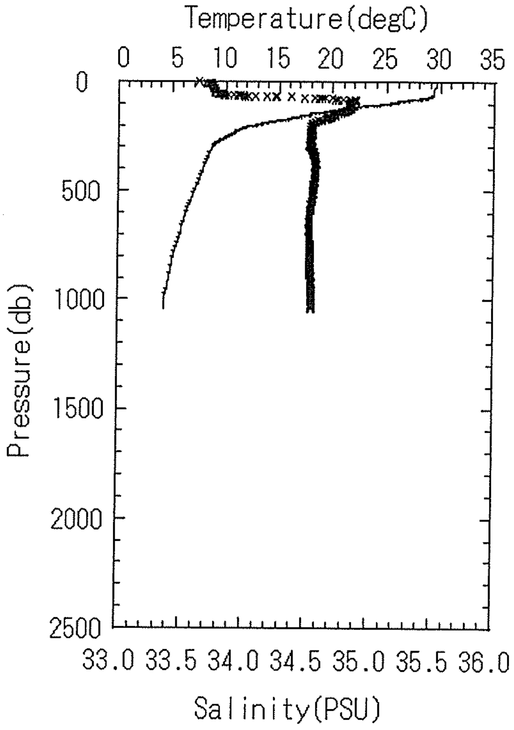
St. 034X



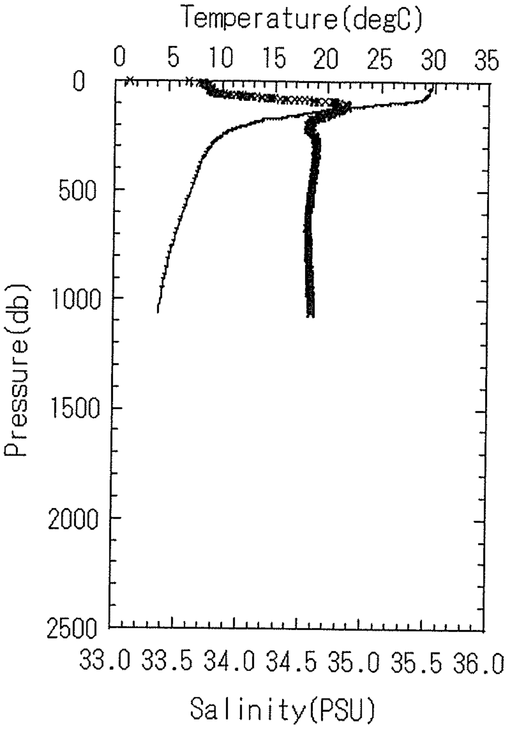
− Temparature

× Salinity

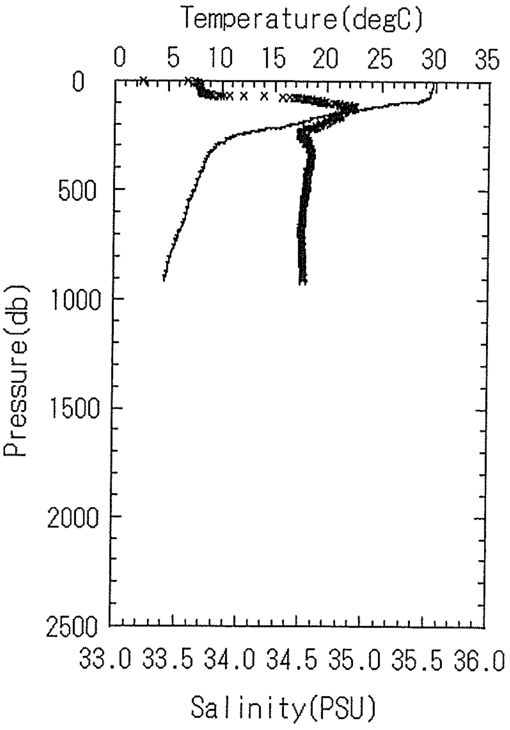
St. 054X



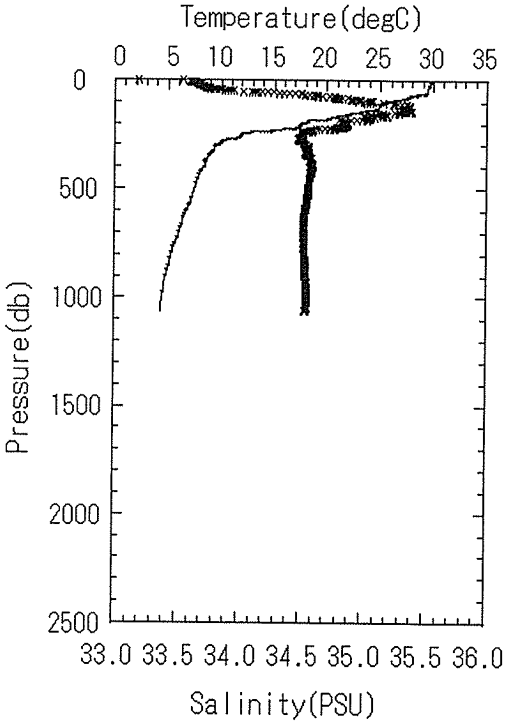
St. 055X



St. 056X

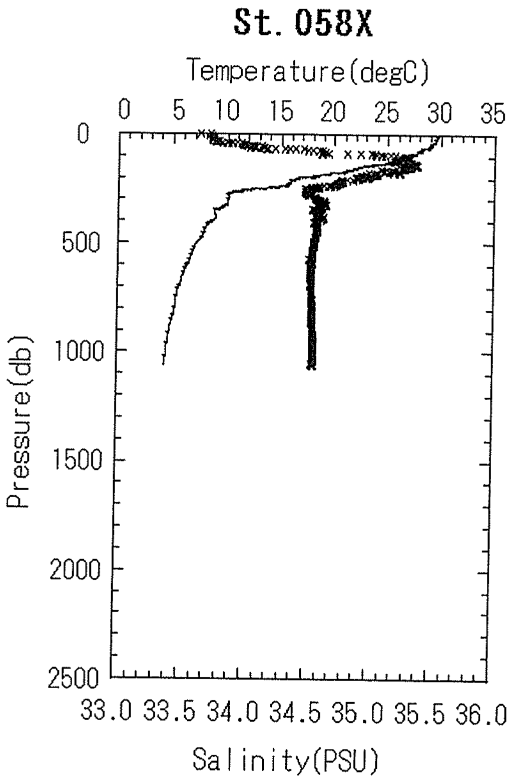


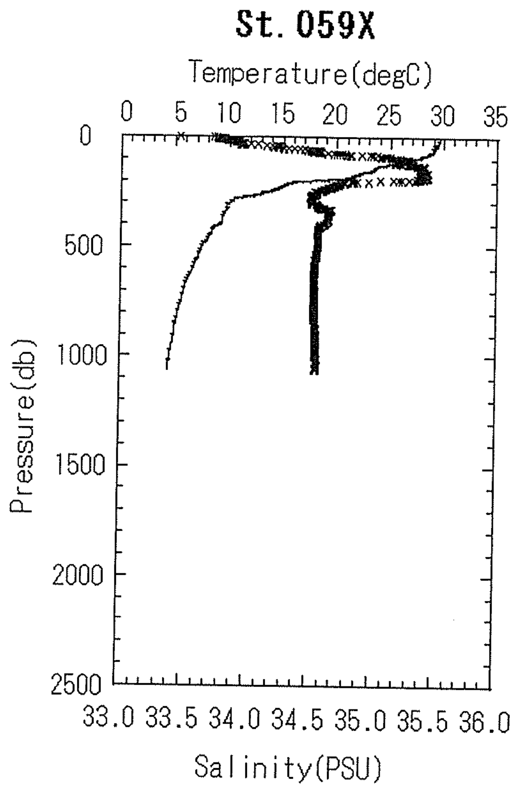
St. 057X

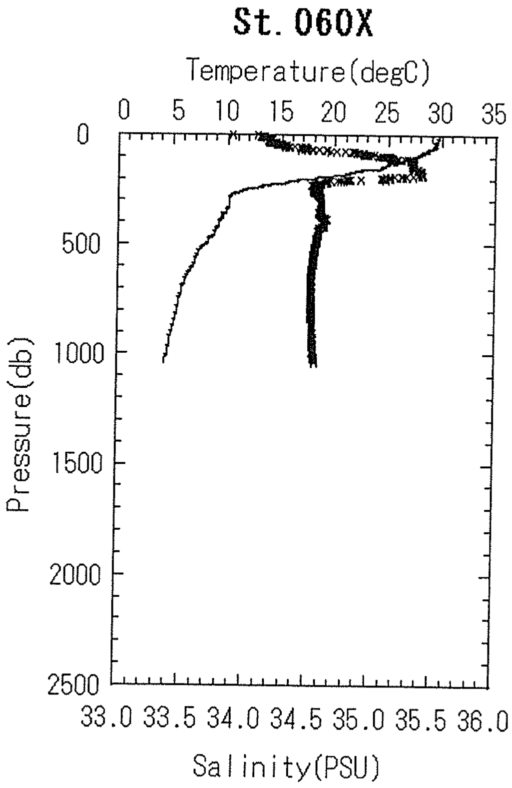


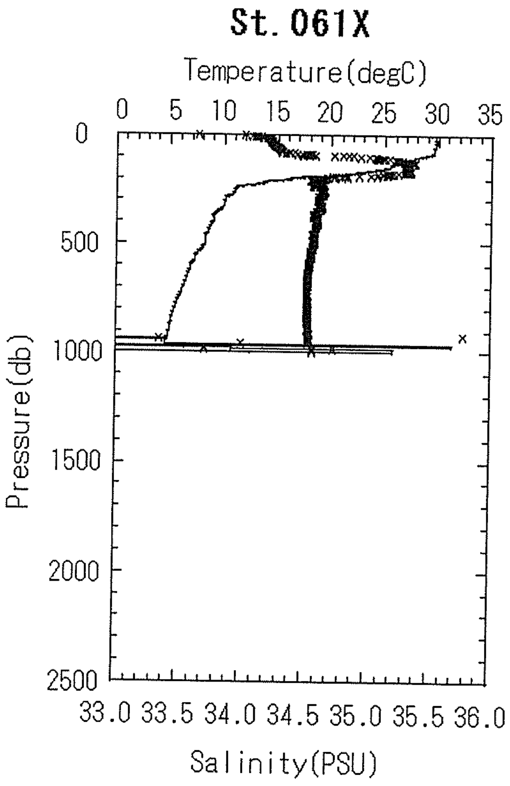
− Temparature

× Salinity





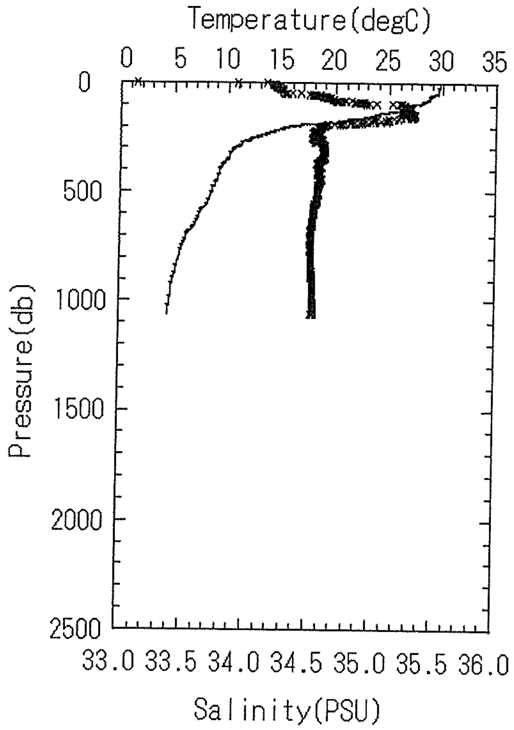




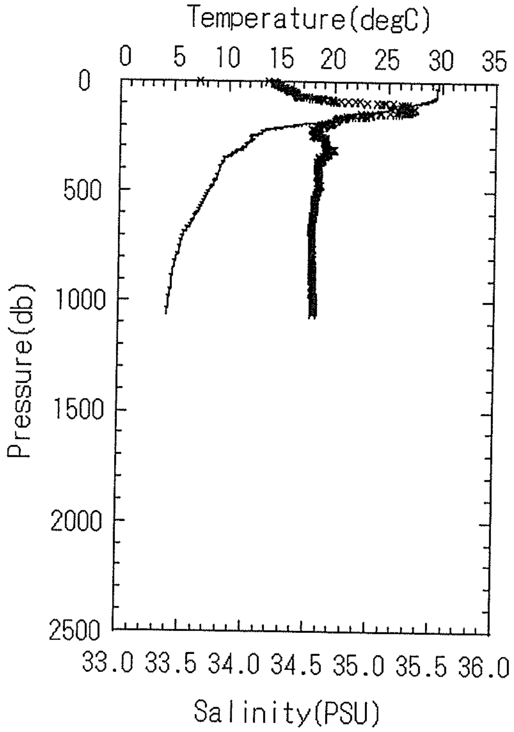
– Temparature

× Salinity

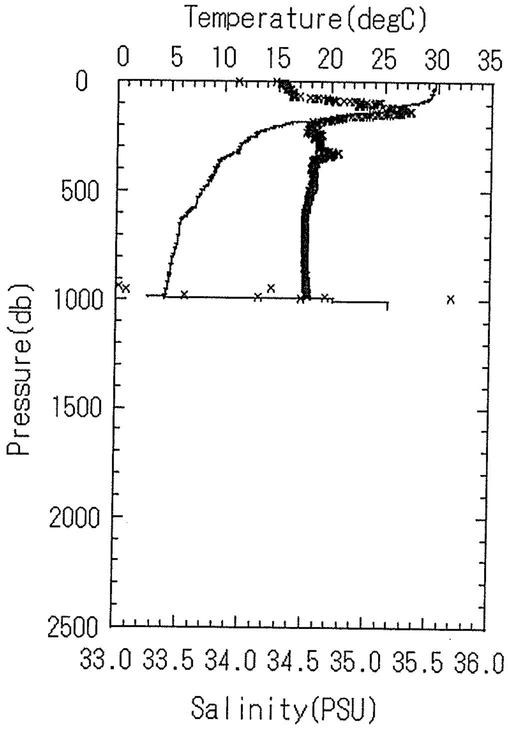
St. 062X



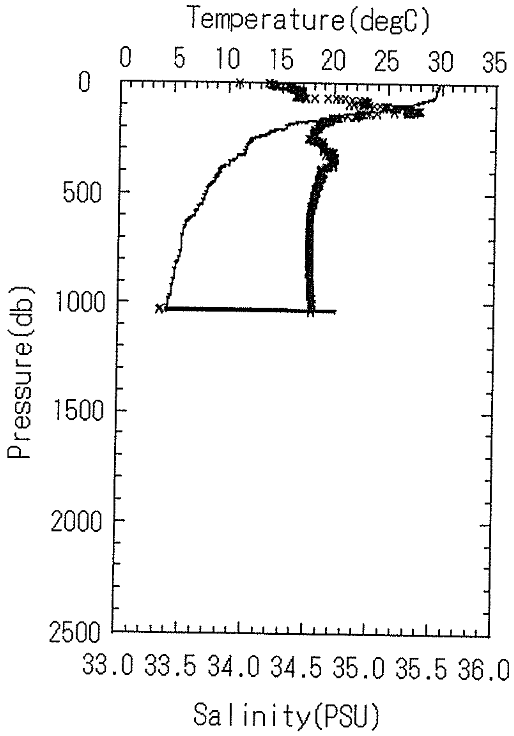
St. 063X



St. 064X

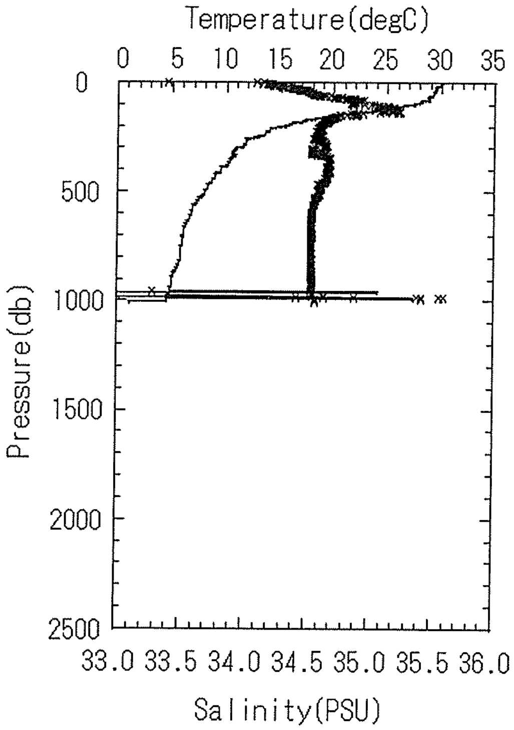


St. 065X

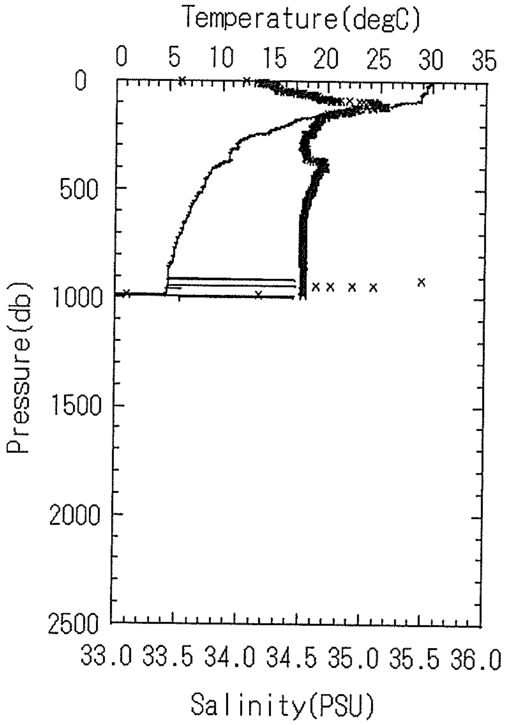


– Temparature

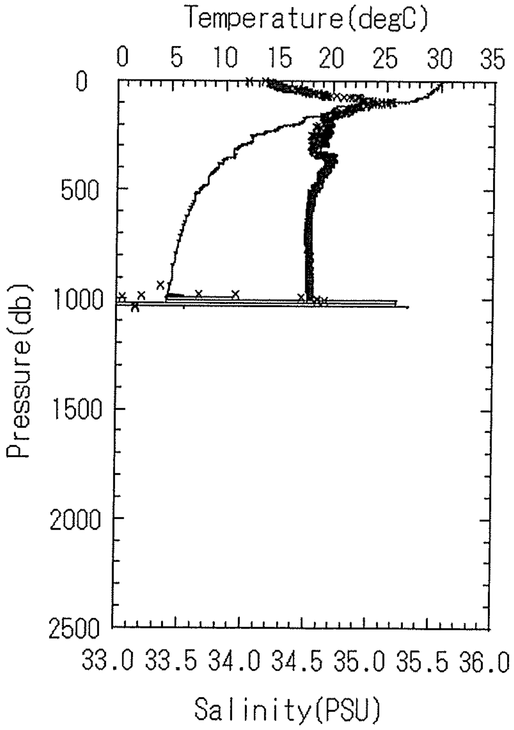
× Salinity



St. 066X



St. 067X



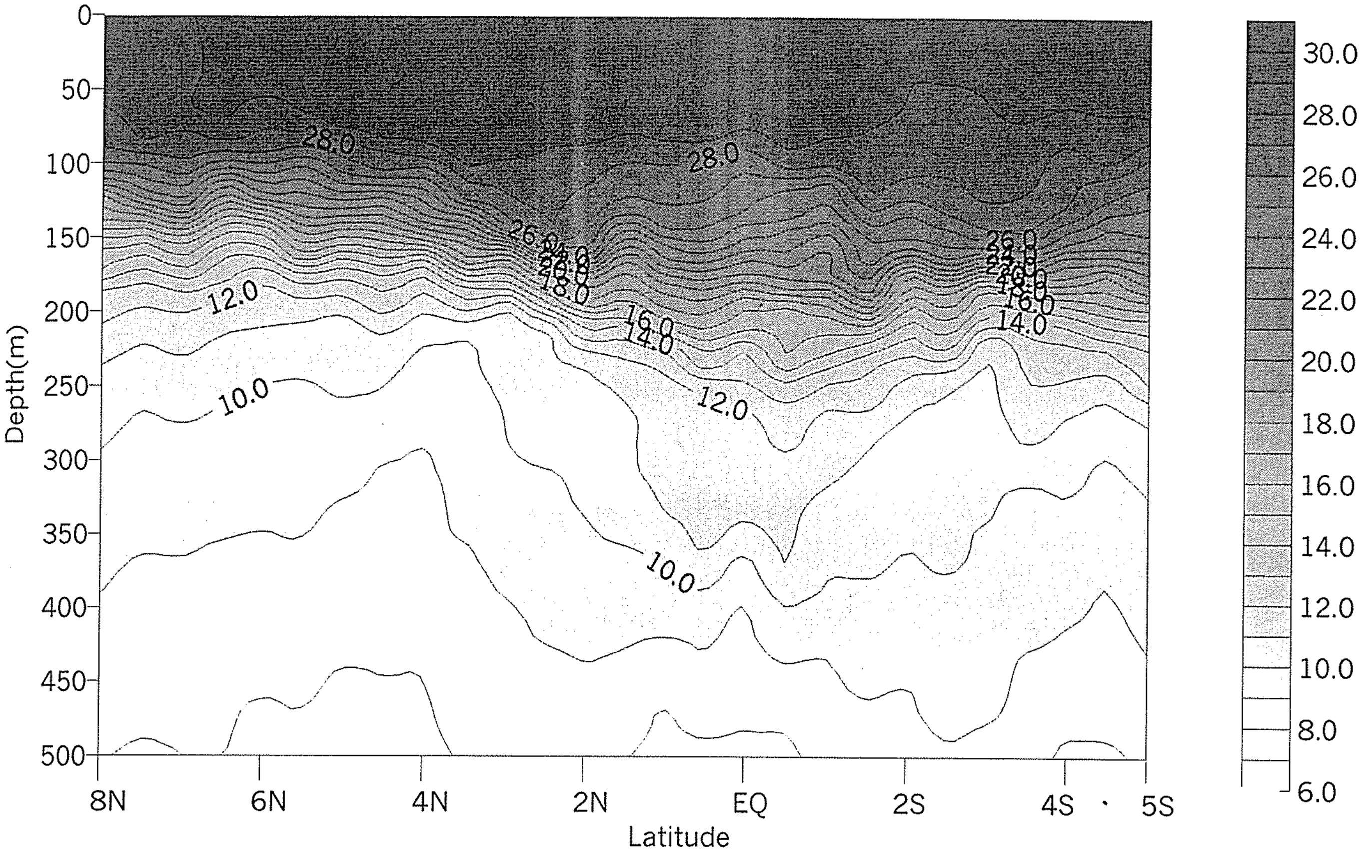
St. 068X

− Temparature

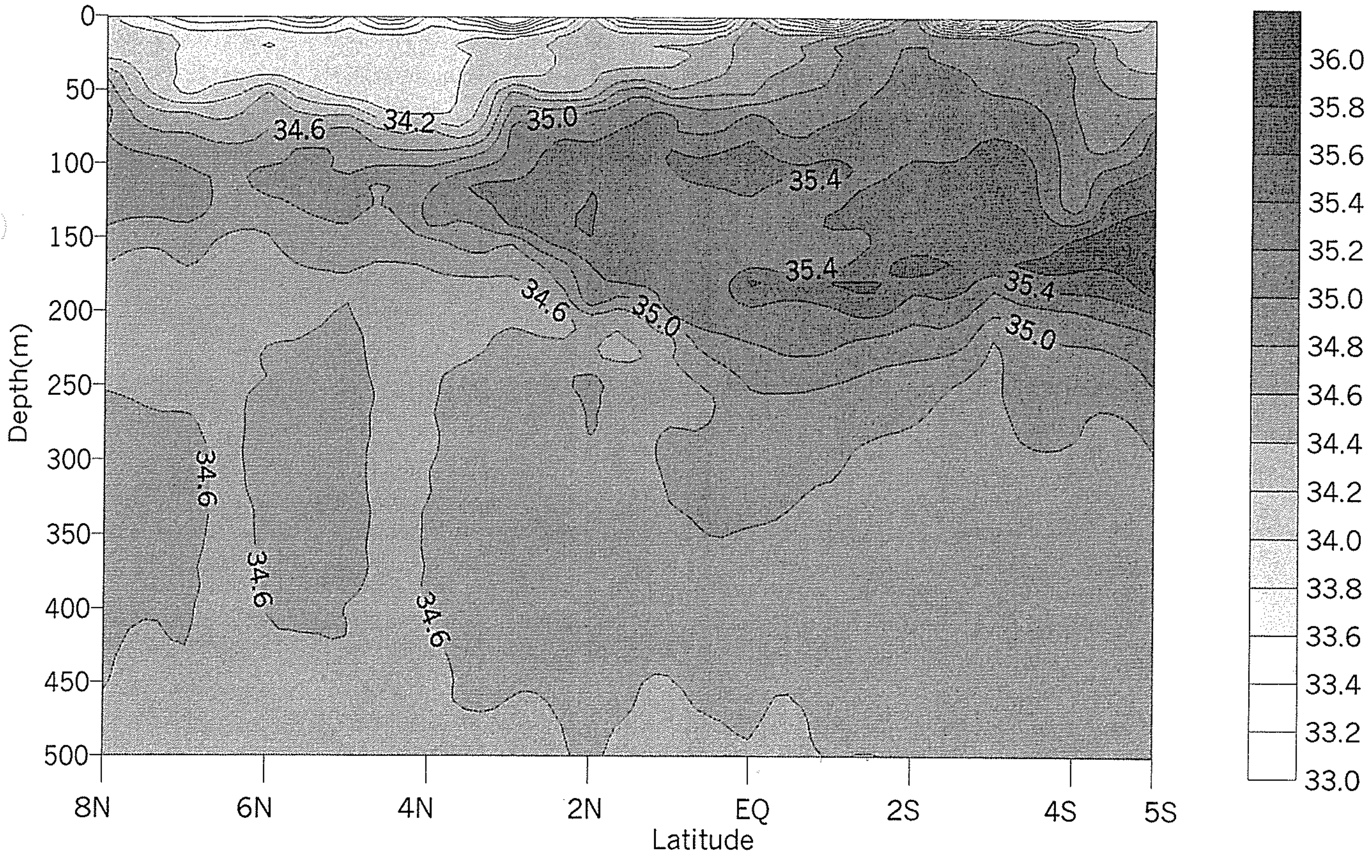
× Salinity

4.4 Sections

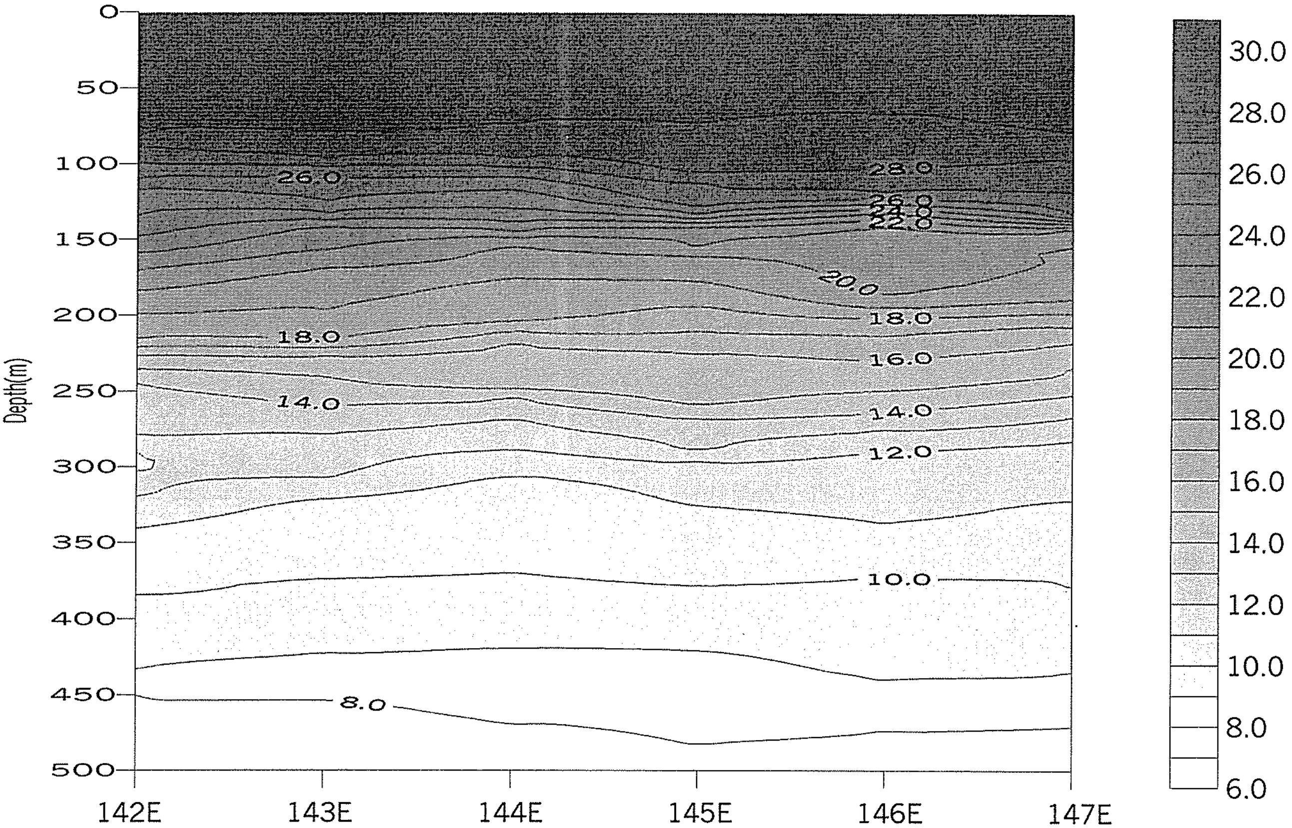
4.4.1 Temperature&Salinity



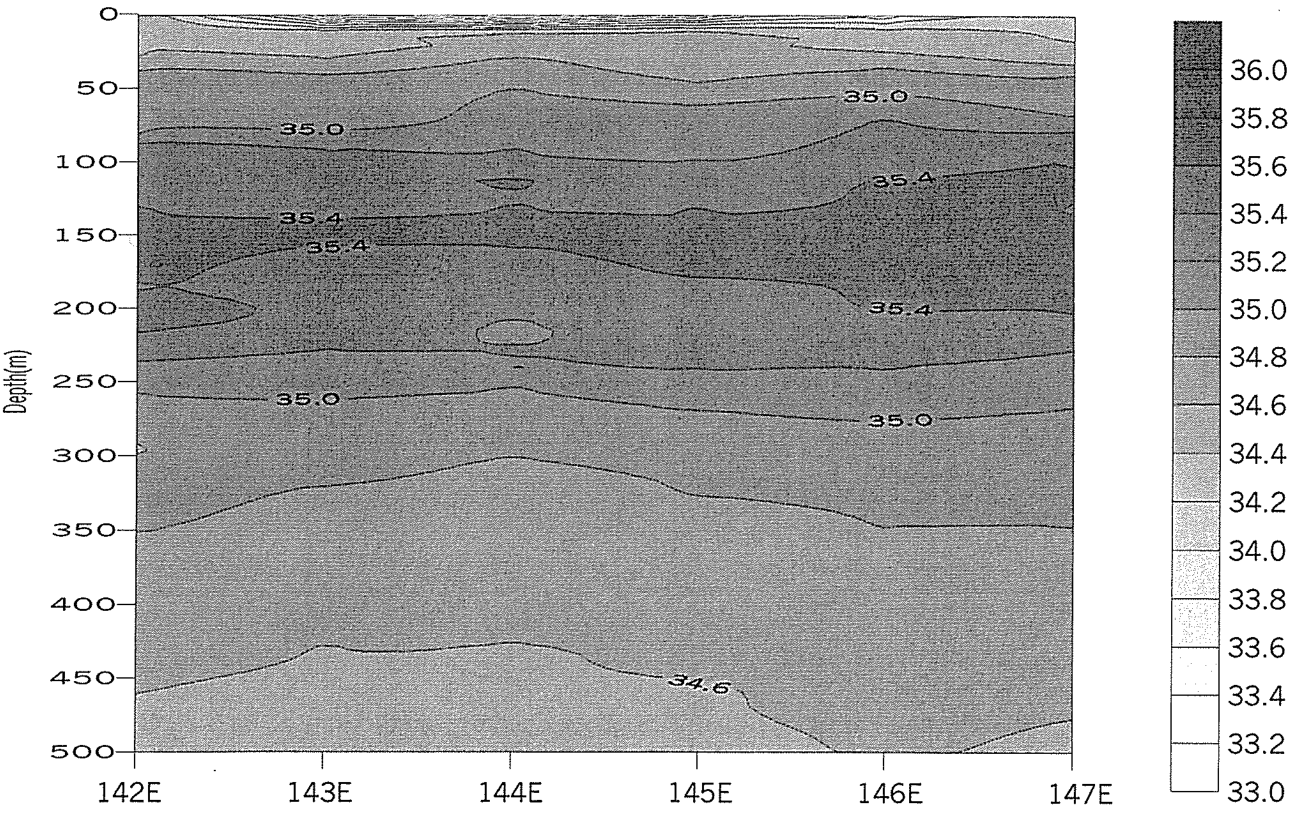
Temperature (St.002-St.028)



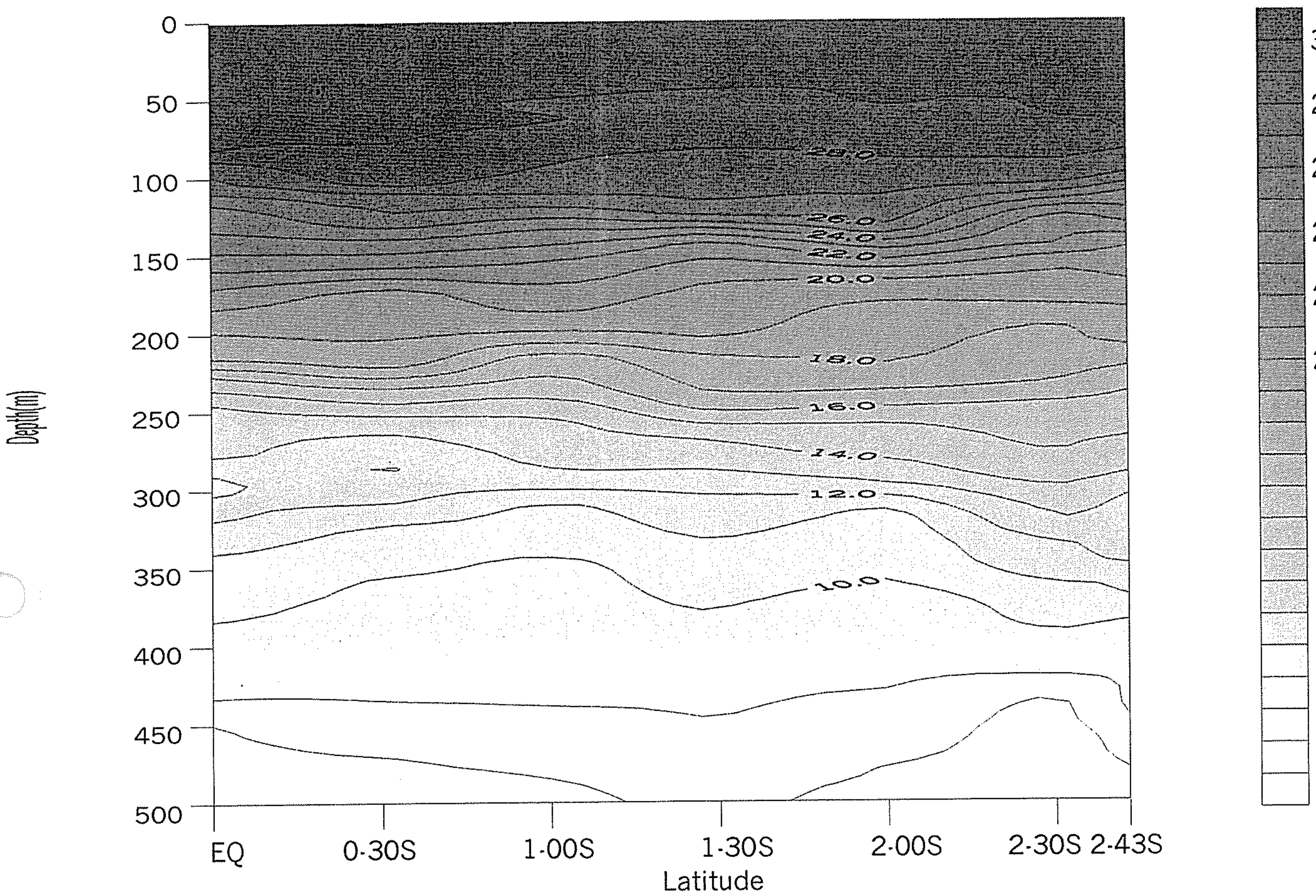
Salinity (St.002-St.028)



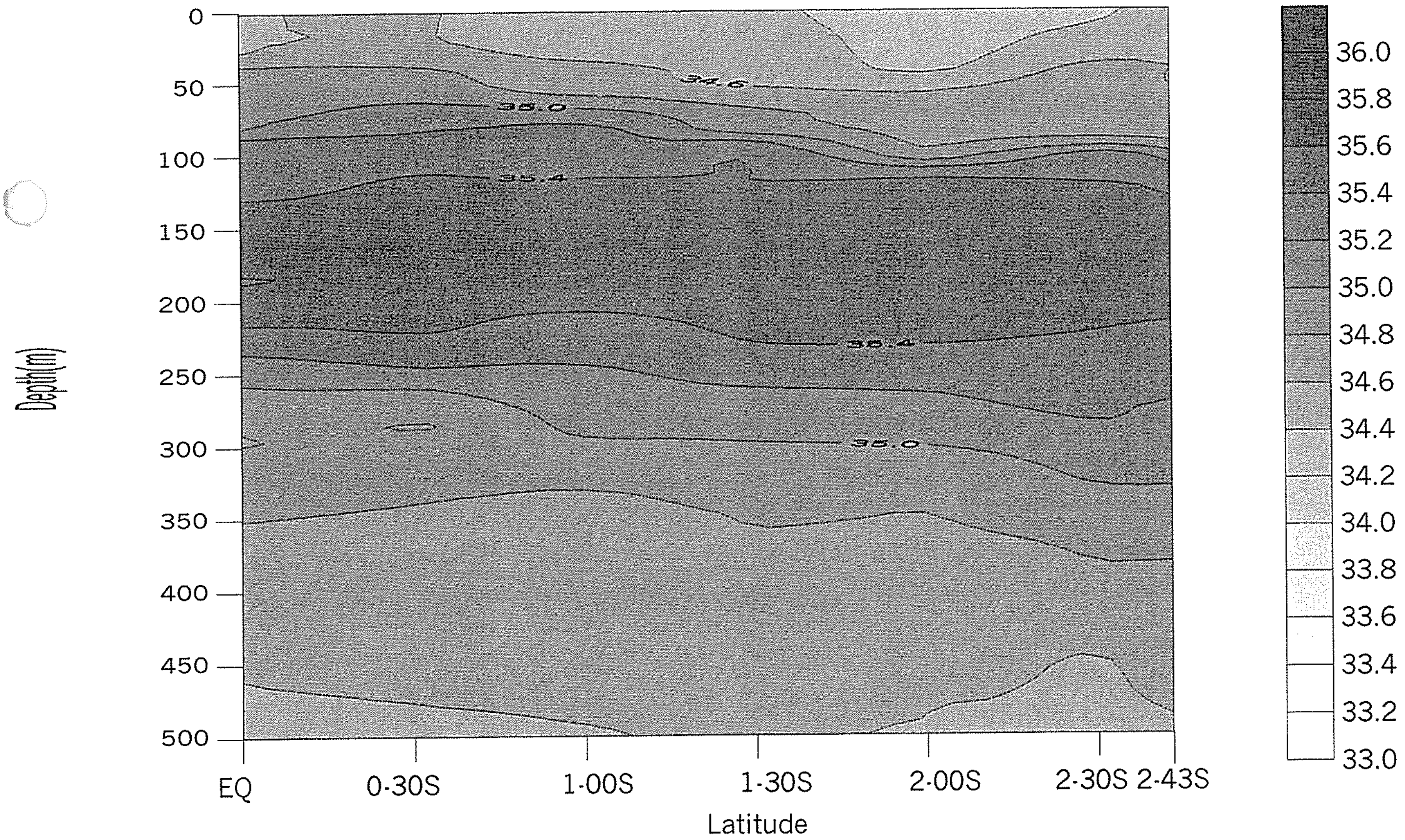
Temperature (St.030-St.035)



Salinity (St.030-St.035)

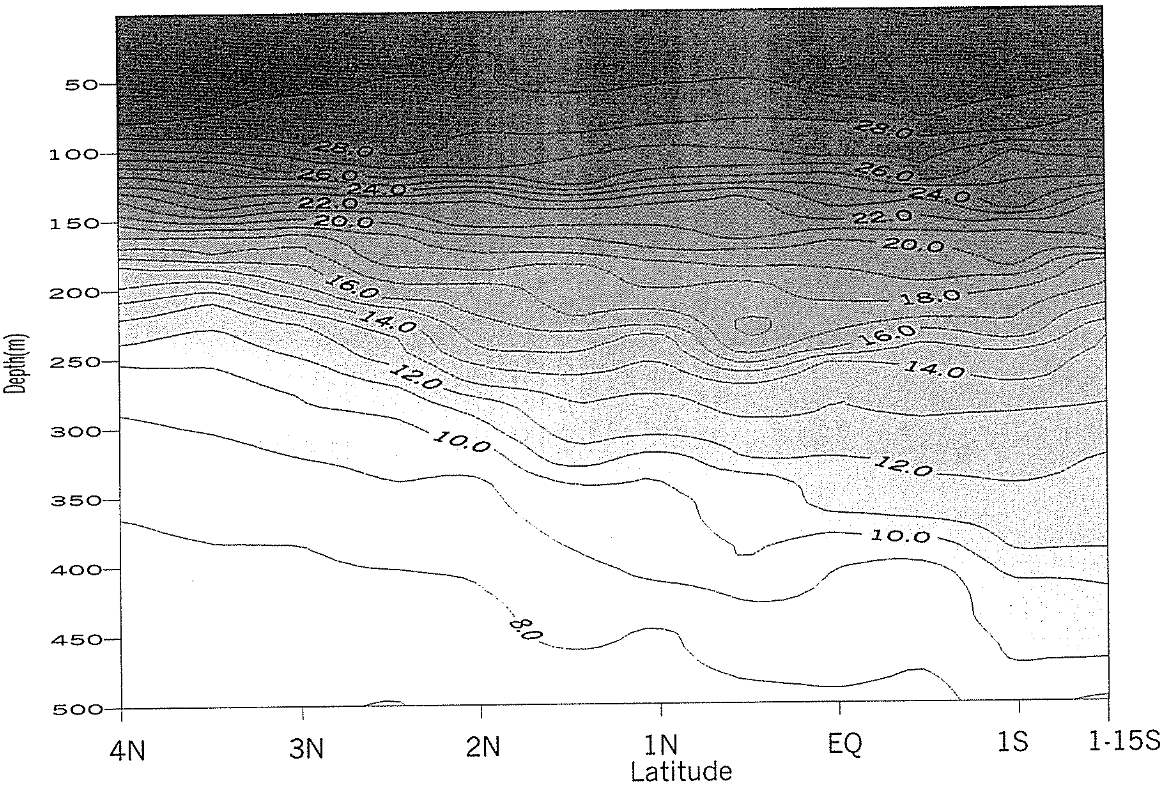


Temperature (St.035-St.041)

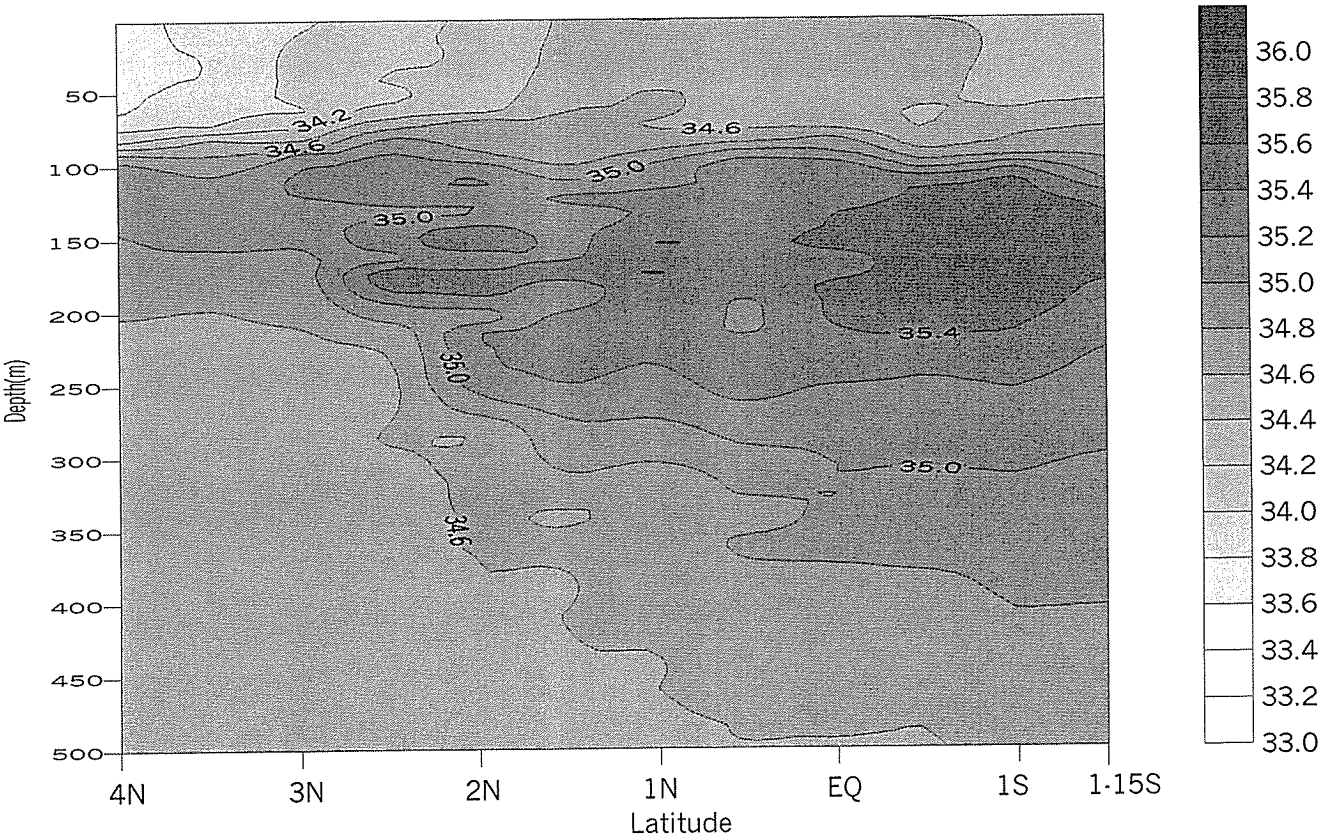


Salinity (St.035-St.041)

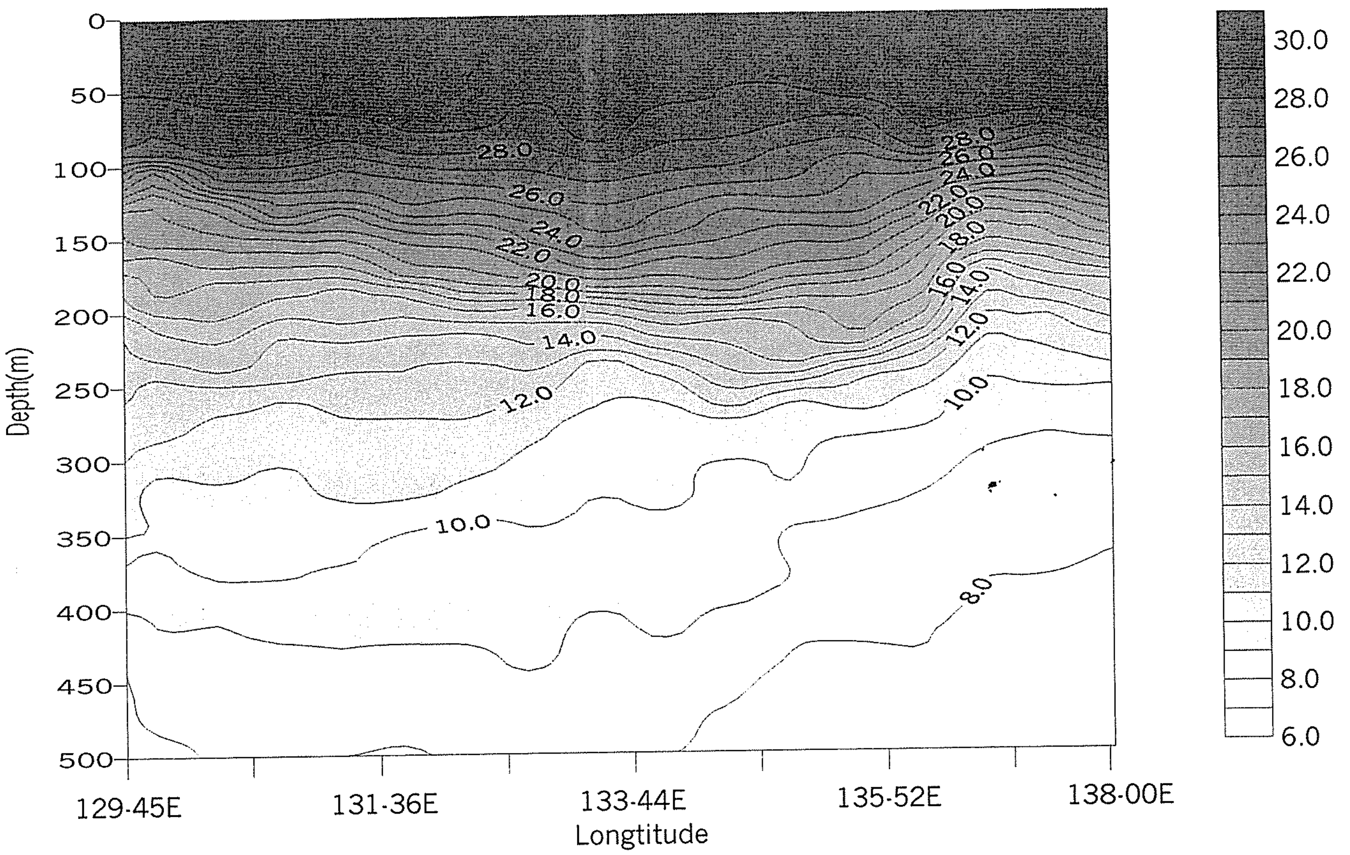
138



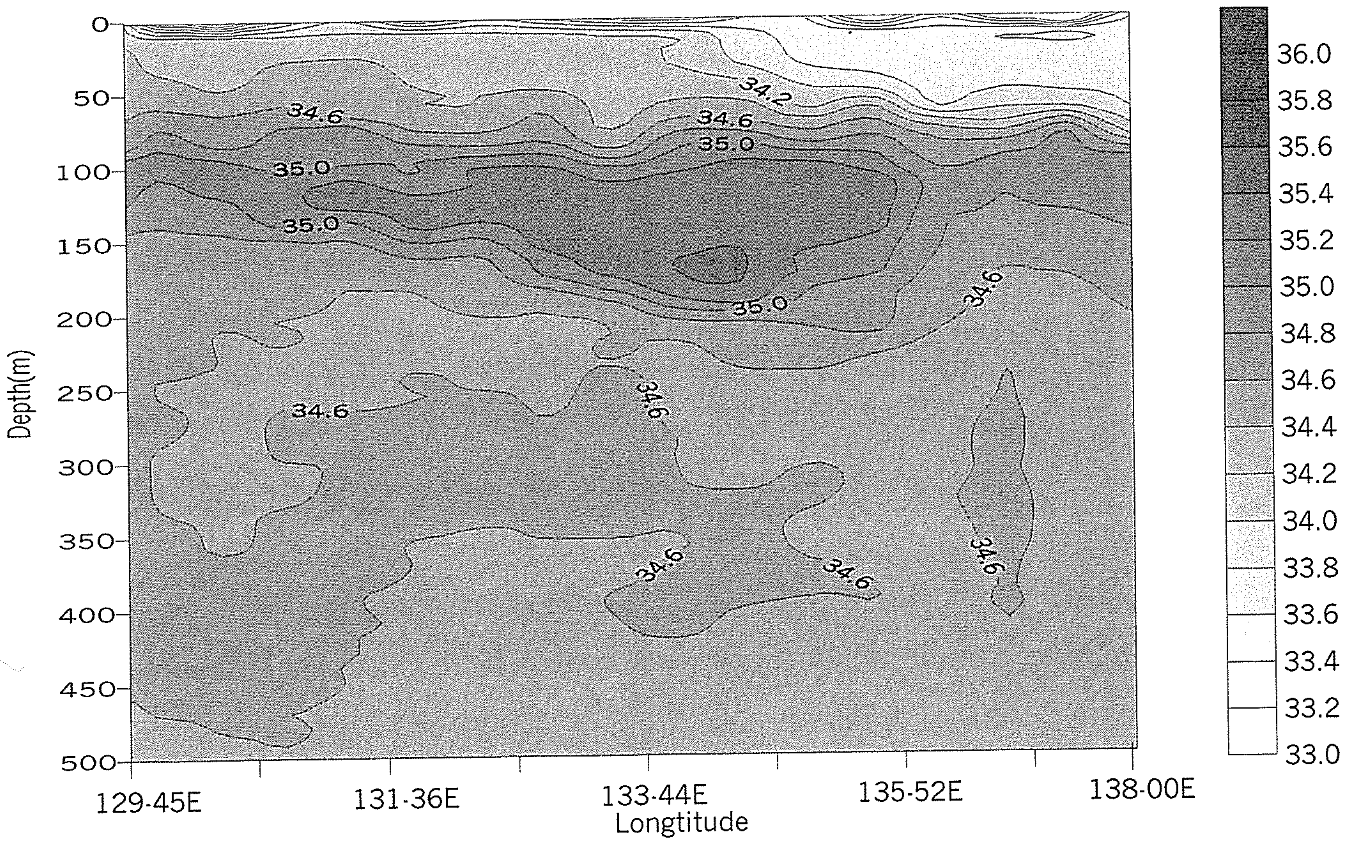
Temperature (St.042-St.053)



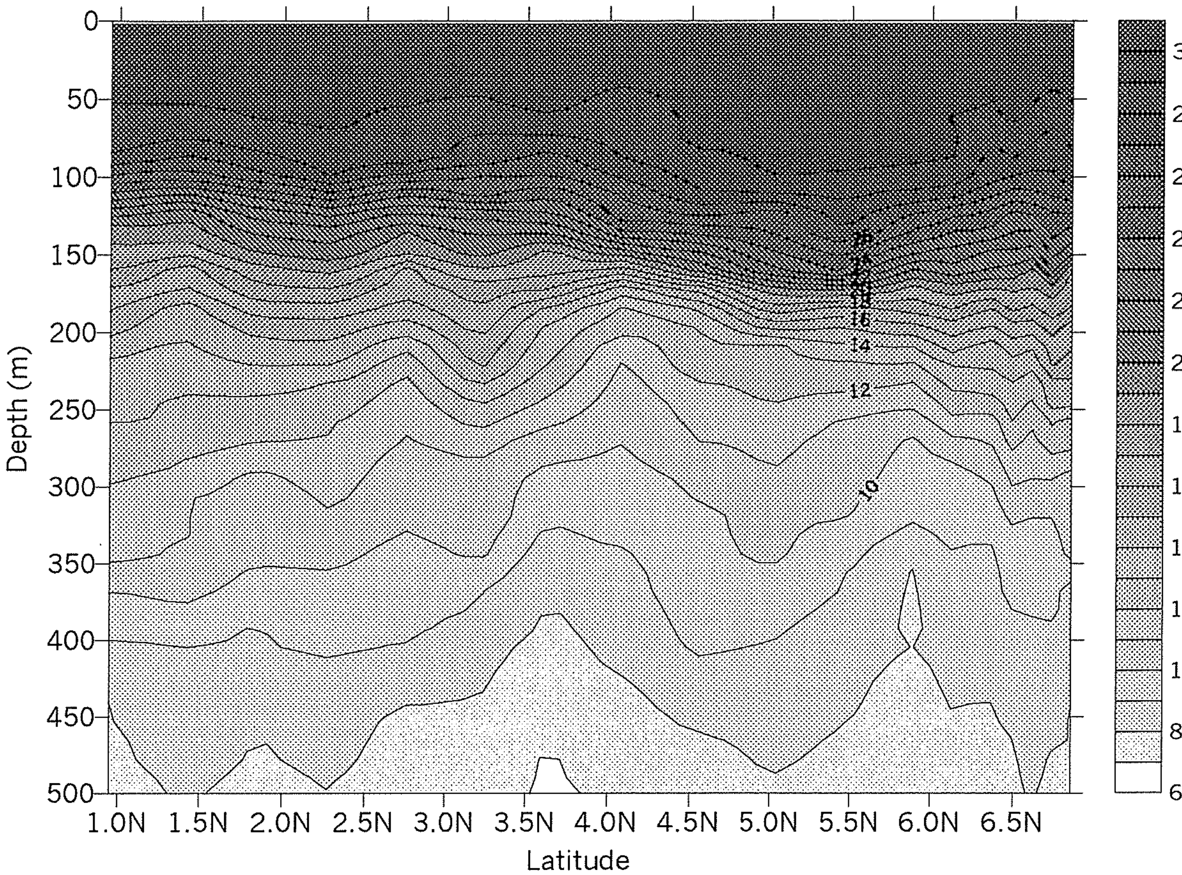
Salinity (St.042-St.053)



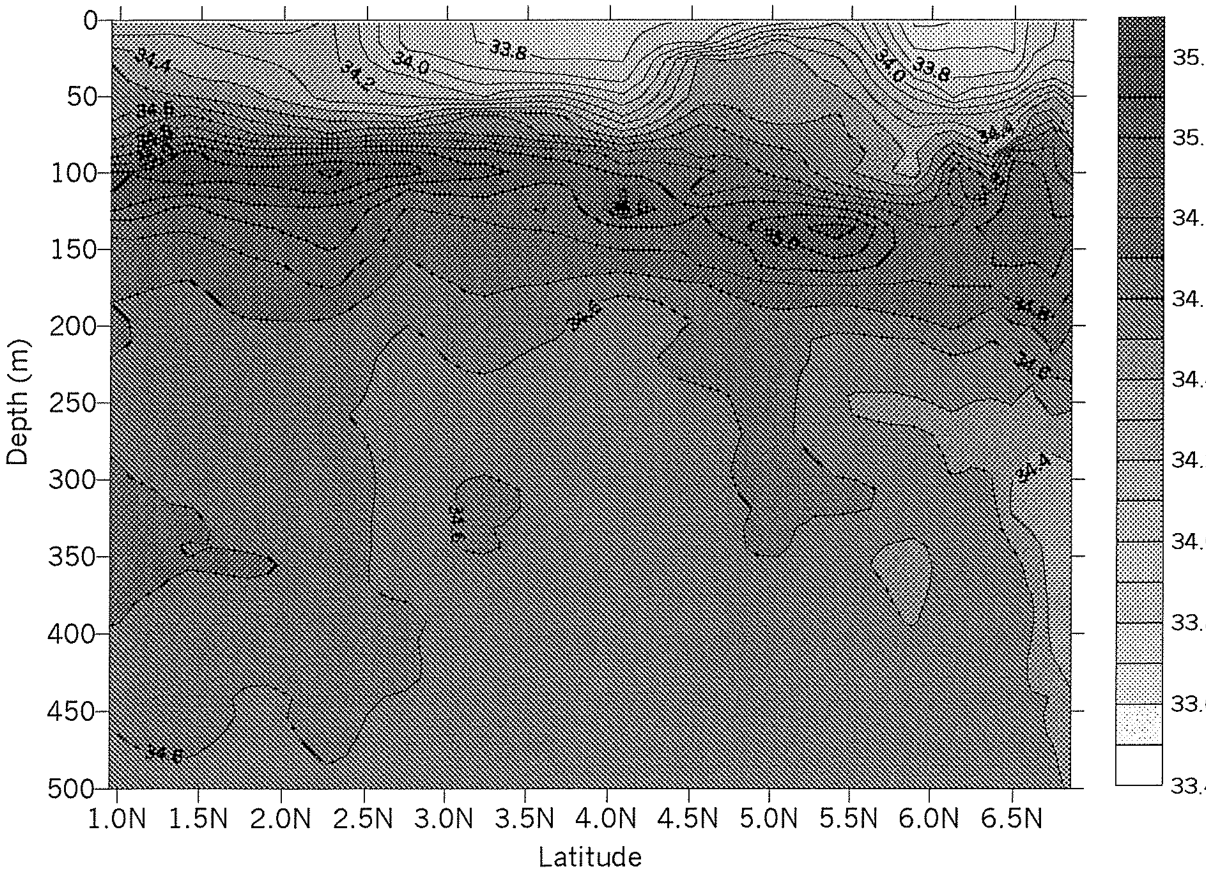
Temperature (St.053-St.069)



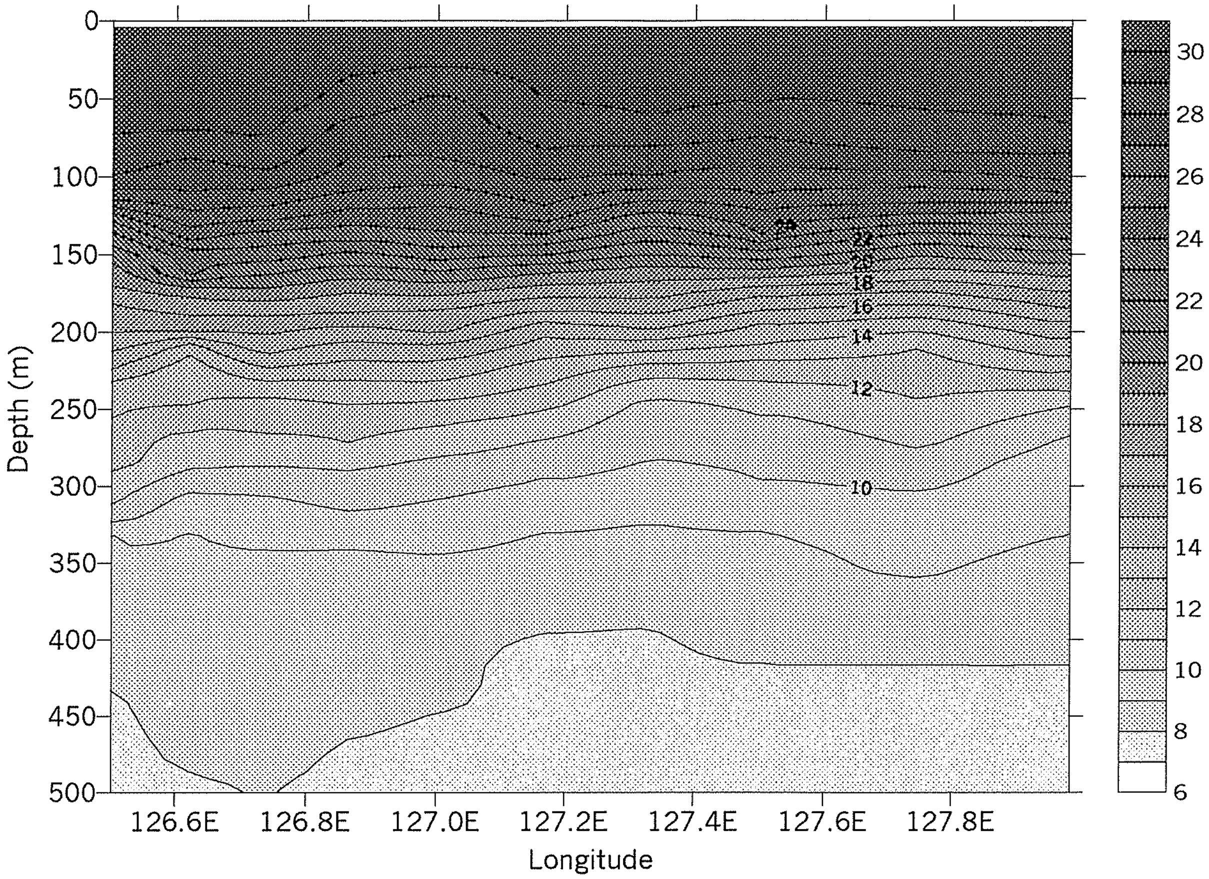
Salinity (St.053-St.069)



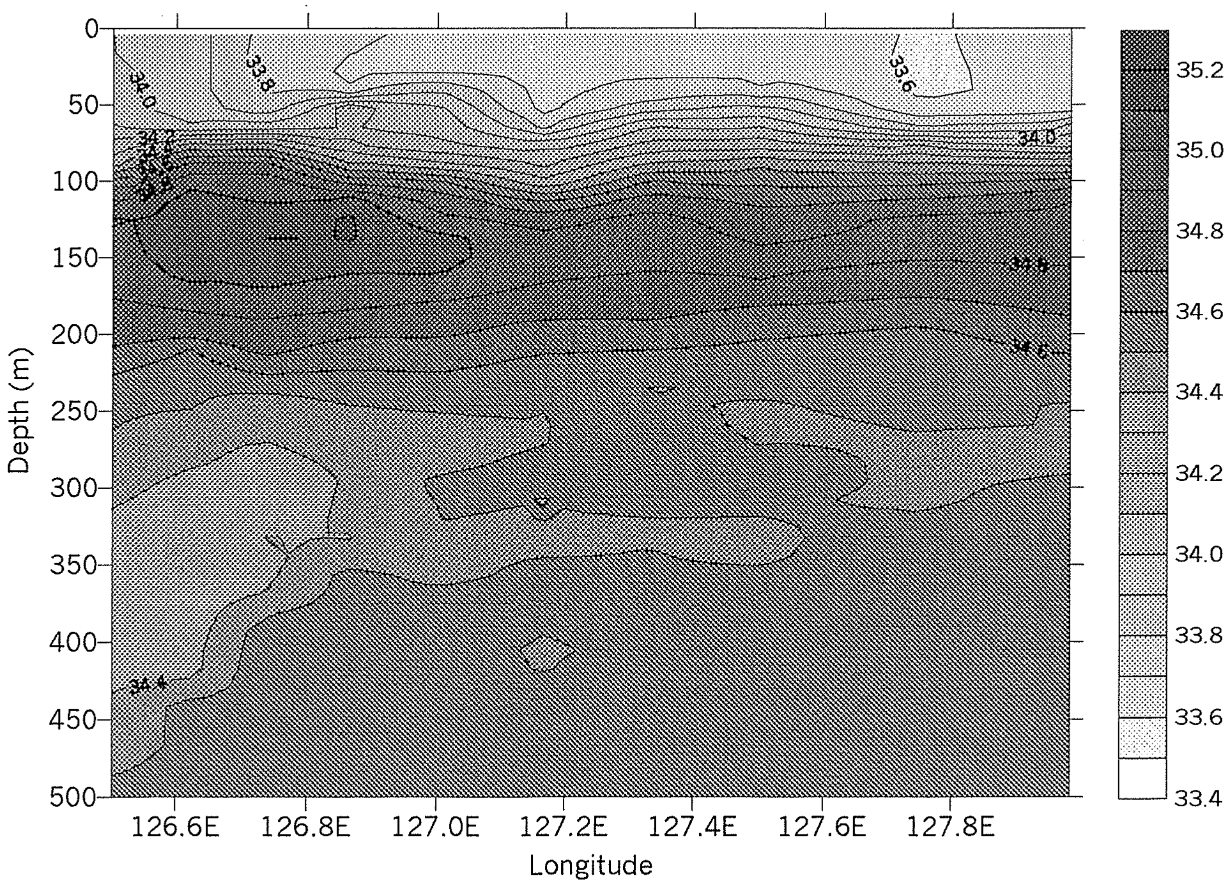
Temperature (St.069-St.086)



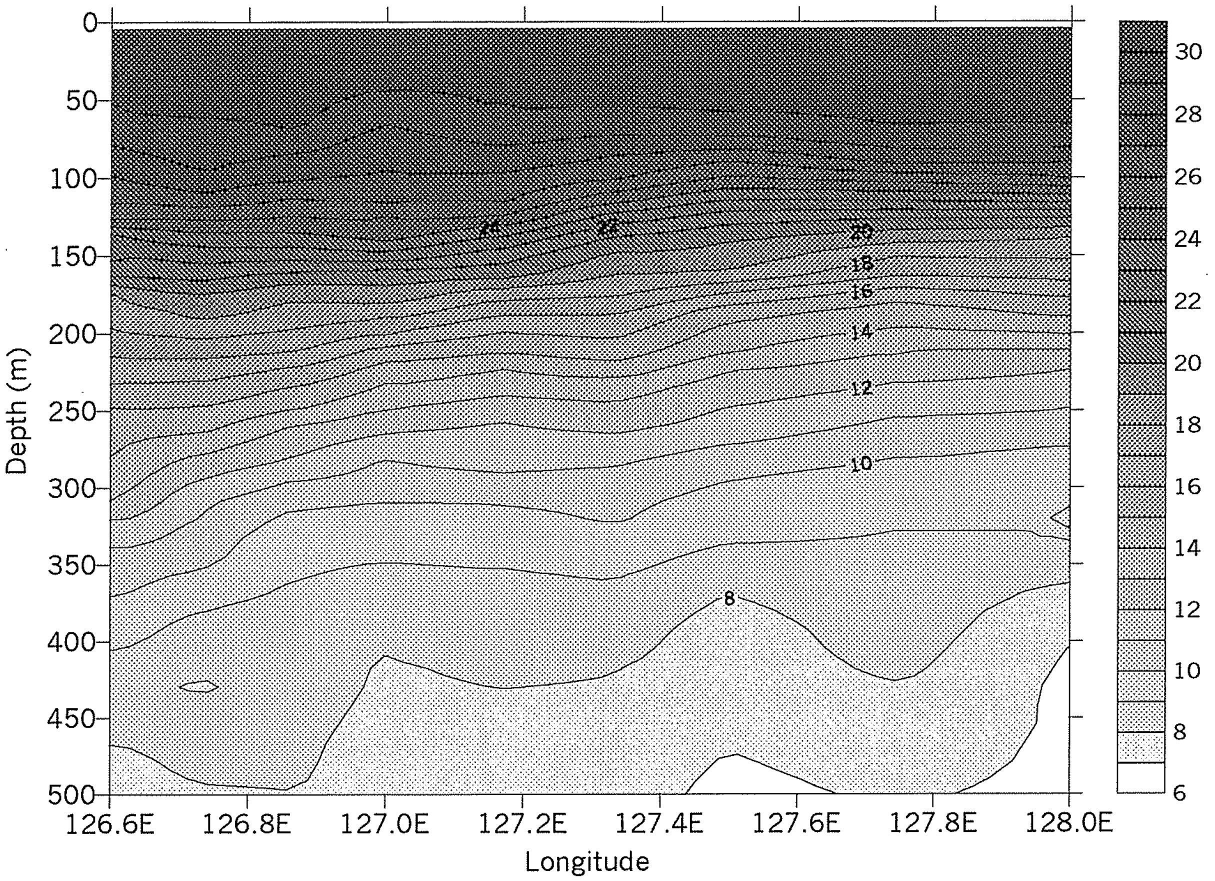
Salinity (St.069-St.086)



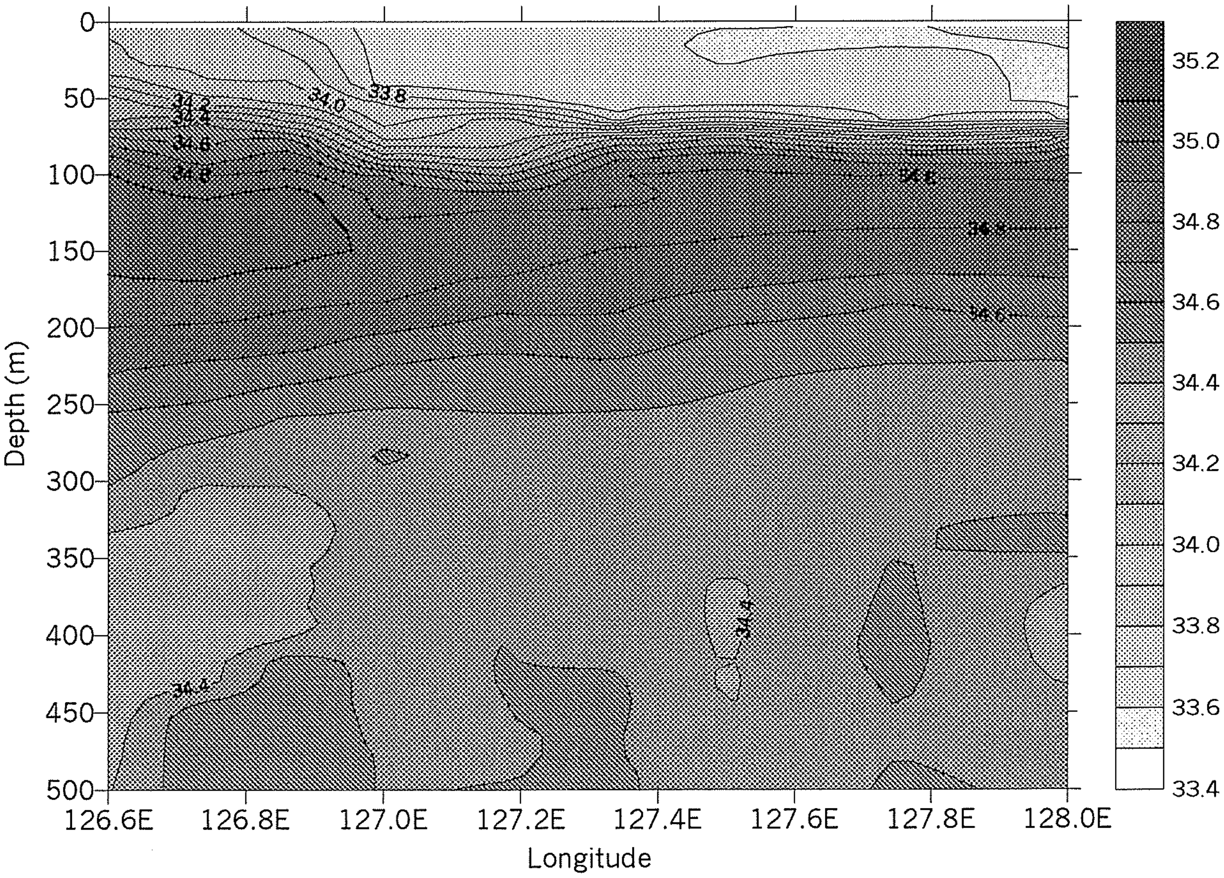
Temperature (St.088-St.097)



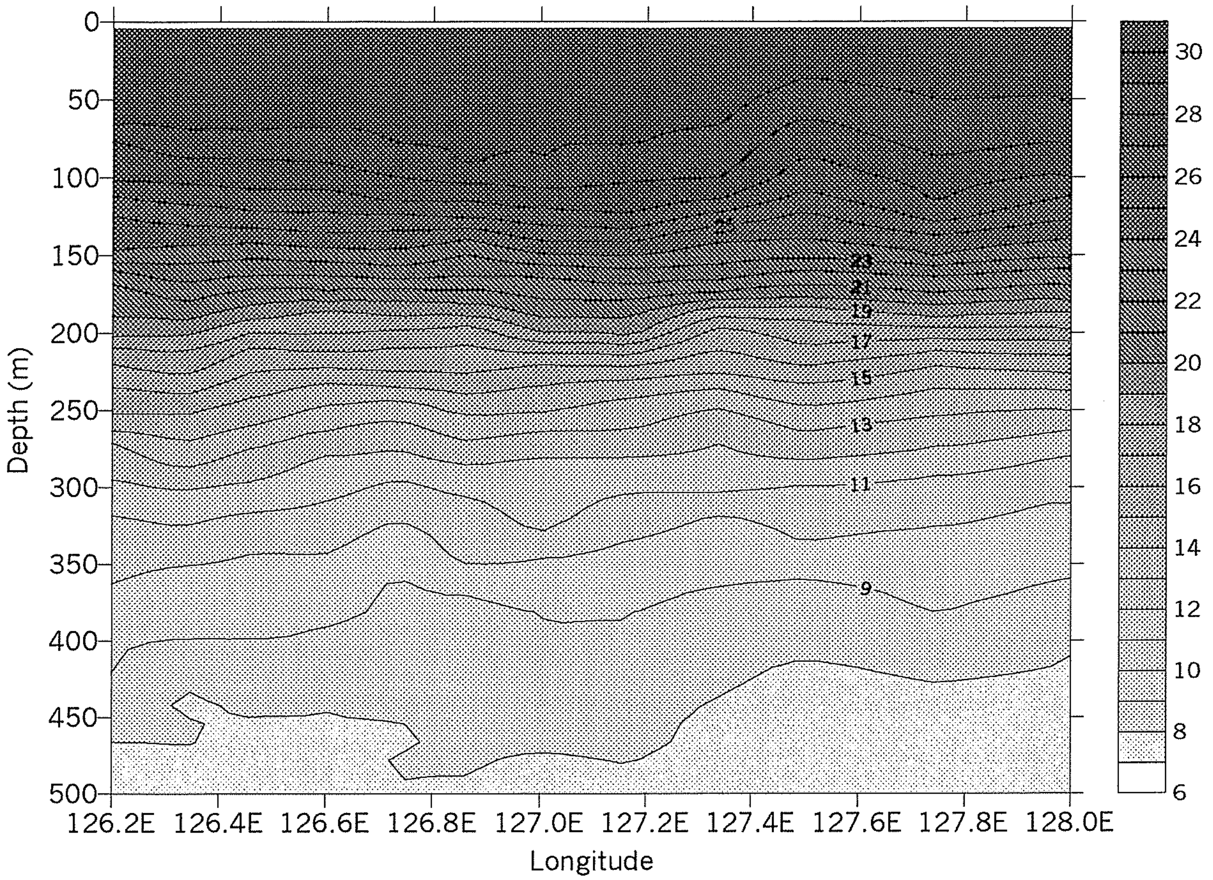
Salinity (St.088-St.097)



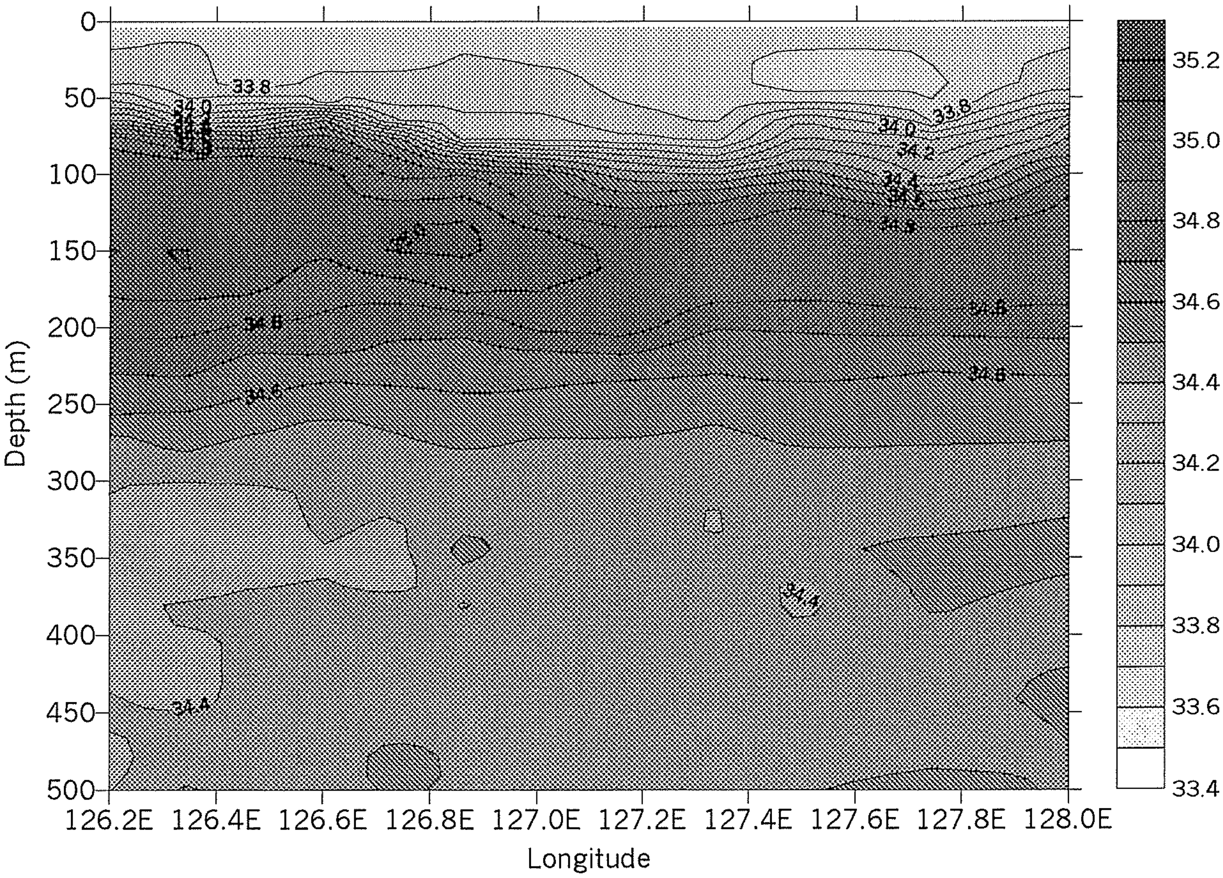
Temperature (St.098-St.106)



Salinity(St.098-St.106)



Temperature (St.107-St.118)



Salinity (St.107-St.118)

4.5 Bottle Salinity

To confirm the difference the conductivity sensors of CTD from data of salinity measurements by using Guildline Autosal Salinometer model 8400B.

1. Salinity Sample Collection

Seawater samples were collected from the variable layer(1000m, 700m, 400m, 250m, 225m, 200m, 175m, 150m, 125m, 100m, 50m, 30m, 10m) in leg. 2 and the deepest layer(2000m) in leg. 3 of Niskin Sampling Bottle. The bottles in which the salinity samples were collected and stored were 250 ml Phoenix brown glass bottles with screw caps. Each bottles were rinsed three times and filled with sample water. Salinity samples were stored in the same laboratory as the salinity measurement was made.

2. Instruments and Method

The salinity analysis was carried out by a Guildline Autosal Salinometer model 8400B, which was modified by addition of an Ocean Science International peristaltic-type sample intake pump. Data of the salinometer was collected simultaneously by a personal computer. A double conductivity ratio was defined as a median of 31 readings of the salinometer. Data collection was startded after 5 seconds and it took about 10 seconds to collect 31 readings by a personal computer.

The salinometer was operated in the airconditioned ship's laboratory at a bath temperature of 24 deg C.

3. Standard Sea Water

Autosal model 8400B was standardized onry before sequence of measurements by use of IAPSO Standard Seawater batch p137 whose conductivity ratio was 0.99995(salinity=34.9980 psu). After the standardization, 8400B was monitored by 2-3 SSW ampules before and after the measurements for samples.

Leg. 2- 31samples
Leg. 3- 39samples

4. Result

The average of difference between CTD and AUTOSAL is 0.010 psu(leg. 2) and 0.004 psu (leg. 3). The standard deviation is 0.0192(leg. 2) and 0.0022(leg. 3).

Salinity Data Comparison between CTD and AUTOSAL (Leg.2)

		Bath Temp	24		
Station	Bottle	2R	offset	2R(cor)	Smeasure
002C	97	1.97733	0	1.97733	34.5543
008C	-				
010C	98	1.97737	0	1.97737	34.5551
010C	99	1.97738	-1	1.97737	34.5551
018C	112	1.97731	-1	1.97730	34.5537
022C	113	1.97647	-1	1.97646	34.5372
022C	114	1.97647	-2	1.97645	34.5370
022C	115	1.97646	-2	1.97644	34.5368
014C	111				
014C	110				
014C	101	1.97645	-2	1.97643	34.5366
014C	108	1.98296	-2	1.98294	34.6645
014C	107	1.98521	-2	1.98519	34.7087
014C	106	2.01102	-2	2.01100	35.2166
014C	105				
014C	104	2.02082	-2	2.02080	35.4097
014C	103	2.01855	-2	2.01853	35.3650
014C	102	1.97247	-2	1.97245	34.4585
014C	109	1.96769	-2	1.96767	34.3647
014C	100	1.96702	-2	1.96700	34.3515
028C	116	1.97692	-2	1.97690	34.5459
028C	117	1.97575	-2	1.97573	34.5229
028C	118	1.98450	-3	1.98447	34.6946
028C	119	1.99885	-3	1.99882	34.9768
028C	120	2.00424	-3	2.00421	35.0829
028C	121	2.01341	-4	2.01337	35.2633
028C	122	2.03872	-4	2.03868	35.7626
028C	123	2.03609	-4	2.03605	35.7106
028C	124	2.01870	-3	2.01867	35.3677
028C	125	1.98970	-3	1.98967	34.7968
028C	126	1.97182	-3	1.97179	34.4455

Difference of Salinity Data between CTD and AUTOSAL (Leg.2)

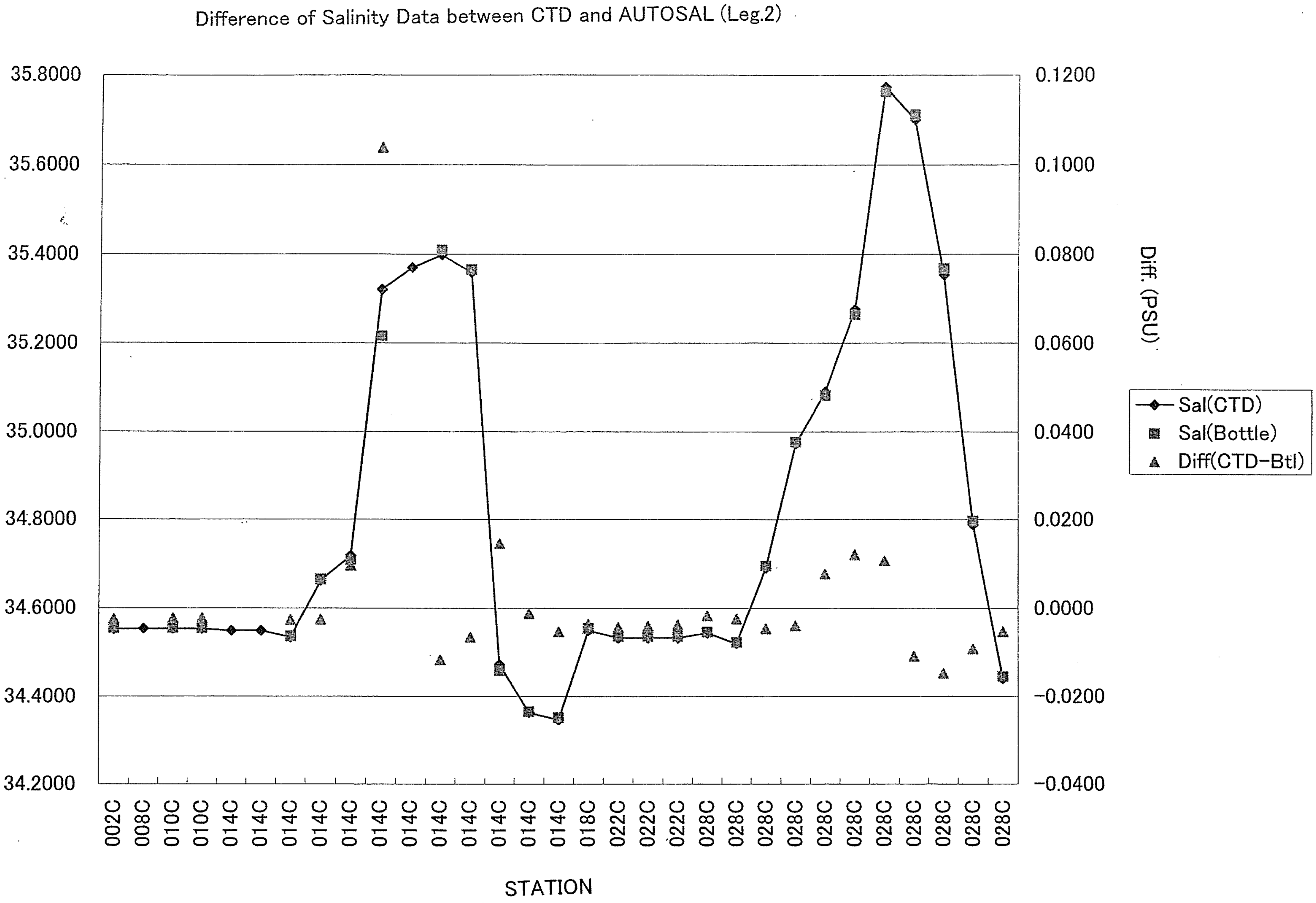
Station	Bottle	Pres(CTD)	Temp(CTD)	Sal(CTD)	Sal(Bottle)	Diff(CTD-Btl)
002C	2	1000.0	4.4806	34.5518	34.5543	-0.0025
008C	2	1001.1	4.4982	34.5536	-	
010C	7	998.8	4.5314	34.5528	34.5551	-0.0023
010C	7	998.8	4.5314	34.5528	34.5551	-0.0023
014C	2	1000.9	4.5638	34.5489	-	
014C	2	1000.9	4.5638	34.5489	-	
014C	3	700.0	5.8543	34.5339	34.5366	-0.0027
014C	4	399.3	9.2572	34.6619	34.6645	-0.0026
014C	5	199.1	15.6049	34.7183	34.7087	0.0096
014C	6	173.6	21.0196	35.3204	35.2166	0.1038
014C	7	148.3	26.7320	35.3704	-	
014C	8	124.3	27.4595	35.3981	35.4097	-0.0116
014C	9	98.5	28.4515	35.3585	35.3650	-0.0065
014C	10	49.8	29.6828	34.4730	34.4585	0.0145
014C	11	30.1	29.6652	34.3634	34.3647	-0.0013
014C	12	10.3	29.6735	34.3462	34.3515	-0.0053
018C	1	1000.3	4.5562	34.5501	34.5537	-0.0036
022C	1	1001.4	4.6990	34.5329	34.5372	-0.0043
022C	2	1001.4	4.7008	34.5329	34.5370	-0.0041
022C	3	1001.4	4.7026	34.5330	34.5368	-0.0038
028C	2	1001.3	4.3468	34.5441	34.5459	-0.0018
028C	3	701.0	5.6707	34.5204	34.5229	-0.0025
028C	4	400.2	9.2501	34.6899	34.6946	-0.0047
028C	5	249.5	12.6816	34.9728	34.9768	-0.0040
028C	6	225.0	13.9278	35.0905	35.0829	0.0076
028C	7	200.3	15.8124	35.2753	35.2633	0.0120
028C	8	175.2	20.8082	35.7732	35.7626	0.0106
028C	9	150.1	23.8774	35.6998	35.7106	-0.0108
028C	10	100.5	26.8571	35.3530	35.3677	-0.0147
028C	11	50.6	29.2484	34.7876	34.7968	-0.0092
028C	12	10.1	29.2265	34.4402	34.4455	-0.0053

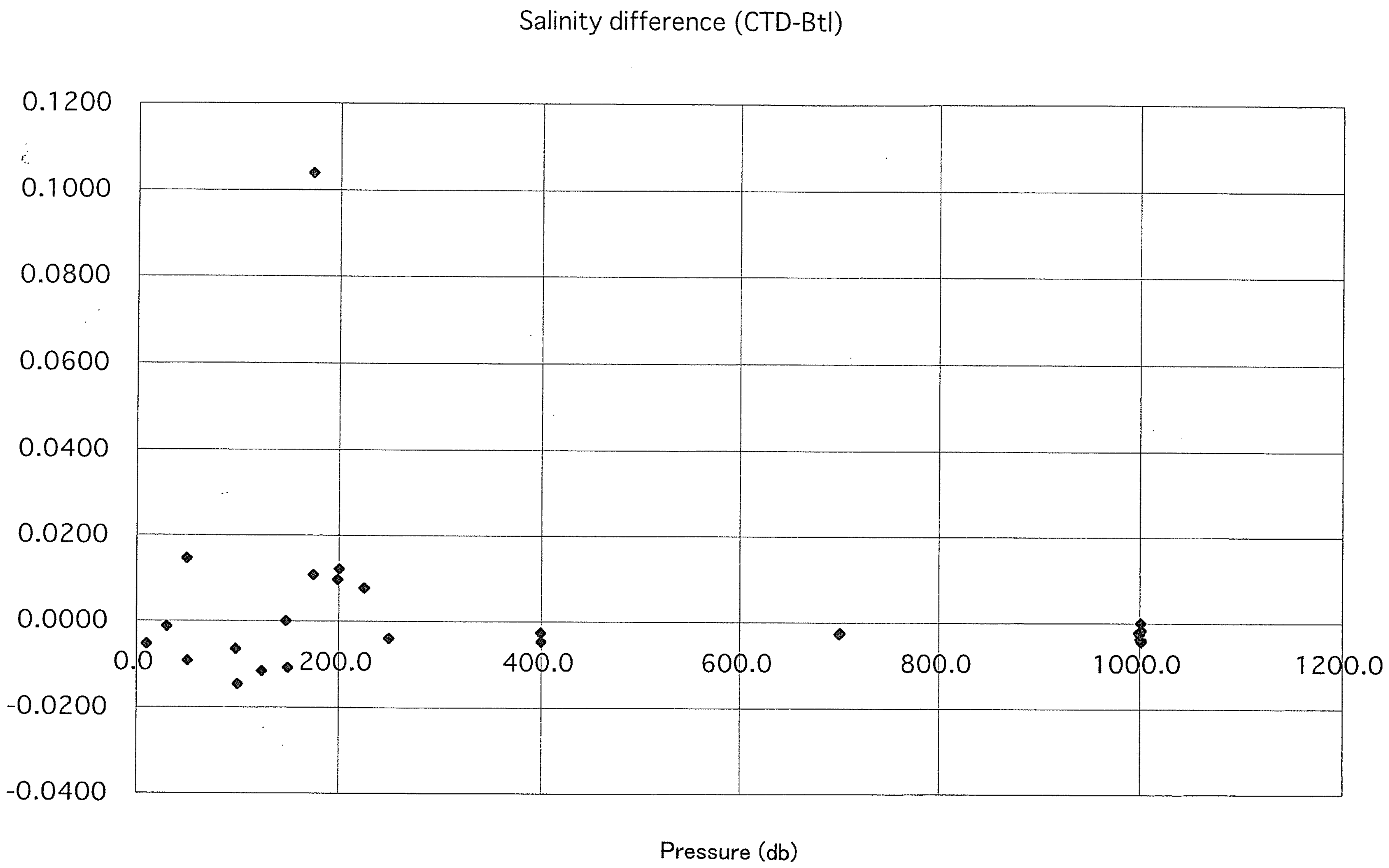
Salinity Data Comparison between CTD and AUTOSAL (Leg.2)

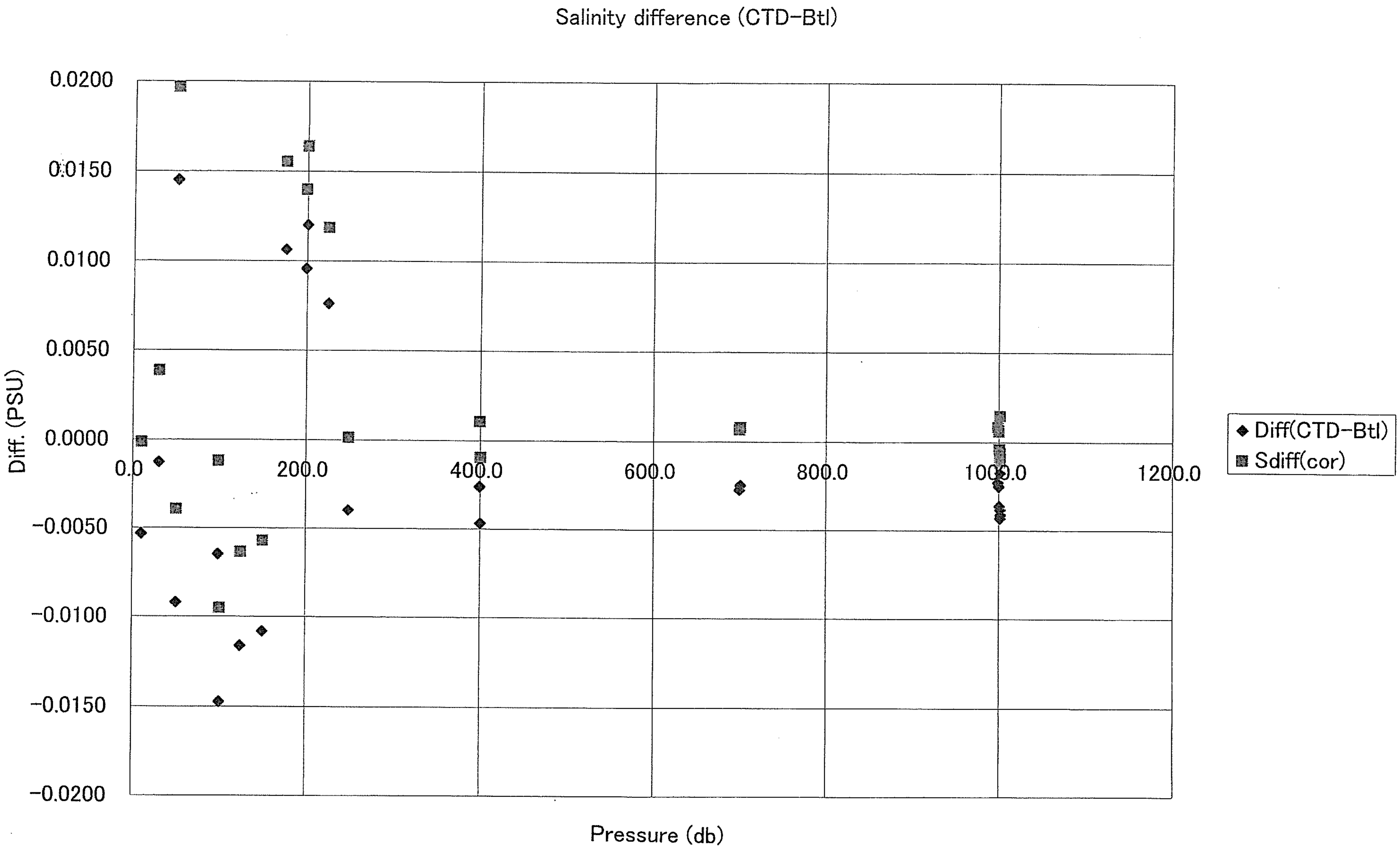
Slope(mea 1.000202
Slope(Med 1.000203
Offset -0.0004

0.0000

Station	Bottle	Pres(CTD)	Temp(CTD)	Cond(CTD)	Cond(s.d.)	Sal(CTD)	Sal(Bottle)	Diff(CTD-Btl)	Cond(Bottle)	deltaC	Slope	C(corr.)	deltaC(corr)	S(corr)	Sdiff(cor)
028C	10	100.5	26.8571	5.555516	0.000271	35.3530	35.3677	-0.0147	5.557572	-0.002056	1.000442	5.556245	-0.001327	35.3582	-0.0095
014C	8	124.3	27.4595	5.627028	0.001475	35.3981	35.4097	-0.0116	5.628666	-0.001638	1.000362	5.627771	-0.000895	35.4034	-0.0063
028C	9	150.1	23.8774	5.288850	0.003746	35.6998	35.7106	-0.0108	5.290276	-0.001426	1.000345	5.289525	-0.000751	35.7049	-0.0057
028C	11	50.6	29.2484	5.726588	0.000313	34.7876	34.7968	-0.0092	5.727927	-0.001339	1.000304	5.727352	-0.000576	34.7929	-0.0039
014C	9	98.5	28.4515	5.726362	0.000229	35.3585	35.3650	-0.0065	5.727296	-0.000934	1.000233	5.727126	-0.000170	35.3638	-0.0012
028C	12	10.1	29.2265	5.671823	0.000138	34.4402	34.4455	-0.0053	5.672597	-0.000774	1.000207	5.672576	-0.000022	34.4454	-0.0001
014C	12	10.3	29.6735	5.704989	0.000111	34.3462	34.3515	-0.0053	5.705769	-0.000780	1.000207	5.705748	-0.000021	34.3514	-0.0001
028C	4	400.2	9.2501	3.726327	0.001047	34.6899	34.6946	-0.0047	3.726775	-0.000448	1.000228	3.726684	-0.000091	34.6936	-0.0009
022C	1	1001.4	4.6990	3.322695	0.000114	34.5329	34.5372	-0.0043	3.323069	-0.000374	1.000233	3.322970	-0.000098	34.5361	-0.0011
022C	2	1001.4	4.7008	3.322856	0.000092	34.5329	34.5370	-0.0041	3.323214	-0.000358	1.000228	3.323131	-0.000083	34.5361	-0.0010
028C	5	249.5	12.6816	4.073938	0.009497	34.9728	34.9768	-0.0040	4.074351	-0.000413	1.000200	4.074366	0.000015	34.9769	0.0001
022C	3	1001.4	4.7026	3.323026	0.000059	34.5330	34.5368	-0.0038	3.323355	-0.000329	1.000220	3.323301	-0.000054	34.5362	-0.0006
018C	1	1000.3	4.5562	3.311410	0.000100	34.5501	34.5537	-0.0036	3.311718	-0.000308	1.000214	3.311683	-0.000035	34.5533	-0.0004
014C	3	700.0	5.8543	3.413400	0.000434	34.5339	34.5366	-0.0027	3.413634	-0.000234	1.000186	3.413694	0.000059	34.5373	0.0007
014C	4	399.3	9.2572	3.724248	0.000204	34.6619	34.6645	-0.0026	3.724502	-0.000254	1.000176	3.724605	0.000103	34.6656	0.0011
002C	2	1000.0	4.4806	3.304800	0.000130	34.5518	34.5543	-0.0025	3.305020	-0.000220	1.000188	3.305072	0.000052	34.5549	0.0006
028C	3	701.0	5.6707	3.395698	0.000049	34.5204	34.5229	-0.0025	3.395918	-0.000220	1.000183	3.395988	0.000070	34.5237	0.0008
010C	7	998.8	4.5314	3.309361	0.000067	34.5528	34.5551	-0.0023	3.309560	-0.000199	1.000181	3.309633	0.000073	34.5559	0.0008
010C	7	998.8	4.5314	3.309361	0.000067	34.5528	34.5551	-0.0023	3.309560	-0.000199	1.000181	3.309633	0.000073	34.5559	0.0008
028C	2	1001.3	4.3468	3.292304	0.000028	34.5441	34.5459	-0.0018	3.292447	-0.000143	1.000165	3.292573	0.000126	34.5473	0.0015
014C	11	30.1	29.6652	5.707469	0.000682	34.3634	34.3647	-0.0013	5.707657	-0.000188	1.000103	5.708229	0.000572	34.3685	0.0039
028C	6	225.0	13.9278	4.206412	0.000249	35.0905	35.0829	0.0076	4.205595	0.000817	0.999901	4.206867	0.001272	35.0947	0.0119
014C	5	199.1	15.6049	4.328837	0.019465	34.7183	34.7087	0.0096	4.327757	0.001080	0.999843	4.329317	0.001559	34.7227	0.0140
028C	8	175.2	20.8082	4.977579	0.001552	35.7732	35.7626	0.0106	4.976265	0.001314	0.999816	4.978190	0.001925	35.7781	0.0156
028C	7	200.3	15.8124	4.411484	0.000178	35.2753	35.2633	0.0120	4.410150	0.001334	0.999788	4.411980	0.001830	35.2797	0.0164
014C	10	49.8	29.6828	5.726293	0.001110	34.4730	34.4585	0.0145	5.724158	0.002135	0.999697	5.727057	0.002899	34.4781	0.0197
014C	6	173.6	21.0196	4.943172	0.000640	35.3204	35.2166	0.1038	4.930242	0.012930	0.997465	4.943776	0.013535	35.3252	0.1086
008C	2	1001.1	4.4982	3.306573	0.000134	34.5536	-	-	-						
014C	2	1000.9	4.5638	3.311999	0.000583	34.5489	-	-	-						
014C	2	1000.9	4.5638	3.311999	0.000583	34.5489	-	-	-						
014C	7	148.3	26.7320	5.546674	0.001969	35.3704	-	-	-						


Difference of Salinity Data between CTD and AUTOSAL (Leg.2)
SALINITY (PSU)
35.8000
35.6000
35.4000
35.2000
35.0000
34.8000
34.6000
34.4000
34.2000
Diff. (PSU)
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
-0.0200
-0.0400
002C
008C
010C
010C
014C
014C
014C
014C
014C
014C
014C
014C
014C
014C
014C
014C
018C
022C
022C
022C
028C
028C
028C
028C
028C
028C
028C
028C
028C
028C
028C
STATION
Sal(CTD)
Sal(Bottle)
Diff(CTD-Btl)


Salinity difference (CTD-Btl)
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
-0.0200
-0.0400
Diff. (PSU)
0.0
200.0
400.0
600.0
800.0
1000.0
1200.0
Pressure (db)


Salinity difference (CTD-Btl)
Diff. (PSU)
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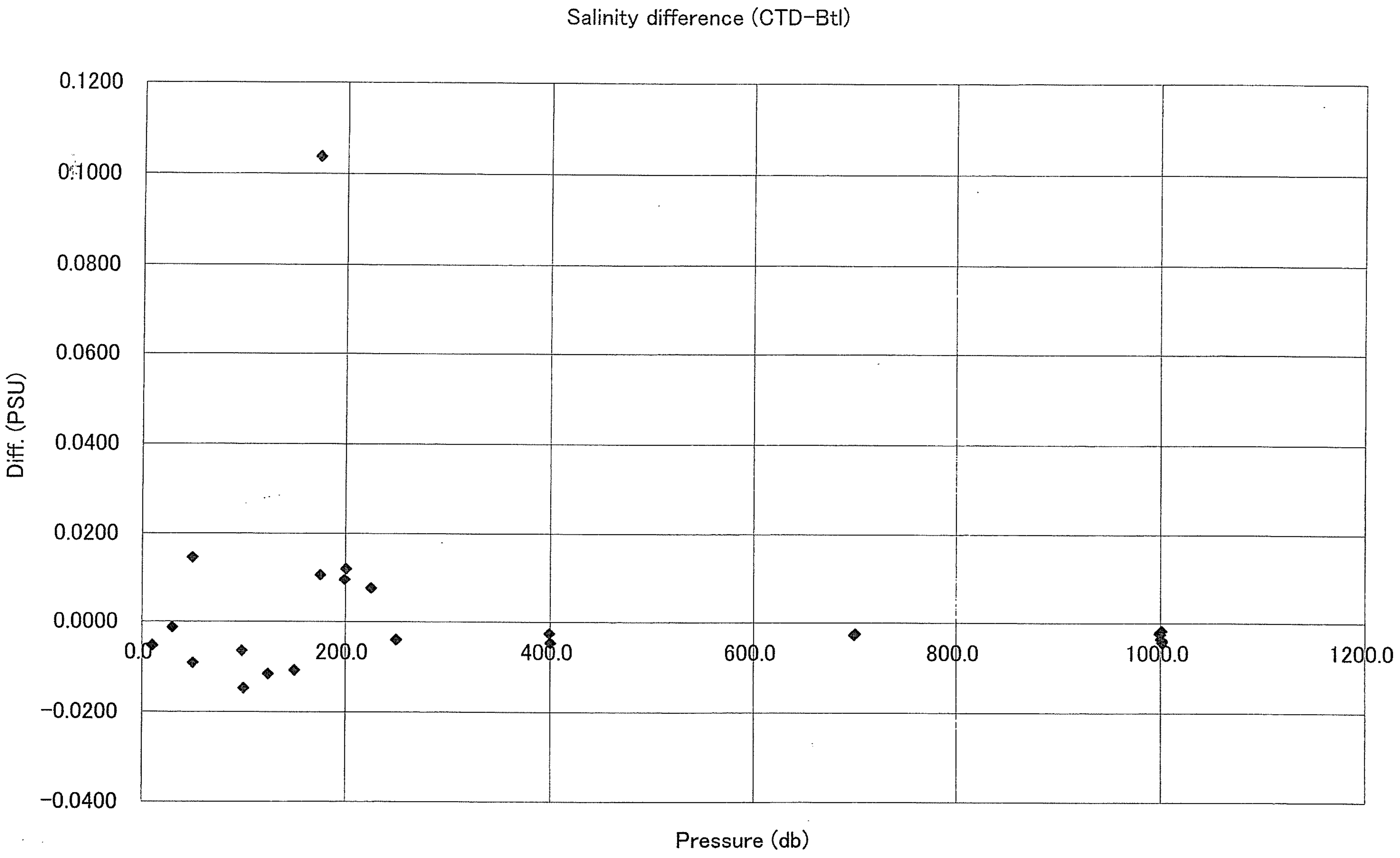
0.0150
0.0100
0.0050
0.0000
-0.0050
-0.0100
-0.0150
-0.0200
0.0
200.0
400.0
600.0
800.0
1000.0
1200.0
Pressure (db)
◆ Diff(CTD-Btl)
▨ Sdiff(cor)


Salinity difference (CTD-Btl)
Diff. (PSU)
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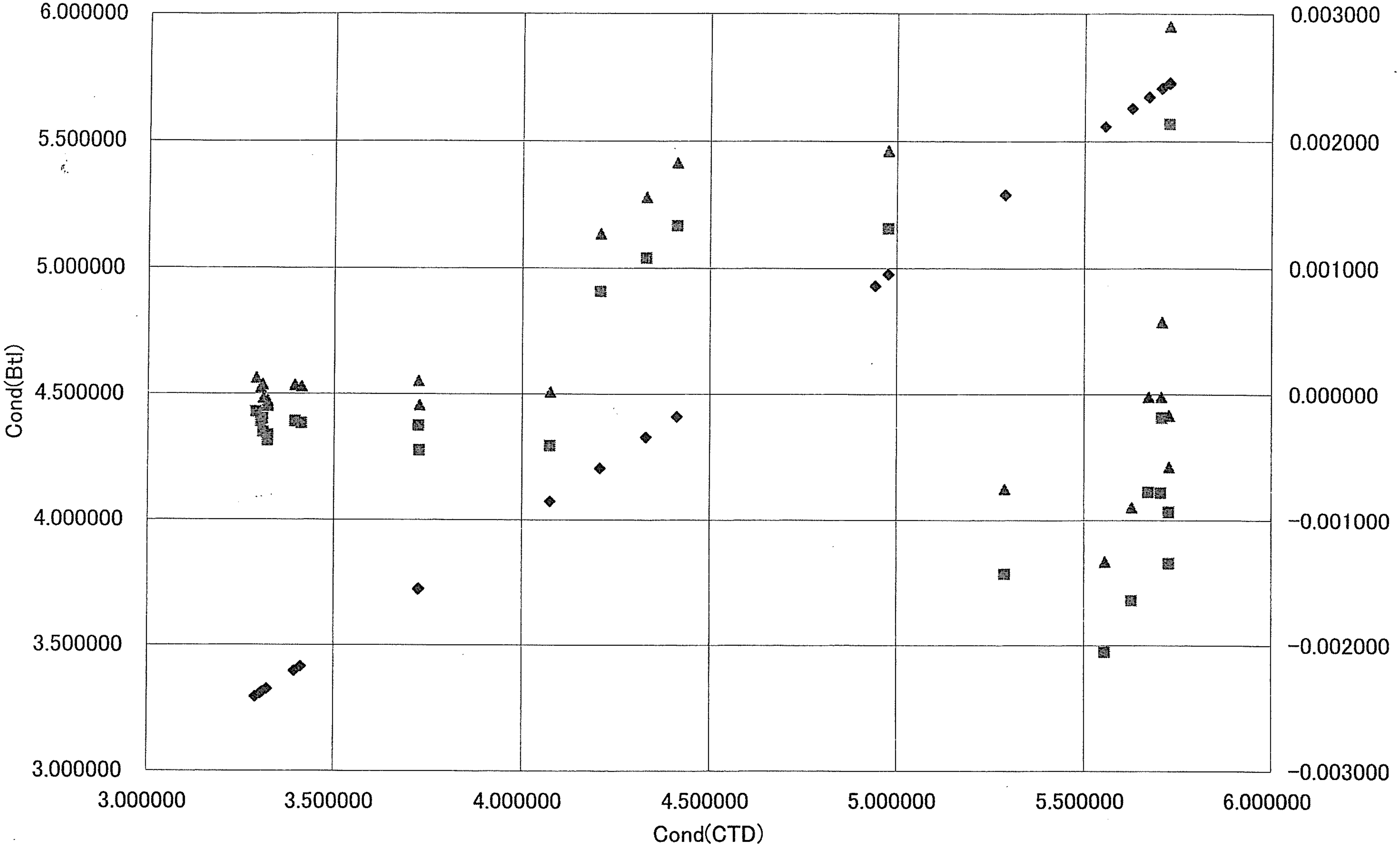
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
-0.0200
-0.0400
0.0
200.0
400.0
600.0
800.0
1000.0
1200.0
Pressure (db)


6.000000
5.500000
5.000000
4.500000
4.000000
3.500000
3.000000
Cond(Btl)
0.003000
0.002000
0.001000
0.000000
−0.001000
−0.002000
−0.003000
3.000000
3.500000
4.000000
4.500000
5.000000
5.500000
6.000000
Cond(CTD)

Salinity Data Comparison between CTD and AUTOSAL (Leg.3)

		Bath Temp	24			
Station	Bottle	2R	offset	2R(cor)	Smeasure	
030C	145	1.97729	0	1.97729	34.5535	34.5535
035C						
036C	146	1.97718	0	1.97718	34.5514	34.5513
037C	147	1.97699	0	1.97699	34.5476	34.5475
038C	148	1.97700	0	1.97700	34.5478	34.5478
039C	149	1.97708	0	1.97708	34.5494	34.5494
040C	150	1.97687	0	1.97687	34.5453	34.5453
042C	151	1.97592	0	1.97592	34.5266	34.5266
043C	152	1.97581	0	1.97581	34.5245	34.5245
045C	153	1.97728	0	1.97728	34.5533	34.5533
047C	154	1.97765	0	1.97765	34.5606	34.5606
049C	155	1.97724	0	1.97724	34.5525	34.5525
051C	156	1.97723	0	1.97723	34.5523	34.5523
053C	157	1.97730	1	1.97731	34.5539	34.5537
070C	158	1.97706	1	1.97707	34.5492	34.5490
072C	159	1.97743	1	1.97744	34.5565	34.5563
074C	160	1.97723	1	1.97724	34.5525	34.5523
076C	161	1.97728	−1	1.97727	34.5531	34.5533
078C	162	1.97725	−1	1.97724	34.5525	34.5527
080C	163	1.97704	−1	1.97703	34.5484	34.5486
082C	164	1.97693	−1	1.97692	34.5463	34.5464
084C	165	1.97642	0	1.97642	34.5364	34.5364
086C	166	1.97725	0	1.97725	34.5527	34.5527
088C			0			
090C	170	1.97697	0	1.97697	34.5472	34.5472
092C	169	1.97710	0	1.97710	34.5498	34.5498
095C	168		0			
097C	167	1.97636	0	1.97636	34.5353	34.5353
098C			0			
099C	174	1.97690	−1	1.97689	34.5457	34.5459
101C	173	1.97691	−1	1.97690	34.5459	34.5461
104C	172	1.97715	0	1.97715	34.5508	34.5508
106C	171	1.97710	0	1.97710	34.5498	34.5498
107C	175	1.97684	−1	1.97683	34.5445	34.5447
109C	176	1.97644	−1	1.97643	34.5366	34.5368
111C	177	1.97765	0	1.97765	34.5606	34.5606
113C	178	1.97799	1	1.97800	34.5675	34.5673
116C	179	1.97685	2	1.97687	34.5453	34.5449
118C	180	1.97702	3	1.97705	34.5488	34.5482

Difference of Salinity Data between CTD and AUTOSAL (Leg.3)

Station	Bottle	Pres(CTD)	Temp(CTD)	Sal(CTD)	Sal(Bottle)	Diff(CTD-Btl)
030C	2	1001.6	4.5211	34.5506	34.5535	-0.0029
035C	2	1000.0	4.4993	34.5477	-	
036C	2	1000.1	4.4602	34.5490	34.5514	-0.0024
037C	2	1000.6	4.7436	34.5437	34.5476	-0.0039
038C	2	1000.0	4.6679	34.5456	34.5478	-0.0022
039C	2	999.3	4.3975	34.5469	34.5494	-0.0025
040C	2	997.9	4.4846	34.5412	34.5453	-0.0041
042C	2	1000.1	4.7457	34.5237	34.5266	-0.0029
043C	2	898.5	4.7779	34.5207	34.5245	-0.0038
045C	2	999.0	4.4634	34.5509	34.5533	-0.0024
047C	2	998.8	4.4767	34.5516	34.5606	-0.0090
049C	2	998.3	4.5205	34.5492	34.5525	-0.0033
051C	2	999.8	4.5460	34.5488	34.5523	-0.0035
053C	2	999.3	4.5264	34.5510	34.5539	-0.0029
070C	2	998.8	4.8235	34.5464	34.5492	-0.0028
072C	2	1000.1	4.4240	34.5537	34.5565	-0.0028
074C	2	1000.6	4.6494	34.5488	34.5525	-0.0037
076C	2	999.7	4.7878	34.5446	34.5531	-0.0085
078C	2	999.8	4.6696	34.5501	34.5525	-0.0024
080C	2	998.8	4.9460	34.5438	34.5484	-0.0046
082C	2	999.7	4.7499	34.5431	34.5463	-0.0032
084C	2	958.0	5.0386	34.5319	34.5364	-0.0045
086C	2	999.8	4.5914	34.5519	34.5527	-0.0008
088C	2	700.4	6.1610	34.5316		
090C	2	1003.4	4.6096	34.5439	34.5472	-0.0033
092C	2	999.5	4.6385	34.5459	34.5498	-0.0039
095C	2	1002.1	4.8238	34.5395		
097C	2	1000.3	4.7785	34.5302	34.5353	-0.0051
098C	2	607.7	7.0500	34.5169		
099C	2	999.4	4.6338	34.5378	34.5457	-0.0079
101C	2	1002.4	4.6599	34.5435	34.5459	-0.0024
104C	2	1001.6	4.4782	34.5482	34.5508	-0.0026
106C	2	1001.0	4.5588	34.5447	34.5498	-0.0051
107C	2	999.7	4.8494	34.5375	34.5445	-0.0070
109C	2	999.0	4.5455	34.5322	34.5366	-0.0044
111C	2	998.2	4.2481	34.5527	34.5606	-0.0079
113C	2	999.3	3.9315	34.5586	34.5675	-0.0089
116C	2	1002.0	4.7902	34.5379	34.5453	-0.0074
118C	2	999.3	4.7170	34.5409	34.5488	-0.0079

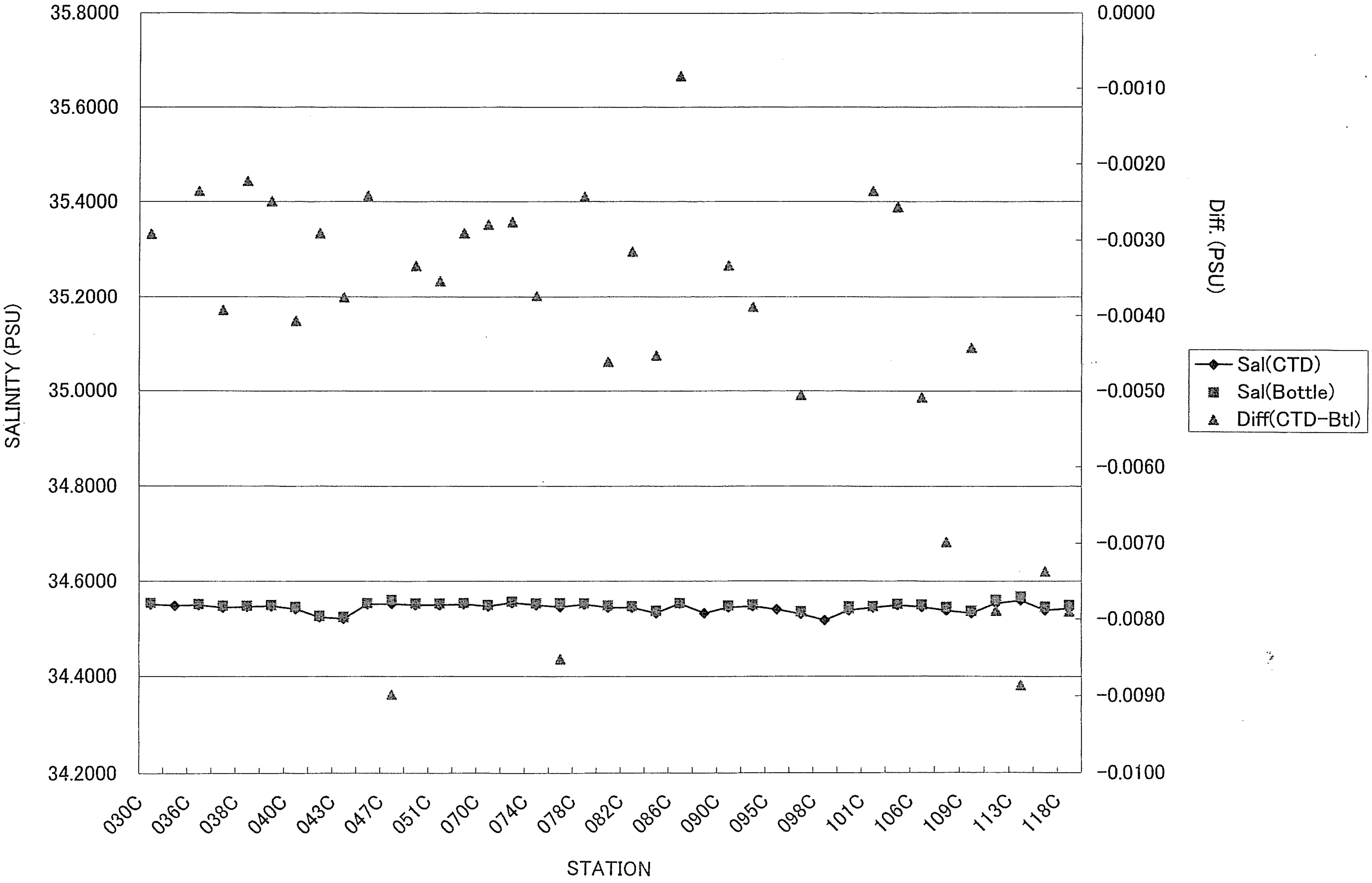
Salinity Data Comparison between CTD and AUTOSAL (Leg.3)

Slope(mea 1.000220
Slope(Med 1.000204
Offset -0.0004

-0.0006

Station	Bottle	Pres(CTD)	Temp(CTD)	Cond(CTD)	Cond(s.d.)	Sal(CTD)	Sal(Bottle)	Diff(CTD-Btl)	Cond(Bottle)	deltaC	Slope	C(corr.)	deltaC(corr)	S(corr)	Sdiff(cor)
030C	2	1001.6	4.5211	3.308380	0.000019	34.5506	34.5535	-0.0029	3.308627	-0.000247	1.000196	3.308656	0.000028	34.5538	0.0003
035C	2	1000.0	4.4993	3.306118	0.000020	34.5477					0.000121	3.306393		34.5509	
036C	2	1000.1	4.4602	3.302748	0.000173	34.5490	34.5514	-0.0024	3.302954	-0.000206	1.000184	3.303022	0.000068	34.5522	0.0008
037C	2	1000.6	4.7436	3.327567	0.000027	34.5437	34.5476	-0.0039	3.327913	-0.000346	1.000224	3.327847	-0.000067	34.5469	-0.0008
038C	2	1000.0	4.6679	3.320963	0.000066	34.5456	34.5478	-0.0022	3.321154	-0.000191	1.000178	3.321241	0.000087	34.5488	0.0010
039C	2	999.3	4.3975	3.296957	0.000028	34.5469	34.5494	-0.0025	3.297171	-0.000214	1.000186	3.297230	0.000059	34.5501	0.0007
040C	2	997.9	4.4846	3.304160	0.000043	34.5412	34.5453	-0.0041	3.304508	-0.000348	1.000226	3.304435	-0.000074	34.5444	-0.0009
042C	2	1000.1	4.7457	3.326004	0.000135	34.5237	34.5266	-0.0029	3.326263	-0.000259	1.000198	3.326283	0.000021	34.5269	0.0002
043C	2	898.5	4.7779	3.324260	0.000083	34.5207	34.5245	-0.0038	3.324589	-0.000329	1.000219	3.324539	-0.000050	34.5239	-0.0006
045C	2	999.0	4.4634	3.303155	0.000033	34.5509	34.5533	-0.0024	3.303362	-0.000207	1.000184	3.303430	0.000067	34.5541	0.0008
047C	2	998.8	4.4767	3.304388	0.000038	34.5516	34.5606	-0.0090	3.305162	-0.000774	1.000355	3.304663	-0.000499	34.5548	-0.0058
049C	2	998.3	4.5205	3.308064	0.000028	34.5492	34.5525	-0.0033	3.308348	-0.000284	1.000207	3.308340	-0.000009	34.5524	-0.0001
051C	2	999.8	4.5460	3.310365	0.000079	34.5488	34.5523	-0.0035	3.310669	-0.000304	1.000213	3.310641	-0.000028	34.5520	-0.0003
053C	2	999.3	4.5264	3.308781	0.000175	34.5510	34.5539	-0.0029	3.309035	-0.000254	1.000198	3.309057	0.000022	34.5542	0.0003
070C	2	998.8	4.8235	3.334864	0.000016	34.5464	34.5492	-0.0028	3.335107	-0.000243	1.000193	3.335145	0.000038	34.5496	0.0004
072C	2	1000.1	4.4240	3.299938	0.000056	34.5537	34.5565	-0.0028	3.300172	-0.000234	1.000192	3.300212	0.000040	34.5569	0.0005
074C	2	1000.6	4.6494	3.319610	0.000016	34.5488	34.5525	-0.0037	3.319935	-0.000325	1.000218	3.319888	-0.000047	34.5520	-0.0005
076C	2	999.7	4.7878	3.331558	0.000020	34.5446	34.5531	-0.0085	3.332298	-0.000740	1.000342	3.331838	-0.000460	34.5478	-0.0053
078C	2	999.8	4.6696	3.321493	0.000016	34.5501	34.5525	-0.0024	3.321701	-0.000208	1.000183	3.321771	0.000071	34.5534	0.0008
080C	2	998.8	4.9460	3.345583	0.000112	34.5438	34.5484	-0.0046	3.345986	-0.000403	1.000240	3.345866	-0.000120	34.5470	-0.0014
082C	2	999.7	4.7499	3.328047	0.000021	34.5431	34.5463	-0.0032	3.328318	-0.000271	1.000202	3.328327	0.000009	34.5464	0.0001
084C	2	958.0	5.0386	3.351085	0.001323	34.5319	34.5364	-0.0045	3.351481	-0.000396	1.000237	3.351369	-0.000111	34.5352	-0.0013
086C	2	999.8	4.5914	3.314671	0.000148	34.5519	34.5527	-0.0008	3.314746	-0.000075	1.000143	3.314948	0.000202	34.5551	0.0023
088C	2	700.4	6.1610	3.440908	0.000425	34.5316					0.000116	3.441211		34.5350	
090C	2	1003.4	4.6096	3.315758	0.000085	34.5439	34.5472	-0.0033	3.316047	-0.000289	1.000208	3.316035	-0.000012	34.5471	-0.0001
092C	2	999.5	4.6385	3.318348	0.000036	34.5459	34.5498	-0.0039	3.318677	-0.000329	1.000220	3.318626	-0.000051	34.5492	-0.0006
095C	2	1002.1	4.8238	3.334439	0.000083	34.5395					0.000120	3.334720		34.5428	
097C	2	1000.3	4.7785	3.329512	0.000220	34.5302	34.5353	-0.0051	3.329943	-0.000431	1.000250	3.329792	-0.000151	34.5335	-0.0017
098C	2	607.7	7.0500	3.516249	0.000170	34.5169					0.000114	3.516567		34.5204	
099C	2	999.4	4.6338	3.317221	0.000028	34.5378	34.5457	-0.0079	3.317901	-0.000680	1.000326	3.317498	-0.000403	34.5410	-0.0047
101C	2	1002.4	4.6599	3.320167	0.000046	34.5435	34.5459	-0.0024	3.320371	-0.000204	1.000182	3.320445	0.000074	34.5467	0.0009
104C	2	1001.6	4.4782	3.304344	0.000040	34.5482	34.5508	-0.0026	3.304569	-0.000225	1.000189	3.304619	0.000050	34.5514	0.0006
106C	2	1001.0	4.5588	3.311196	0.000113	34.5447	34.5498	-0.0051	3.311641	-0.000445	1.000255	3.311472	-0.000169	34.5478	-0.0020
107C	2	999.7	4.8494	3.336451	0.000058	34.5375	34.5445	-0.0070	3.337053	-0.000602	1.000300	3.336732	-0.000321	34.5408	-0.0037
109C	2	999.0	4.5455	3.308853	0.000180	34.5322	34.5366	-0.0044	3.309233	-0.000380	1.000236	3.309129	-0.000104	34.5354	-0.0012
111C	2	998.2	4.2481	3.284127	0.000193	34.5527	34.5606	-0.0079	3.284801	-0.000674	1.000327	3.284398	-0.000403	34.5559	-0.0047
113C	2	999.3	3.9315	3.256589	0.000057	34.5586	34.5675	-0.0089	3.257343	-0.000754	1.000354	3.256854	-0.000489	34.5617	-0.0058
116C	2	1002.0	4.7902	3.331289	0.000042	34.5379	34.5453	-0.0074	3.331930	-0.000641	1.000313	3.331569	-0.000361	34.5411	-0.0042
118C	2	999.3	4.7170	3.324901	0.000037	34.5409	34.5488	-0.0079	3.325588	-0.000687	1.000327	3.325180	-0.000408	34.5441	-0.0047

Difference of Salinity Data between CTD and AUTOSAL (Leg.3)



4.6 Dissolved Oxygen Measurement

K. Akizawa and T. Ohama [1)]

[1)] :Marine Works Japan, LTD.

Objectives:

Measurement of dissolved oxygen (below D.O.) using D.O. meter corrected by the Winkler titration processed to the WHP Operations and Methods(Culberson,1991).

Comparison of D.O. meter data corrected by the Winkler titration with CTD D.O. data.

Instruments:

D.O. meter	; TOA Portable Dissolved Oxygen Meter Model DO-25A
Titrator	; Metrohm Model 716 DMS Titrino/ 10ml of titration vessel
Detector	; Pt Electrode/ 6.0401.100
Software	; Data acquisition/ Metrohm,METRODATA/ 6.6040.100

Methods :

We sampled seawater by the 12 piston Niskin water samplers (Go 1015) during CTD upcast.

The water was sampled from the 5-liter Niskin bottles into 100ml D.O. glass bottles for D.O. analysis. In several casts, seawater for the Winkler titration was also calibrated by BOD flasks (ca, 180 ml) (see Green and Carritt 1966).

D.O. glass bottles were washed using two bottles of seawater, then seawater was collected in the bottles with measuring water temperature. D.O. was measured by the D.O. meter with CTD salinity for correction within 30 minutes after it was collected. (We have done the 0-100% calibration of the D.O. meter before the measurement.). (see TOA D.O. meter operation manual).

The samples for the titration method were analyzed within 2 hours. These samples were analyzed by Metrohm piston burette of 10ml with Pt Electrode. The standardizations were performed every day before the sample titration.

The data from the D.O. meter was corrected with calibration factors. The factors were decided by linear regression based on the Winkler titration values vs. D.O. meter values.

Reproducibility:

(1) D.O. meter Value

85pairs of samples were analyzed as replicates taken by the same Niskin bottle. The average and standard deviation (2 sigma) of difference of replicates were 0.018ml/l and 0.026ml/l

(0.498% of D.O. maximum (5.21ml/l) in this cruise) .

(2) Winkler Titration Value

46pairs of samples were analyzed. The average and standard deviation (2 sigma) of difference of replicates were 0.003ml/l and 0.004ml/l (0.11% of D.O. maximum (3.706ml/l) in this cruise) .

Results:

(1) Correction of D.O. meter Values

Linear regression line shown below was obtained form 133 pairs of D.O. meter-Winkler data (Fig4.6.1).

All D.O. meter data were calibrated by this formula (Corrected D.O. data were Shown in Tables4.6.1-1~3).

Formula : Y = 0.0904 + 0.7111 × X (n = 133)
R = 0.9914
Y : Winkler Value (ml/ l) X : D.O. meter Value (ml/ l)

(2) CTD-D.O. Sensor Value correction

Linear regression line shown below was obtained from 251 pairs of CTD D.O. Sensor and corrected D.O. data. (Fig.4.6.2)

For upcast : Y = 0.2077 + 1.0014 × X (n = 251)
R = 0.989
Y : Corrected D.O. Value (ml/ l) X : CTD-D.O. Sensor Upcast Value (ml/ l)

(3) Contour plots

Contour plots in Figs.4.6.3-1~3 were made from corrected dissolved oxygen data in Table4.6.1~3.

142 E Line	: Stn C35,C36,C37,C38,C39,C40
138 E Line	: Stn C42,C43,C45,C47,C49,C51,C53
Mindanao-New Gguinea Line	: Stn C70,C72,C74,C76,C78,C80,C82,C84,C86
7 N Line	: Stn C88,C90,C92,C95,C97
8 N Line	: Stn C98,C99,C101,C104,C106
10 N Line	: Stn C107,C109,C111,C113,C116,C118

(4) Vertical profiles

All vertical profiles in this cruise are shown in Figs.4.6.4-1～6. These profiles were derived from corrected D.O. data in Tables.4.6.1-1～3.

References :

Culberson,C.H. (1991) Dissolved Oxygen, in WHP Operations and Methods, Woods Hole.,pp1-15

Culberson,C.H.,G.Knapp,R.T.Williams and F.Zemlyak (1991) A comparison of methods for the determination of dissolved oxygen in sea water (WHPO 91-2),Woods Hole.

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Horibe,Y.,Y.Kodama and K.Shigehara (1972) Errors in sampling procedure for the determination of dissolved oxygen by Winkler method,J. Oceanogr. Soc, Jpn., 28, 203-206.

Murray,N.,J.P.Riley and T.R.S.Wilson (1968) The solubility of oxygen in Winkler reagents used for determination of dissolved oxygen, Deep-Sea Res., 15, 237-238

S.Kitagawa and K.Taira (1993) Measurement of dissolved oxygen by an electrode method,

Umi no Kagaku (in Japanese), 2, 15-18.TOA Electronics Ltd. (1991) DO-25A Portable Dissolved Oxygen meter Operation Manual,Tokyo, 29

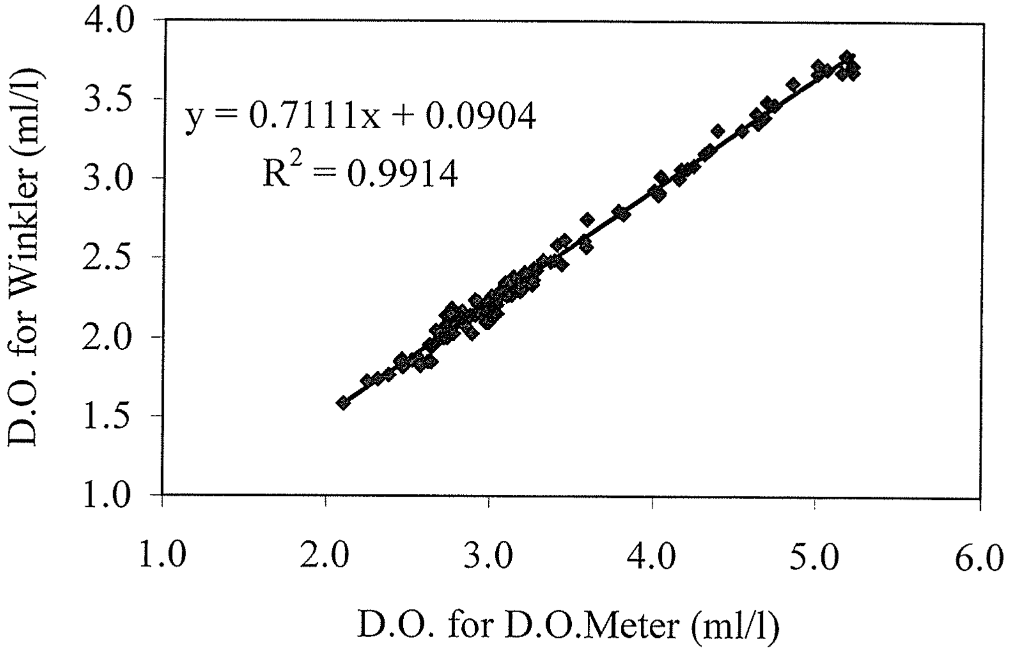


Fig.4.6.1 Correction of D.O.meter-Winkler

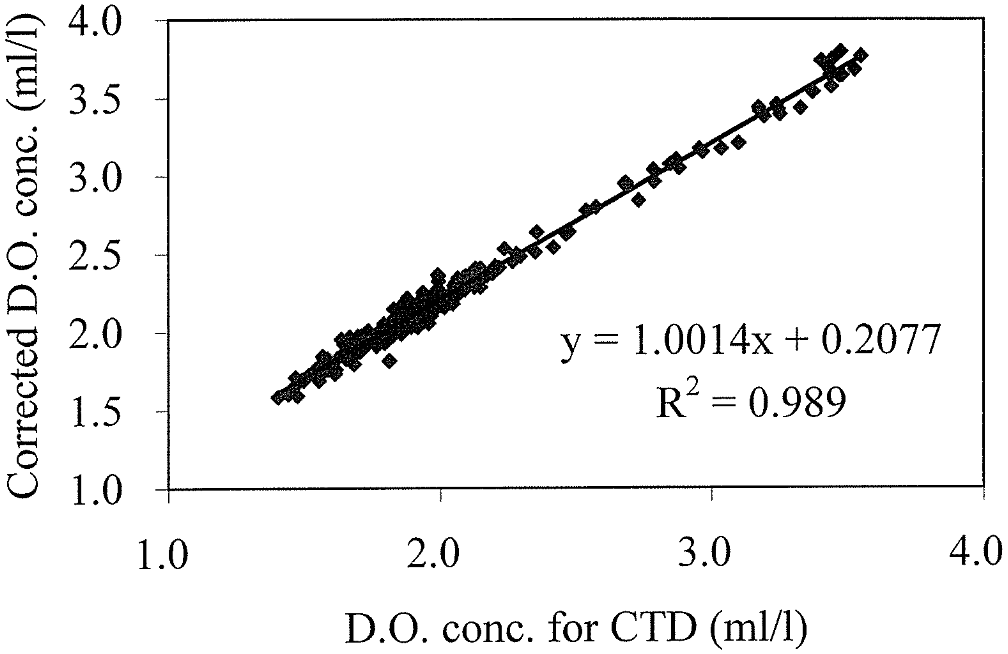
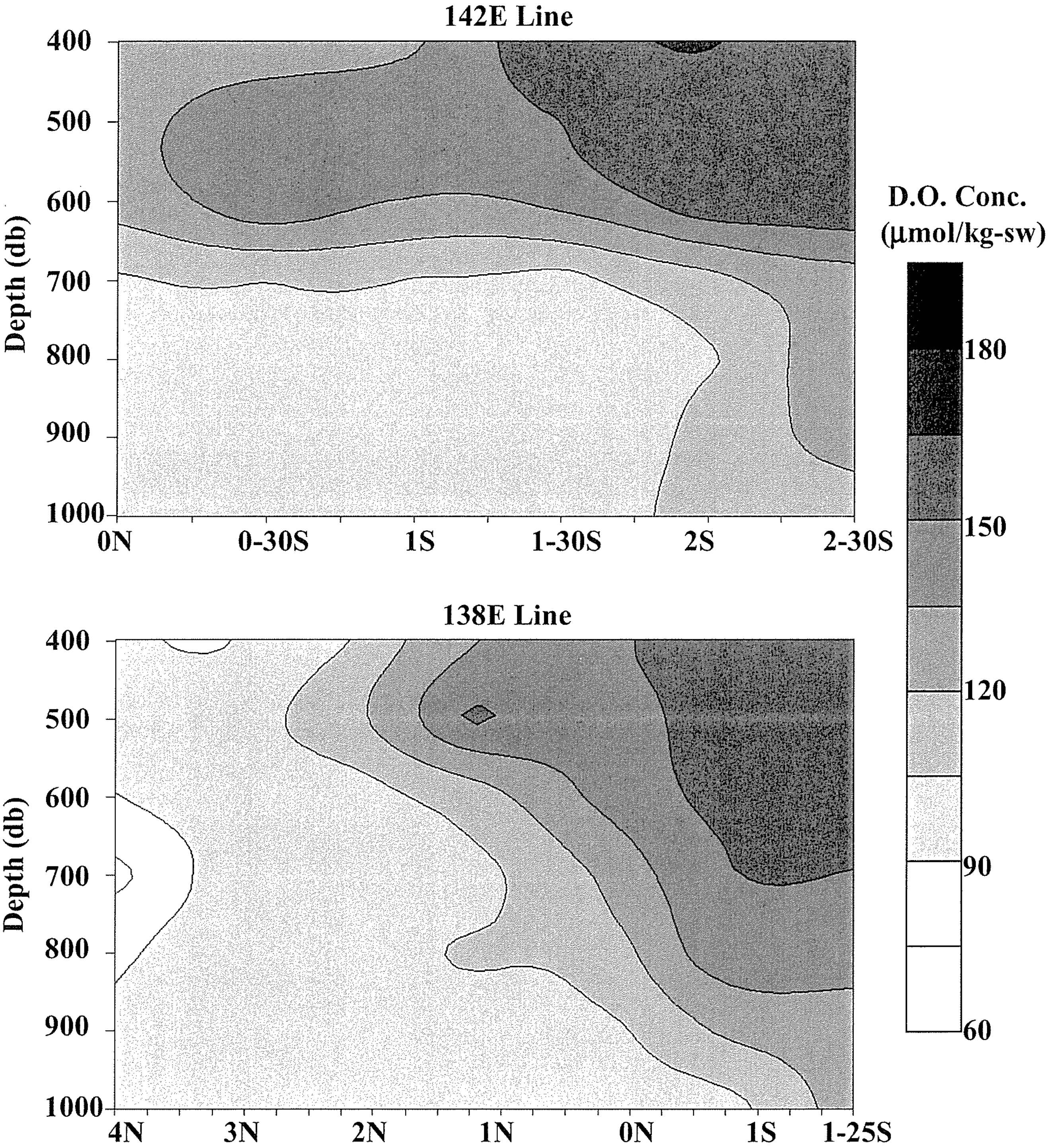


Fig.4.6.2 Correction of CTD-Corrected D.O. data



142E Line

138E Line

Fig.4.6.3-1 D.O. Contour on 142E and 138E Line.

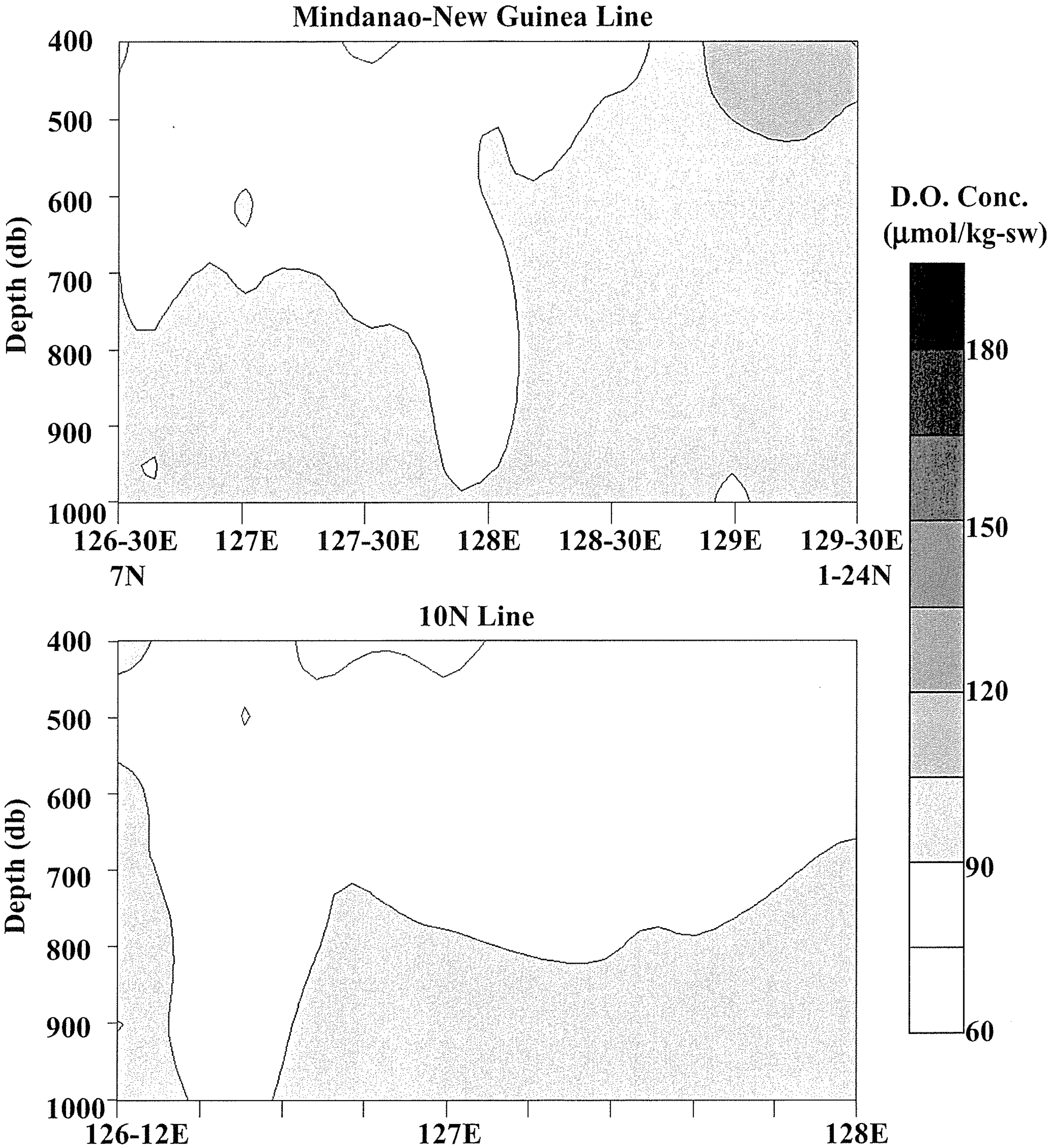


Fig.4.6.3-2 D.O. Contour on Mindanao-New Guinea and 10N Line .

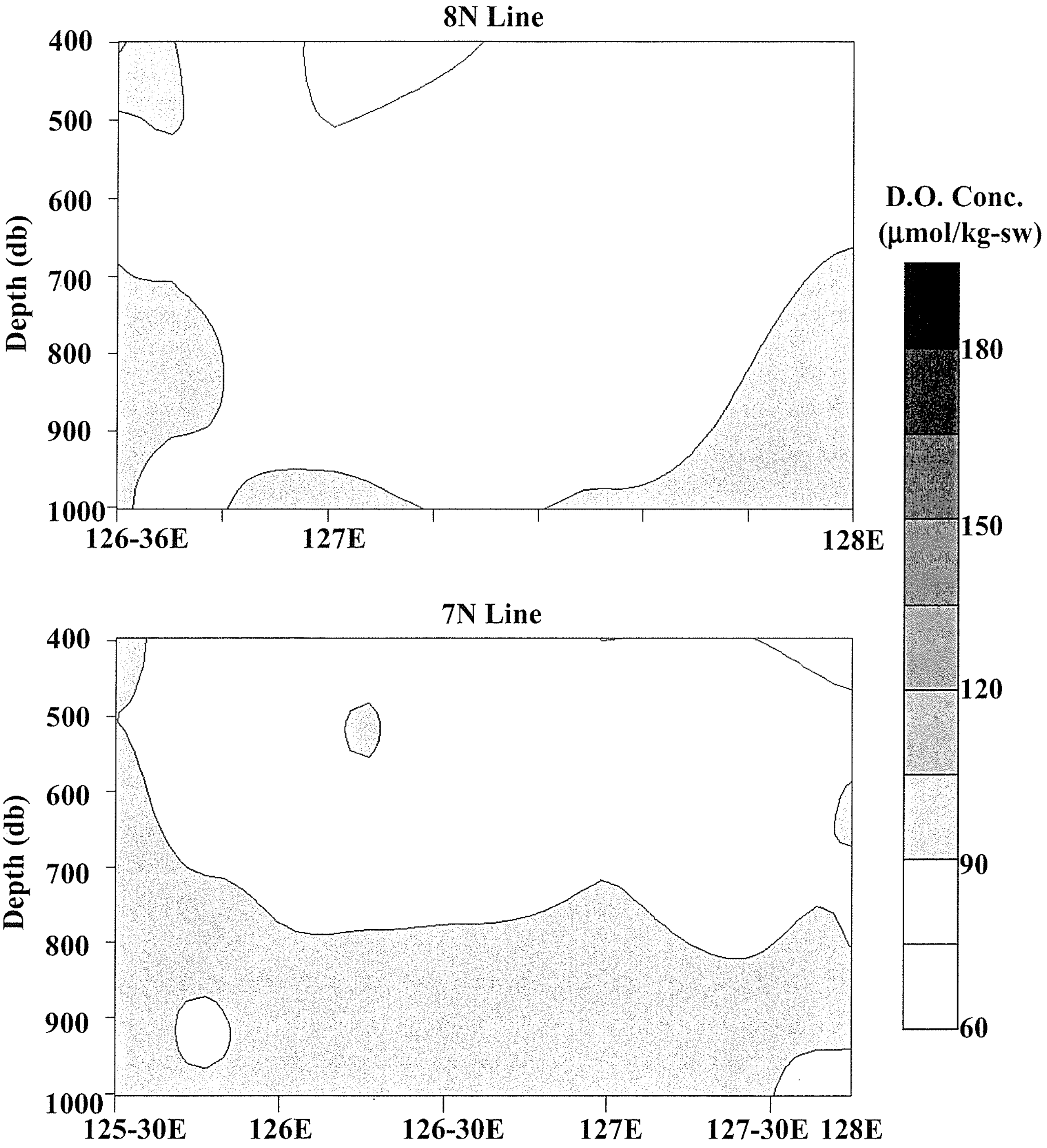


Fig.4.6.3-3 D.O. Contour on 8N and 7N Line.

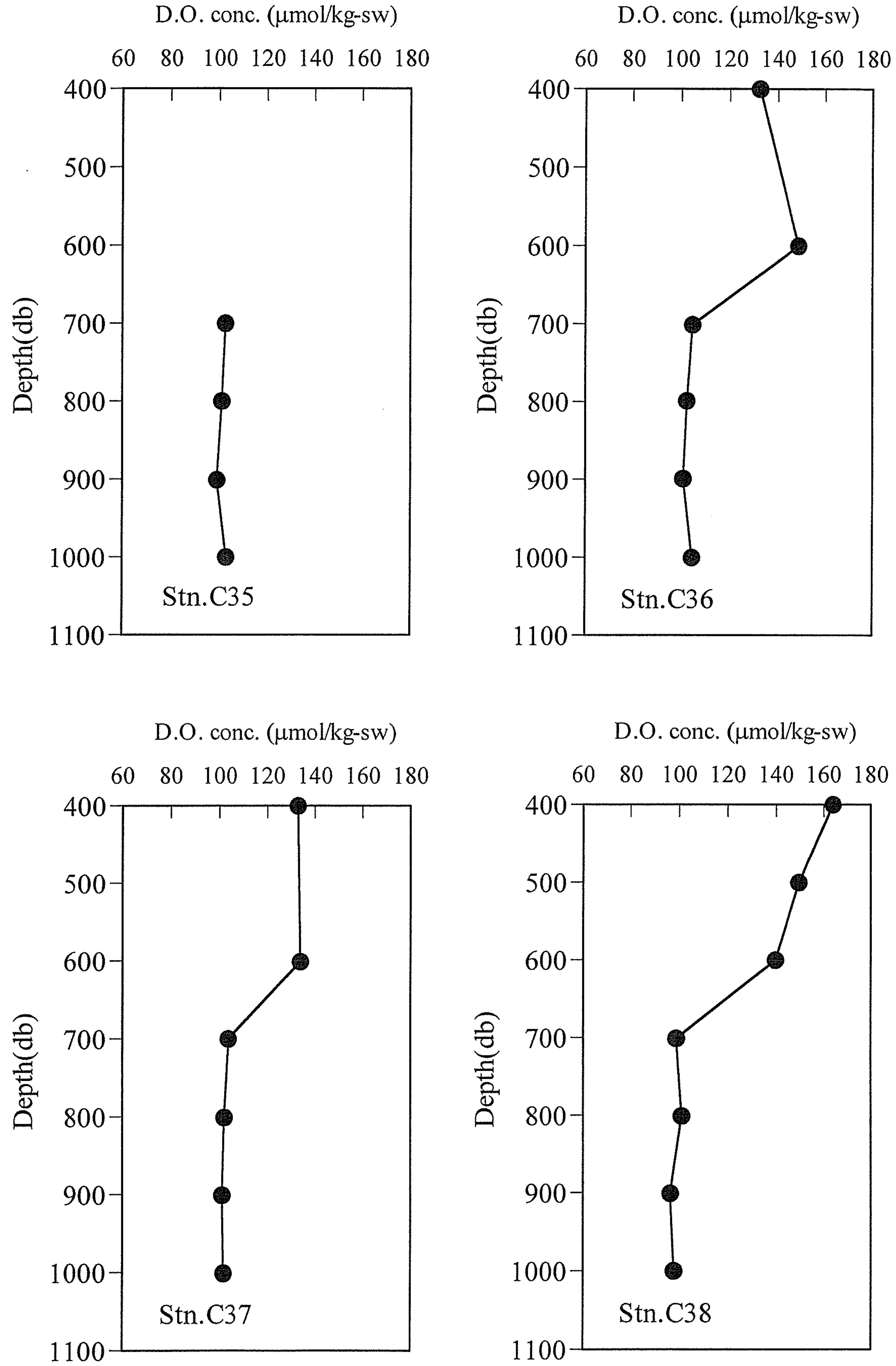


Fig.4.6.4-1-a Vertical plofiles on 142E Line.

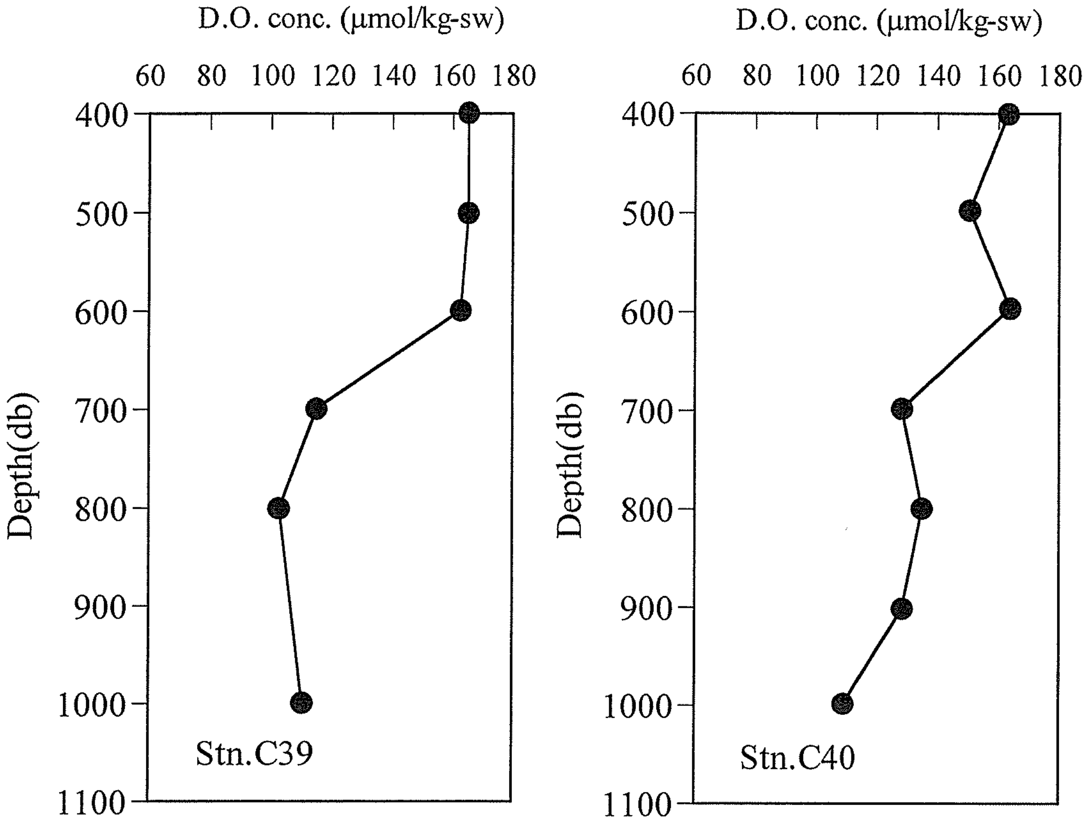


Fig.4.6.4-1-b Vertical plofiles on 142E Line.

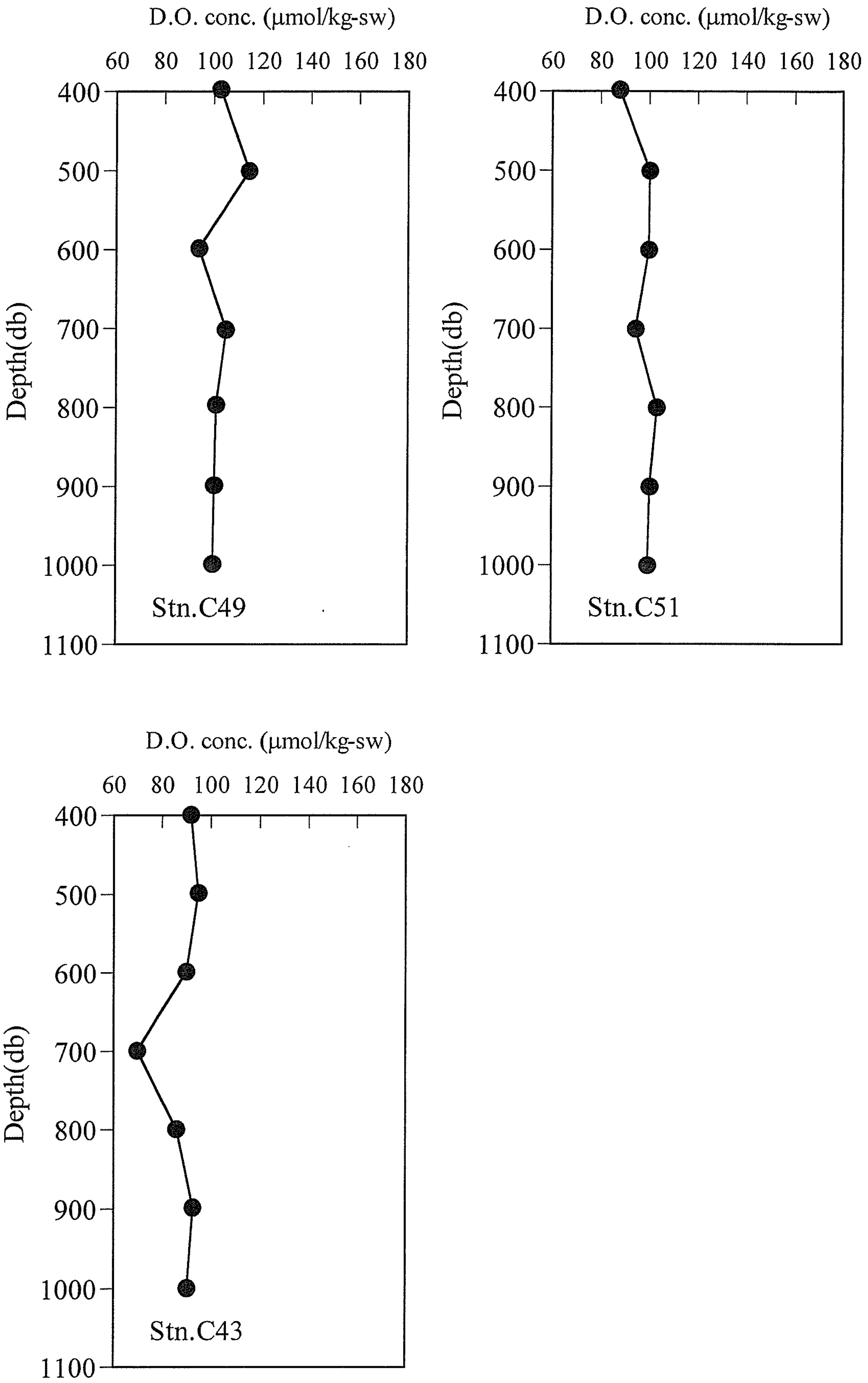


Fig.4.6.4-2-b Vertical plofiles on 138E Line.

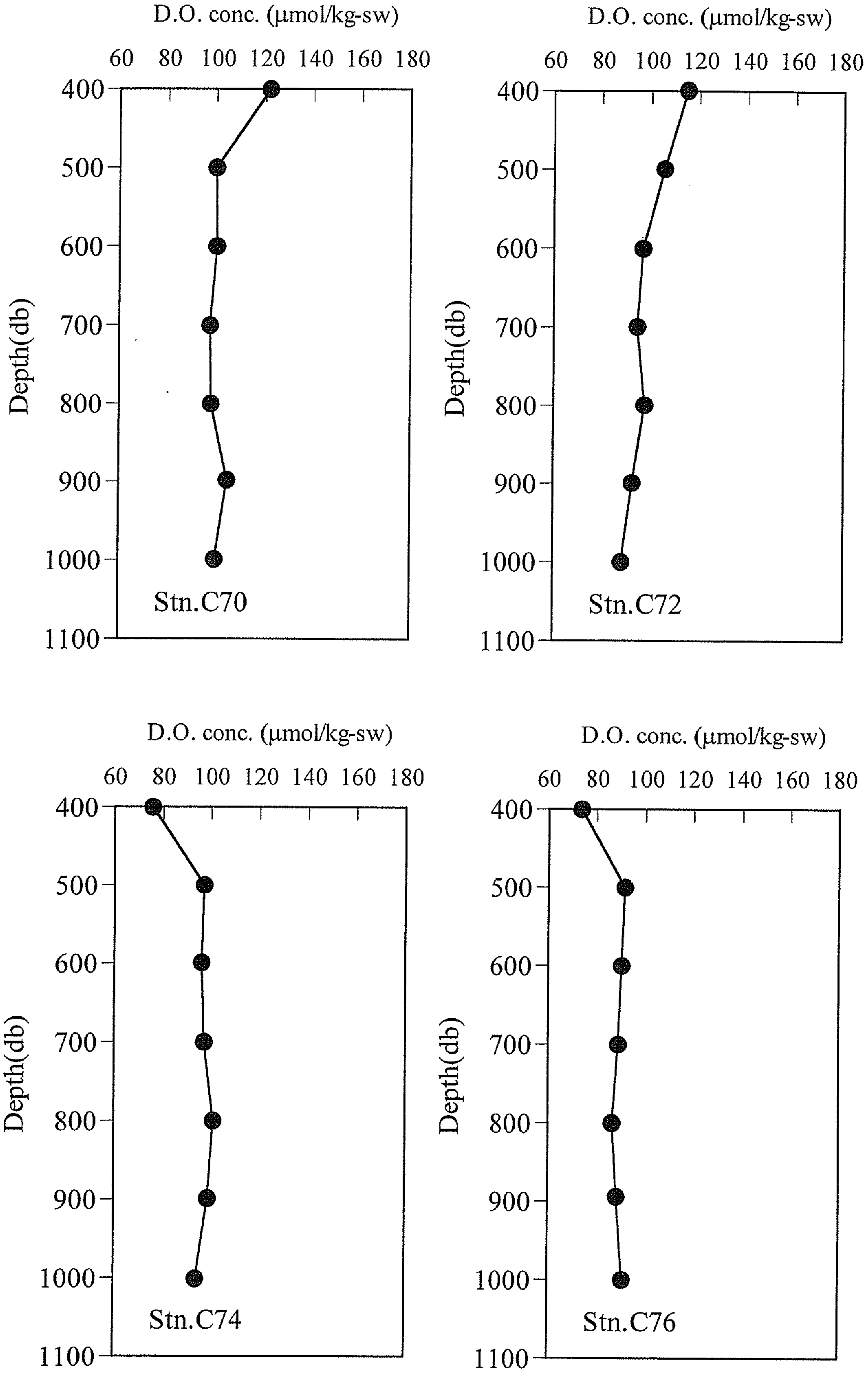


Fig.4.6.4-3-a Vertical plofiles
on Mindanao-New guinea Line.

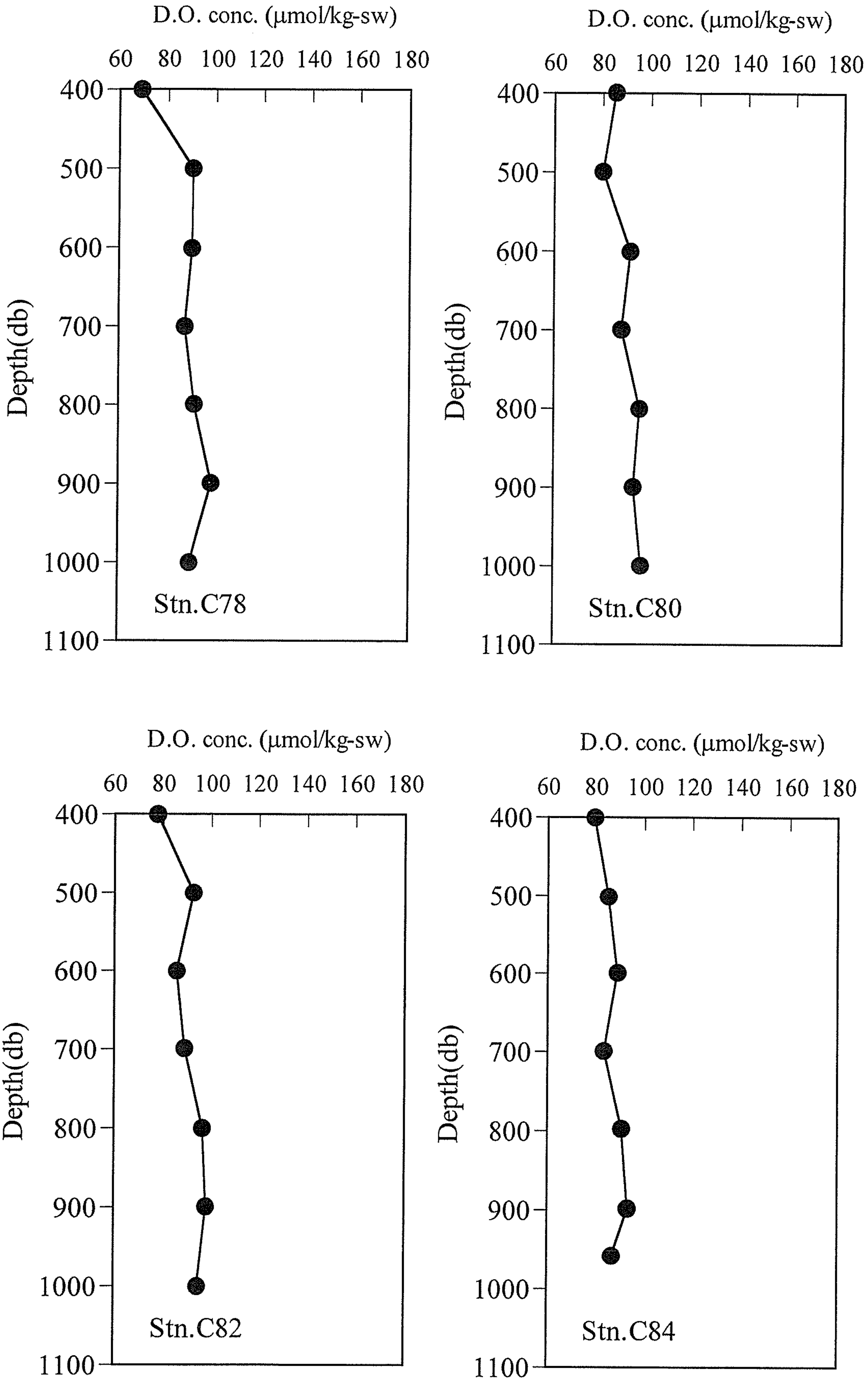


Fig.4.6.4-3-b Vertical plofiles
on Mindanao-New guinea Line.

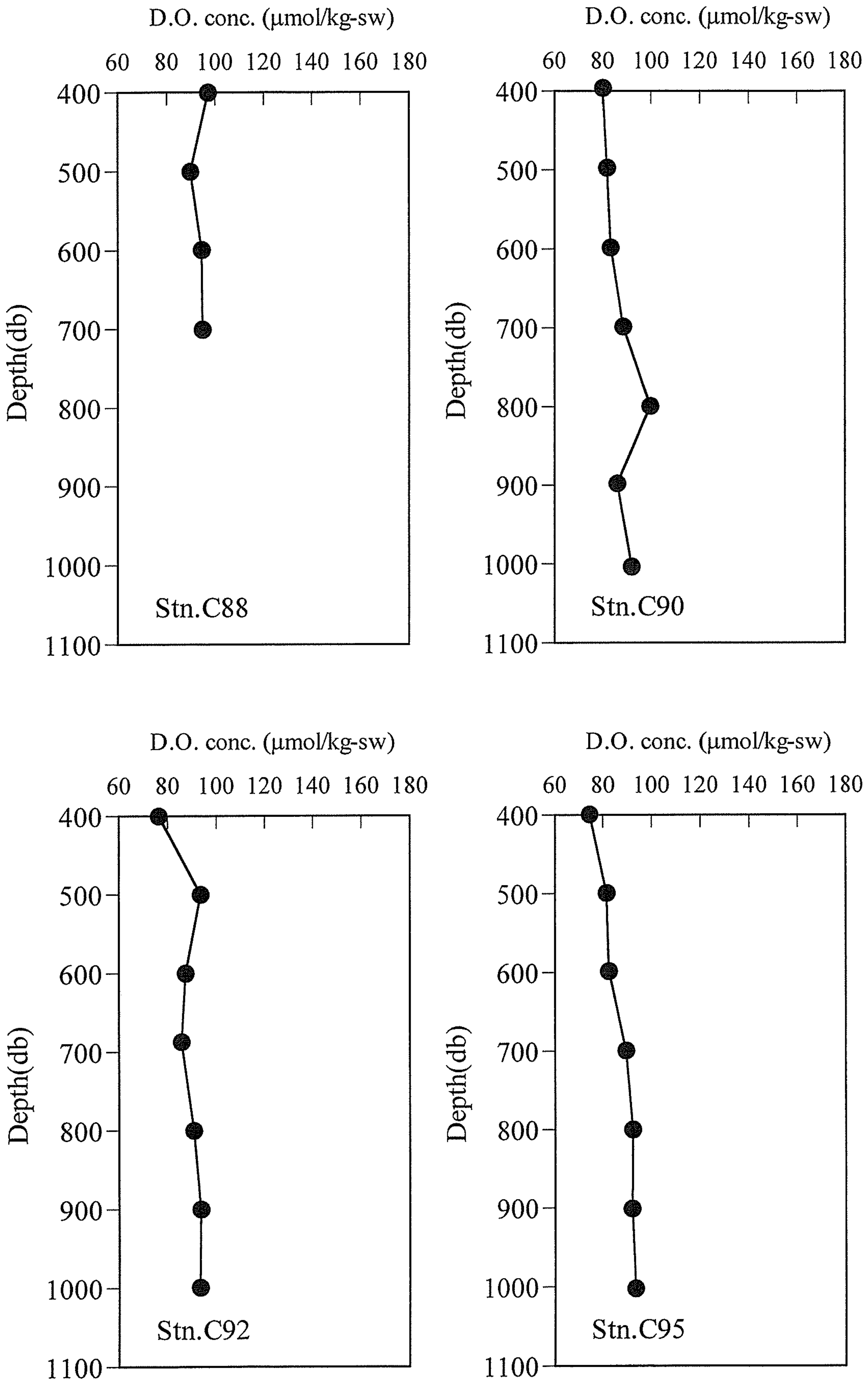


Fig.4.6.4-4-a Vertical plofiles on 7N Line.

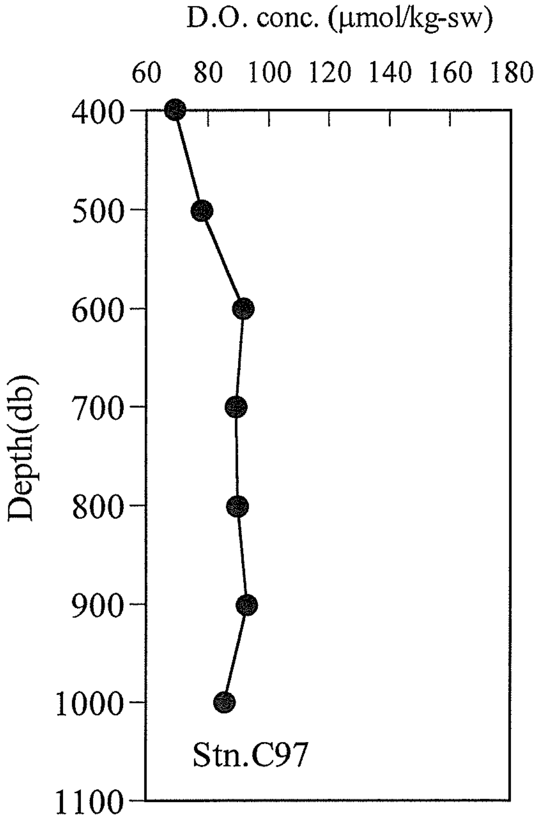


Fig.4.6.4-4-b Vertical plofiles on 7N Line.

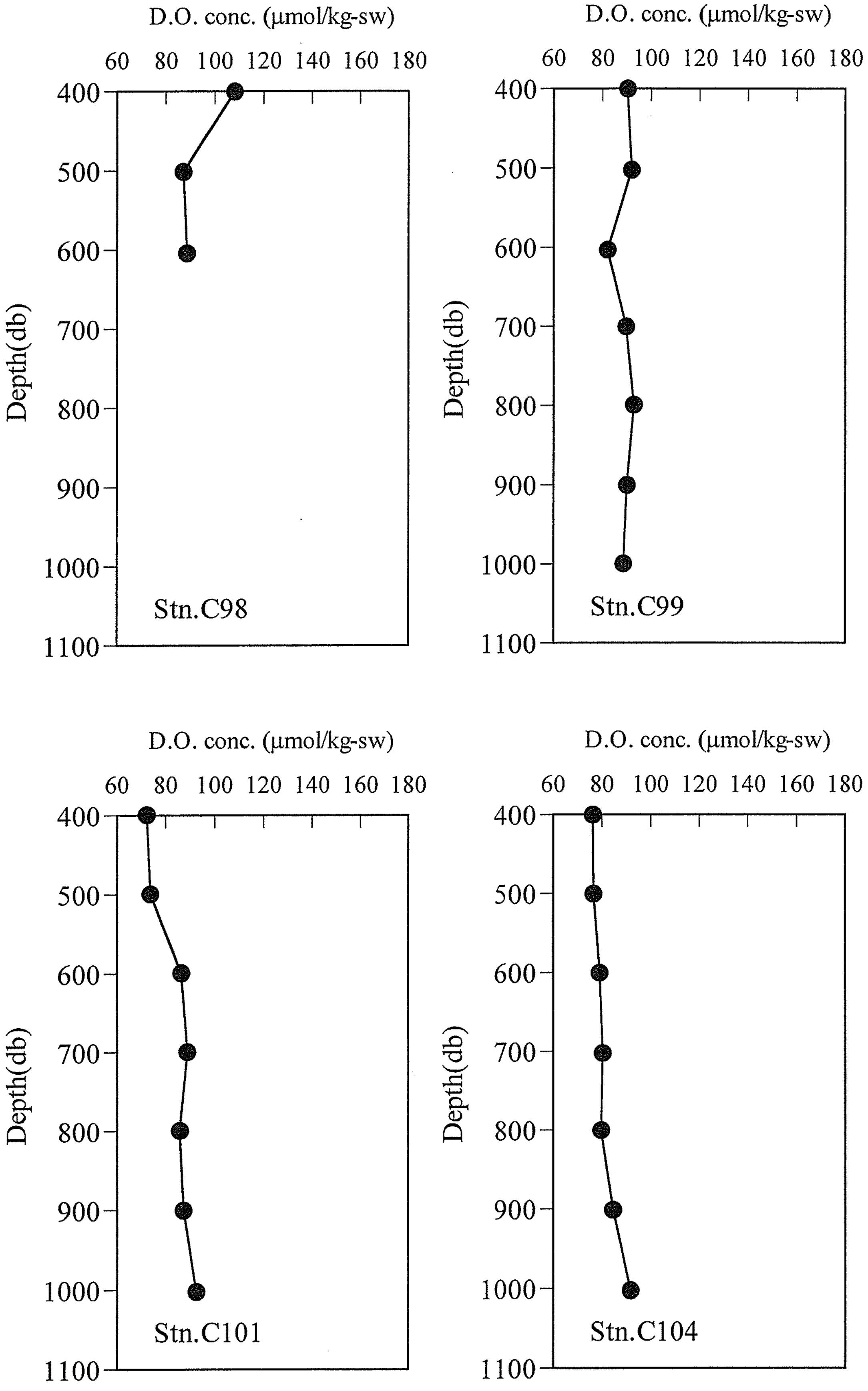


Fig.4.6.4-5-a Vertical plofiles on 8N Line.

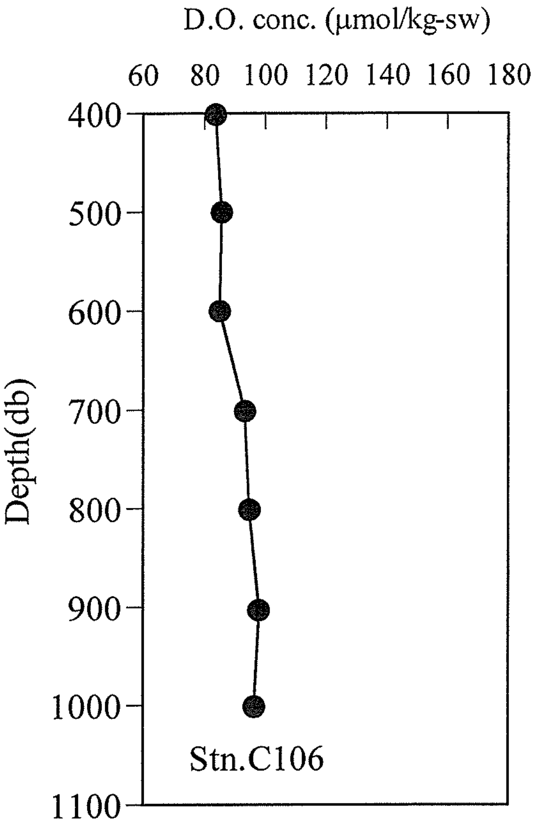


Fig.4.6.4-5-b Vertical plofiles on 8N Line.

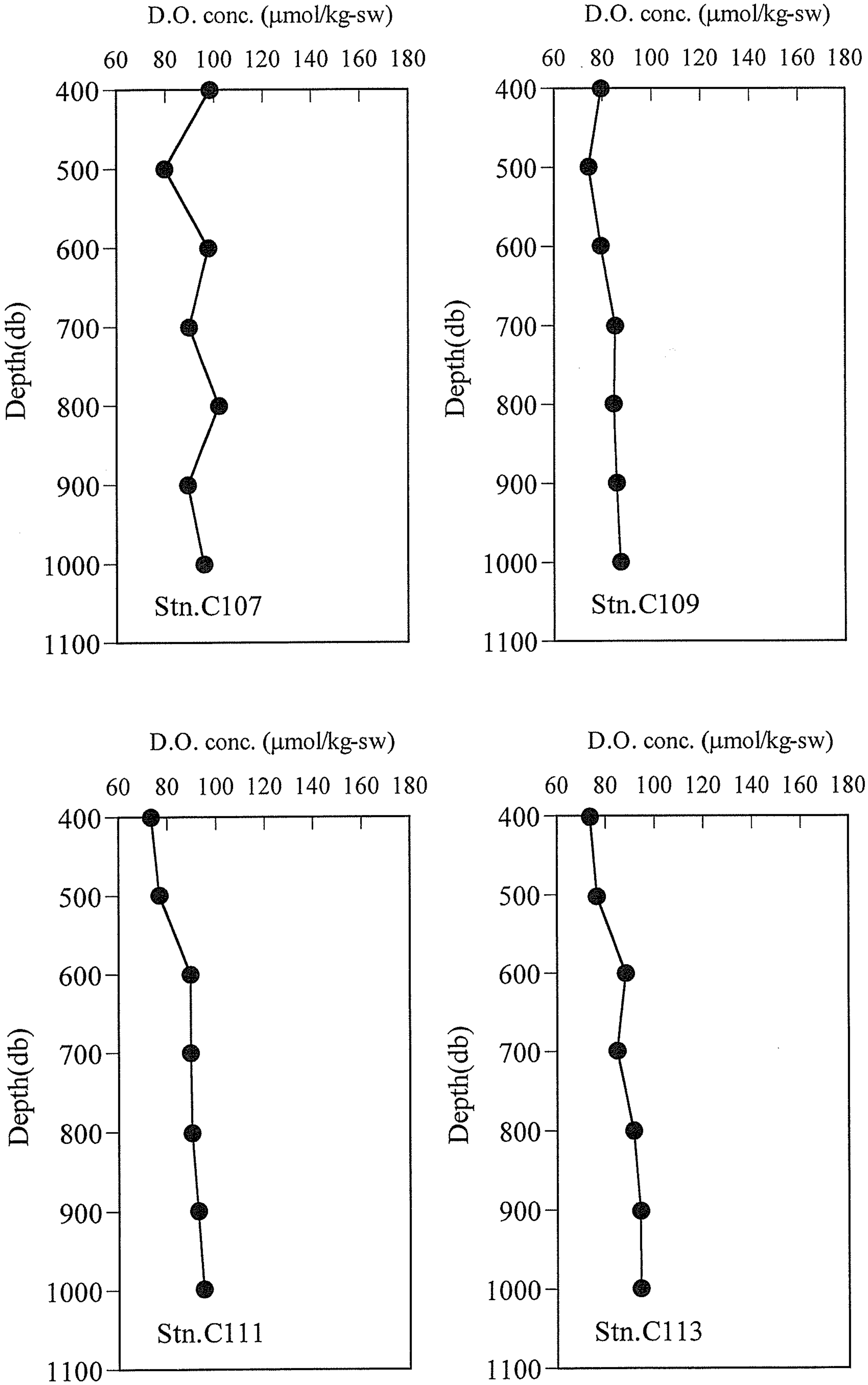


Fig.4.6.4-6-a Vertical plofiles on 10N Line.

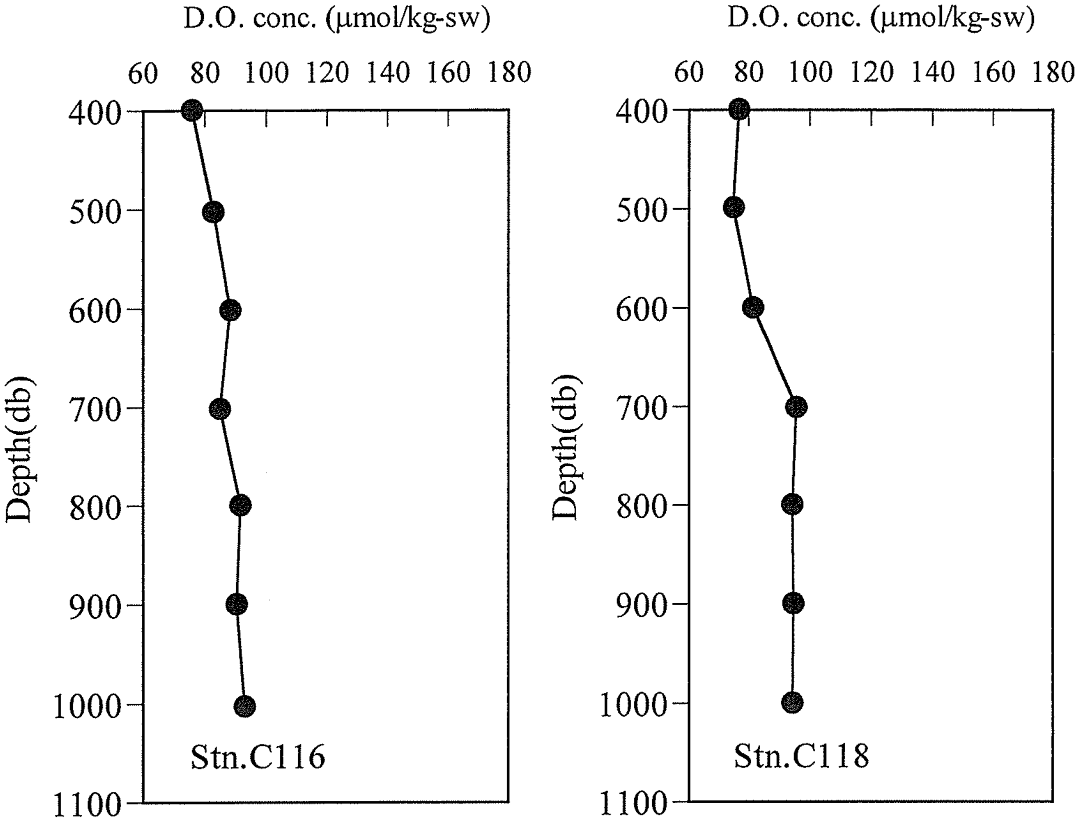


Fig.4.6.4-5-b Vertical plofiles on 10N Line.

Table4.6.1-1 Corrected D.O.data

Stn.	C35	
	0N	142E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	–	–
499	–	–
599	–	–
700	2.359	102.58
800	2.323	101.02
901	2.277	99.00
1000	2.366	102.87

Stn.	C36	
	0-30S	142E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	3.041	132.36
600	3.418	148.70
701	2.405	104.60
799	2.352	102.27
899	2.316	100.71
1000	2.401	104.41

Stn.	C37	
	1S	142E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	3.052	132.80
601	3.077	133.83
700	2.384	103.67
801	2.345	101.96
901	2.323	101.02
1001	2.337	101.63

Stn.	C38	
	1-30S	142E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	3.767	163.91
500	3.440	149.65
600	3.212	139.72
701	2.270	98.72
801	2.323	101.02
901	2.217	96.37
1000	2.249	97.76

Stn.	C39	
	2S	142E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	3.795	165.15
500	3.795	165.14
599	3.738	162.63
699	2.640	114.80
800	2.359	102.57
900	–	–
999	2.533	110.13

Stn.	C40	
	2-30S	142E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	3.749	163.14
497	3.461	150.56
596	3.767	163.84
698	2.953	128.41
799	3.105	135.04
901	2.956	128.54
998	2.512	109.20

Stn.	C42	
	1-15S	138E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
398	3.685	160.38
501	3.646	158.62
601	3.646	158.59
700	3.429	149.14
800	3.177	138.14
900	2.963	128.85
1000	2.935	127.60

Stn.	C43	
	1S	138E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	3.642	158.25
502	3.681	159.97
600	3.575	155.34
698	3.436	149.32
798	3.397	147.62
897	2.842	123.52

Stn.	C45	
	0N	
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	3.383	147.18
501	3.155	137.25
600	3.177	138.16
700	2.778	120.83
800	2.501	108.75
900	2.288	99.46
999	2.266	98.53

Stn.	C47	
	1N	138E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
499	3.539	153.96
600	2.544	110.63
699	2.288	99.48
800	2.451	106.59
899	2.352	102.25
999	2.273	98.84

Stn.	C49	
	2N	138E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
397	2.359	102.62
500	2.629	114.36
598	2.160	93.93
701	2.412	104.89
796	2.323	101.01
898	2.309	100.39
998	2.298	99.92

Stn.	C51	
	3N	138E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
398	2.014	87.62
500	2.302	100.13
600	2.295	99.80
700	2.170	94.38
800	2.373	103.18
900	2.309	100.39
1000	2.291	99.61

Stn.	C53	
	4N	138E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	2.110	91.68
498	2.181	94.78
598	2.067	89.83
699	1.605	69.75
799	1.975	85.82
898	2.131	92.61
999	2.074	90.14

Stn.	C70	
	1-24N	129-30E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	2.800	121.81
500	2.295	99.83
600	2.302	100.13
700	2.241	97.48
800	2.252	97.93
898	2.409	104.72
999	2.295	99.77

Stn.	C72	
	2-18N	129E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	2.643	115.02
499	2.423	105.40
600	2.224	96.72
699	2.174	94.54
799	2.245	97.62
899	2.131	92.66
1000	2.032	88.33

Table4.6.1-2 Corrected D.O.data

Stn.	C74	
	3-12N	128-30E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	1.737	75.56
500	2.231	97.04
599	2.209	96.10
700	2.234	97.17
800	2.323	101.02
899	2.273	98.85
1001	2.160	93.89

Stn.	C76	
	4-06N	128E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	1.690	73.55
500	2.103	91.47
600	2.074	90.22
700	2.042	88.82
800	1.989	86.49
894	2.032	88.33
1000	2.085	90.65

Stn.	C78	
	5N	127-30E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	1.587	69.06
500	2.074	90.24
601	2.067	89.91
700	2.003	87.12
799	2.096	91.12
899	2.259	98.23
1000	2.057	89.41

Stn.	C80	
	5-54N	127E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	1.961	85.30
499	1.840	80.03
600	2.103	91.46
699	2.021	87.89
800	2.195	95.46
899	2.138	92.97
999	2.213	96.22

Stn.	C82	
	6-21N	126-45E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	1.783	77.56
500	2.124	92.40
600	1.968	85.58
699	2.042	88.82
800	2.217	96.38
899	2.252	97.92
1000	2.170	94.36

Stn.	C84	
	6-39N	126-35E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	1.829	79.48
501	1.961	85.20
599	2.046	88.91
699	1.921	83.50
797	2.089	90.76
898	2.145	93.23
958	2.000	86.90

Stn.	C86	
	6-51N	126-28E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	2.185	94.95
500	1.932	83.96
599	1.911	83.04
699	2.085	90.61
800	2.124	92.30
900	2.131	92.61
1000	2.156	93.69

Stn.	C88	
	7N	126-30E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	2.234	97.11
500	2.067	89.84
599	2.174	94.47
700	2.181	94.78

Stn.	C90	
	7N	126-44E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
396	1.843	80.22
497	1.882	81.90
598	1.918	83.43
698	2.035	88.52
799	2.295	99.79
898	1.982	86.17
1003	2.117	92.04

Stn.	C92	
	7N	127E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	1.758	76.39
500	2.153	93.54
600	2.010	87.36
687	1.971	85.66
800	2.089	90.76
900	2.153	93.54
999	2.145	93.23

Stn.	C95	
	7E	127-30E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	1.715	74.54
499	1.875	81.49
598	1.897	82.42
699	2.060	89.52
800	2.124	92.31
901	2.117	92.00
1002	2.149	93.39

Stn.	C97	
	7N	128E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	1.594	69.28
501	1.797	78.09
600	2.110	91.69
700	2.057	89.37
801	2.067	89.83
901	2.138	92.92
1000	1.971	85.66

Stn.	C98	
	8N	126-36E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	2.483	108.06
501	2.003	87.14
604	2.039	88.67

Stn.	C99	
	8N	126-44E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	2.078	90.31
502	2.117	91.99
603	1.889	82.11
700	2.067	89.83
799	2.138	92.92
900	2.074	90.14
999	2.039	88.60

Stn.	C101	
	8N	127E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	1.662	72.22
499	1.697	73.77
599	1.989	86.43
699	2.046	88.91
799	1.975	85.82
900	2.010	87.36
1002	2.131	92.61

Table4.6.1-3 Corrected D.O.data

Stn.	C104	
	8N	127-30E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	1.754	76.25
500	1.761	76.55
600	1.818	79.02
702	1.847	80.25
800	1.833	79.64
901	1.946	84.58
1002	2.113	91.84

Stn.	C106	
	8N	128E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
401	1.921	83.60
500	1.968	85.59
600	1.953	84.96
701	2.145	93.30
801	2.181	94.84
903	2.252	97.92
1001	2.217	96.37

Stn.	C107	
	10N	126-12E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	2.259	98.34
500	1.833	79.73
600	2.245	97.66
700	2.064	89.76
800	2.345	101.96
900	2.053	89.27
1000	2.206	95.91

Stn.	C109	
	10N	126-28E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	1.829	79.49
499	1.712	74.39
599	1.825	79.33
700	1.961	85.20
799	1.946	84.58
899	1.975	85.82
999	2.010	87.36

Stn.	C111	
	10N	126-44E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
400	1.690	73.46
499	1.769	76.86
600	2.060	89.52
700	2.060	89.52
801	2.074	90.14
899	2.131	92.61
998	2.185	94.93

Stn.	C113	
	10N	127E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
401	1.697	73.77
502	1.761	76.55
600	2.032	88.29
699	1.950	84.73
800	2.103	91.38
901	2.167	94.16
999	2.170	94.31

Stn.	C116	
	10N	127-45E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	1.744	75.78
502	1.904	82.73
601	2.032	88.29
701	1.953	84.89
799	2.110	91.69
899	2.081	90.45
1002	2.142	93.08

Stn.	C118	
	10N	128E
Depth	D.O.	D.O.
(db)	(ml/l)	(μmol/kg-sw)
399	1.769	76.86
498	1.726	75.00
599	1.875	81.49
700	2.202	95.70
799	2.174	94.47
899	2.181	94.78
999	2.174	94.47

5. Shipboard ADCP

5.1 OCEAN SURVEYOR II PERFORMANCE REPORT

By Darryl Symonds, RDI
&
Chikara Shimoda, SEA Corp

I. Introduction

The R/V Kaiyo, owned and operated by members of the Japanese Institute JAMSTEC invited Darryl Symonds of RD Instruments (RDI) and Chikara Shimoda of SEA Corporation (SEA Corp) to attend the Third Leg (LEG3) of their TOCS Cruise. The intention of their visit was to evaluate the performance of the 38kHz Ocean Surveyor (OS-II) ADCP installed on the R/V Kaiyo.

LEG3 started on 13 September in Kavieng, Papua New Guinea and ended on 1 October at Palau Island. The Map on the following page shows the entire route of LEG3. Much of this cruise track allowed measurements of the Equatorial Undercurrent, and the Mindanao Current (part of the Western Boundary Currents).

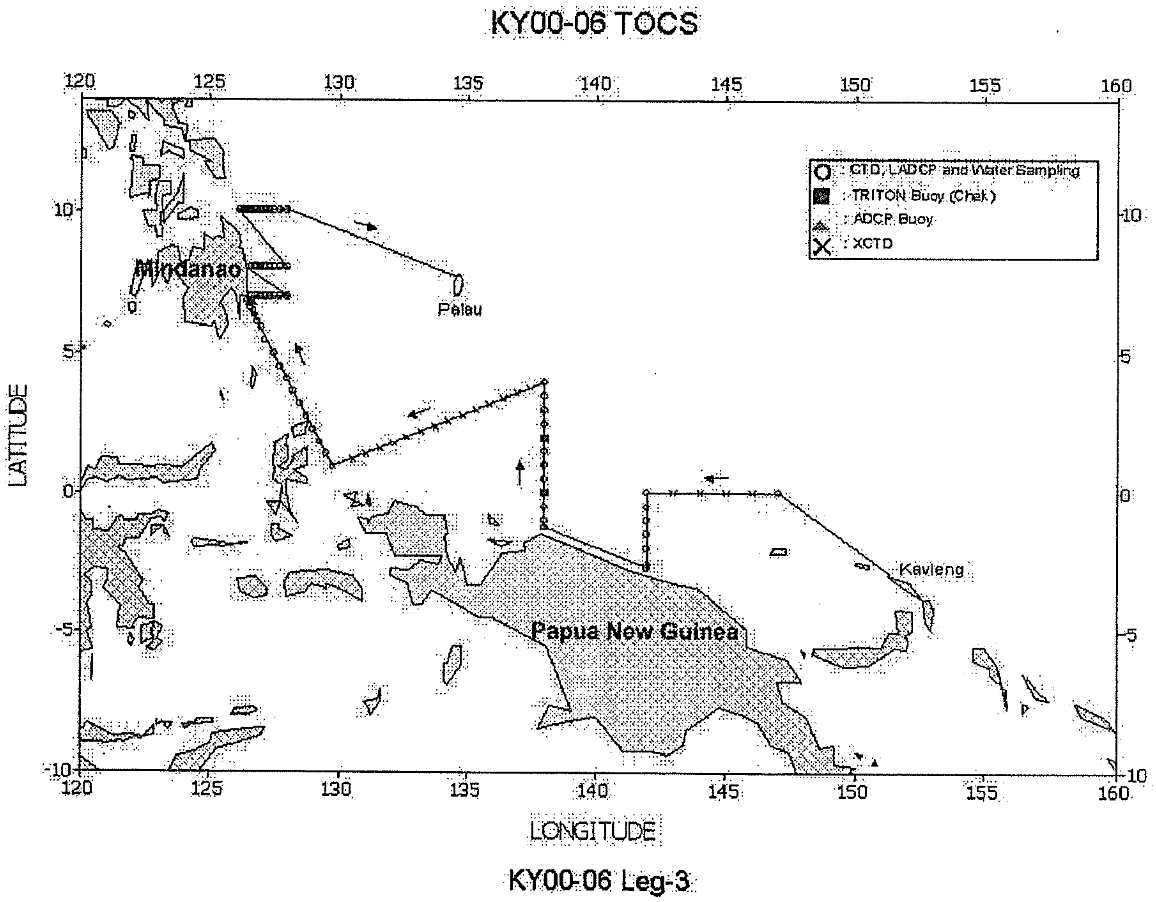
LEG3 included many stations that allowed for casts of a CTD rosette with 1 or 2 Sontek ADPs installed on the rosette, the recovery of 2 JAMSTEC Triton Buoys, and the recovery of 2 RDI BroadBand Blue-Water (BBBW) 150kHz ADCPs.

The following performance report will discuss the setup and performance of the OS-II. This report will not deal with any of the actual science the data will be used for. But, it is understood that the data is intended and will be used by others for the latter purpose. This report will present information that supports the OS-II as a reliable, robust, reasonable, and accurate shipboard current profiling device.

Before continuing it is important to understand all of the "major parts" that make up the OS-II System, as each of these "major parts" must be in good working order for the OS-II System as a whole to complete its function. Therefore we shall describe these "major parts" of the OS-II System.

Major Parts Description:
The RDI OS-II System as provided from the factory consists of both an operational hardware package (the 38kHz Transducer, Transducer Cable, and 38kHz Electronics Chassis) and a Data Acquisition Software package (VMDAS program). To support the OS-II Hardware and Software SEA Corp. installed a UPS backup system for "clean and reliable power" and a PIII 600MHz Computer to operate the VMDAS program and other RDI software products.

In addition to the above pieces specific data from the vessel must be supplied. The R/V Kaiyo supplied heading from the vessel's 360:1 synchro gyro to the OS-II electronics chassis. Differential corrected GPS Navigation data is supplied from the R/V Kaiyo through a serial cable connection and the NMEA data strings $GPGGA, and $GPVTG.



MAP OF LEG 3 OF THE TOCS CRUISE

II. Reliability

All shipboard systems require them to be reliable. For the purpose of this Report and specifically for the OS-II Acoustic Doppler Current Profiler (ADCP) reliability is defined as the ability to continuously operate and collect data autonomously (without user attention) and does not have explainable or unexplainable stoppages.

The OS-II System was in operation during the entire time of LEG3 of the TOCS Cruise. This was a total of 18 days. During that time, other than to do special testing of the OS-II System, at no time was there need for input by an operator. At no time did the DAS fail to collect data from the OS-II hardware, the R/V Kaiyo vessel input of gyro heading or navigation data. The OS-II operated flawlessly and was 100% reliable during the cruise.

III. Robustness

All shipboard systems must be robust. For the purpose of this Report and specifically for the OS-II Acoustic Doppler Current Profiler (ADCP) robustness is defined as the ability to collect data through changing sea conditions, ship speeds, and water features.

The ship speed while in transit was normally 14knots. While on station the vessel could be seen drifting as slow as 0.2knots and as fast as 2knots. This, as is expected, depended on the winds and surface current speeds.

The LEG3 of the TOCS Cruise provided for exceptional weather and sea conditions. Although, it cannot be said that the seas were "flat" the seas were very calm and only long period swells were ever seen or sensed throughout the cruise. Therefore there were no changing sea state conditions.

Most of LEG3 was in water deeper than 1,500 meters. Across this track the concentration levels of suspended backscatter material (required to receive signals back) in the water column appeared to be fairly uniform. That is to say no noticeable difference in backscattering levels were noted during the cruise other than the normal diurnal migration of plankton and other sea life. Note, the backscatter in water depths of less than 1,500 meters were very rarely traveled over once leaving Papua New Guinea and prior to Palau Island and so are not mentioned here.

The water features (water current velocity) did change dramatically over the cruise track. Some features such as the Equatorial Undercurrent or Mindino Current showed currents as high as 200cm/sec and as low as 5cm/sec.

The OS-II ADCP consistently profiled to greater than 1000 meters with 16 meter depth cells throughout the cruise. The entire profile of the current magnitudes and direction were consistent whether the vessel was on station or moving at speeds greater than 14 knots. The 1000 meter profiling range exceeds RDI's specifications. The fact that this range was obtained and the currents were unchanged from when on station to when moving all assure that the OS-II ADCP is a robust system.

Figure 1 is provided to illustrate the ability of the ADCP to measure the same currents whether on station or moving and when traveling in different directions. This figure shows a contour plot of the east/north components through a time when the vessel was both in motion and on station. No noticeable variance in the current vectors can be seen during these changes in vessel speed.

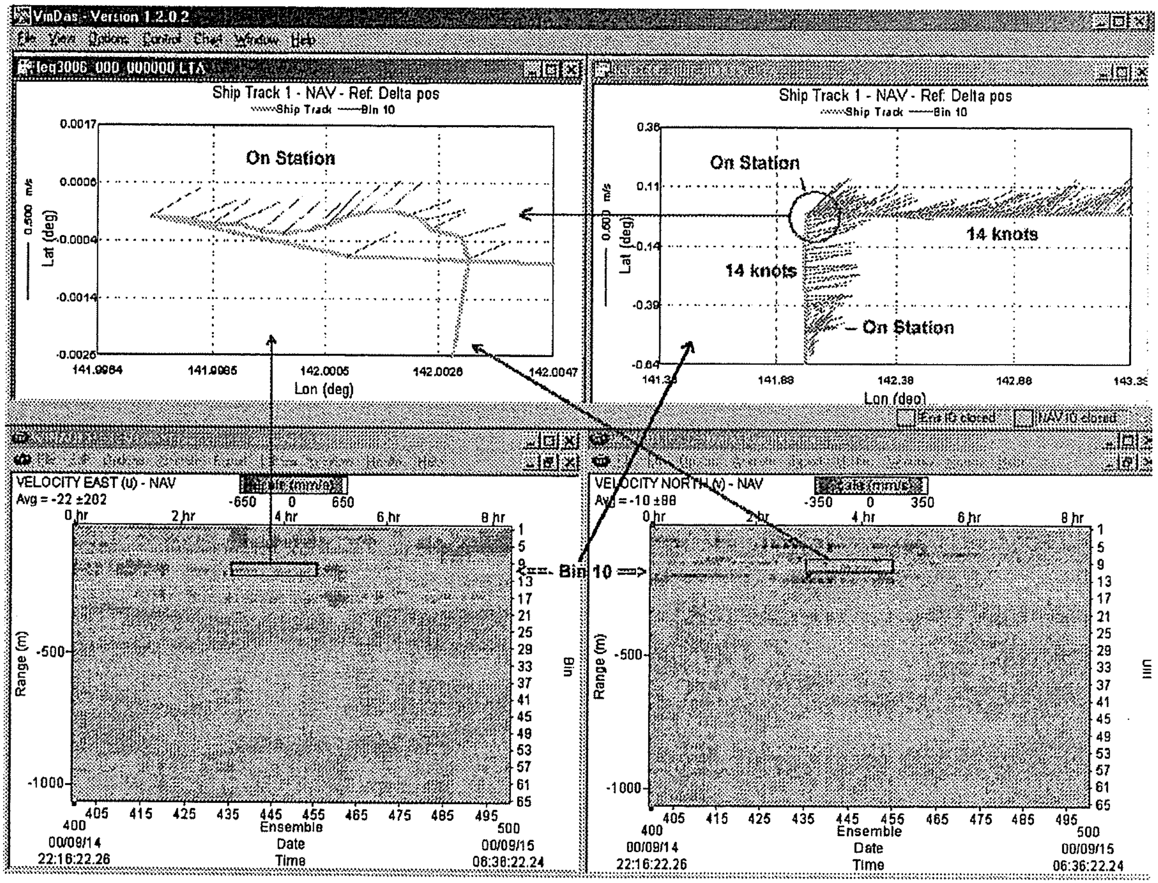


Figure 1 – Contour plot indicating no changes in the velocity components with changing ship speed.

IV. Setup

The setup of any ADCP is based on the requirements of the science to be studied, the environment in which data is being collected, and the capabilities of the ADCP to satisfy those requirements. A balance between these, sometimes opposing, requirements is always required. As an example, the need for the highest vertical resolution possible is, generally, in conflict with obtaining the maximum range out of the system. That is, if you want to have high vertical resolution then you want to use small depth cells (bins). However, the smaller the depth cell is then the less energy you place in the water. Resulting typically in less range. So a balance between these 2 requirements must be made.

In addition to requirements listed above the setup of the system must align the ADCP transducer to the vessels gyro (which is typically the centerline of the vessel). The installation of the transducer was done so that the transducer alignment would be at an angle of 45°. Data collected prior to the TOCS Cruise was analyzed by RDI Engineers and it was determined that the actual transducer alignment to the vessel is 43.28°. Data collected prior to LEG3 of the TOCS Cruise (i.e. LEG1 and LEG2) were collected using a transducer alignment angle of 45°. This data must be reprocessed before the files STA and LTA can be used for research studies. This reprocessing can be done through the RDI VMDAS program which originally collected the data.

The first data sets (LEG3001-LEG3006) collected during LEG3 of the TOCS were collected using the 45° transducer alignment angle. The data from files LEG3005 and LEG3006 (these are the first files to contain data in water deep enough to collect ADCP data) have been reprocessed using the RDI VMDAS program. The new STA, LTA, LOG, and VMP (the reprocessed setup file) have been copied to the ADCP data collection computer. All other data files ((LEG3007 and greater) collected during the cruise used the transducer alignment angle of 43.28° and, therefore, require no reprocessing for this correction.

In addition to the transducer alignment angle there are several other parameters that must be setup. The OS-II 38kHz ADCP can be setup to collect data in either or both the narrow bandwidth profiling mode (providing the maximum range possible), and in the broad bandwidth profiling mode (providing an increased vertical resolution). The setup choice for this leg of the TOCS Cruise was narrow bandwidth profiling mode and 16meter depth cells. This setup met the requirements of the scientists. However, to determine if there was another possible setup that would provide even more information 2 different tests were carried out. The following reviews each of these tests.

Range Test

During the cruise the second RDI BBBW150 ADCP was recovered at Station 90. The water at this location was over 3000 meters deep. This made it an excellent location for range testing. At this station, we used a total of 3 different setups to discover the maximum profiling range of the OS-II ADCP.

1. Setup 1 – One-hundred 16 meter bins – This matches the setup we used during the rest of the cruise with the exception we went from 75 bins to 100 bins.
2. Setup 2 – Sixty 32 meter bins – This doubles both the transmit and bin size over setup 1. Which will place more energy into the water.
3. Setup 3 – One-hundred 16 meter bins and 32 meter transmit pulses – This is a special setup that is not normally done. Typically the user will only setup the bin size and the OS-II ADCP will automatically set the transmit pulse equal to that. However, for this setup we commanded the OS-II to override the transmit pulse with a 32 meter pulse. This, like Setup 2, was done to increase the energy into the water.

Each setup was run for a 15 minutes. Averages of 1 minute and 5 minutes were collected during each of these 15 minute periods. The range obtained in all 3 setups was greater than 1000 meters at the 25% good data point. However, it was discovered that when using 32 bins the range to the 75% good data point decreased to just less than 1000 meters.

Data obtained by both the OS-II ADCP and the Sontek ADP confirmed that below 1,000 meters there is a dramatic reduction in backscattering material. The reduction in range found with the 32 meter bins is most likely the result of the larger averaging depth cells moving into this weaker backscatter area. This would result in a lower signal to noise ratio and in turn a lower percentage of good data points in the furthest ranges.

The following table presents the results obtained by averaging the three 5-minute averages during each setup. all on station in water over 3000 meters deep. Ranges give are for the bin that is closest to the percent good threshold indicated without going under the value shown.

Setup	Range in Meters		
	75% Good	50% Good	25% Good
16m bin/xmit	1071	1119	1188
32m bin/xmit	959	1076	1162
16m bin/32m xmit	1063	1111	1165

Table 1. Range versus Depth Cell (bin) Setup

Vertical Resolution Test

The OS-II 38kHz ADCP can be setup to collect data in either or both the narrow bandwidth profiling mode (providing the maximum range possible), and in the broad bandwidth profiling mode (providing an increased vertical resolution). A test was performed in which the OS-II ADCP was setup to collect both narrow bandwidth and broad bandwidth pings at the same time. The narrow bandwidth profiling setup used 16meter bins to allow for the 1000 meters of profiling range. While, the broad bandwidth profiling setup used 8 meter bins to allow for high vertical resolution.

The data collected for this test was done while traveling at 14knots for approximately 1.5 hours. The data was averaged in 1 minute, 5 minute, 10 minute, 15 minute, and 100 minute intervals using the VMDAS program. Each of these averages starting with the same start time of 20September2000 at 01:51:37 were output into TEXT files using the RDI WINADCP program. The TEXT files were then read into Microsoft™ EXCEL™ where the components for East (U), North (V), and Vertical (W) for each averaging interval and profiling mode were plotted and attached as Figures 2-11.

The BB Mode profiled 800 meters with 8 meter bins. Comparing the short term 1 or 5 minute averages of the BB Mode pings to the NB Mode pings allows one to see more shear structure in the water. It is also apparent that the standard deviation of the BB Mode pings is lower than the NB Mode pings. Which allows for viewing this higher resolution profiling in short time periods. This is best seen by viewing the comparison of Figure 2 and 3 with Figures 6 and 7 (and then again with figures 8-11). Figures 2 and 3 show that the short average of the NB pings results in a much noisier signal but does show the same trends as the lower noise signal found in the BB pings. Increasing the averaging interval to 5 minutes shows already a greatly decreased noise in both the NB and BB pings. Averaging still longer and soon the 2 modes are virtually identical and have about the same noise characteristics. However, with the longer averaging intervals we have smoothed the velocity estimate because of both the velocity variability in both time and space (we are moving at 14 knots when collecting this data).

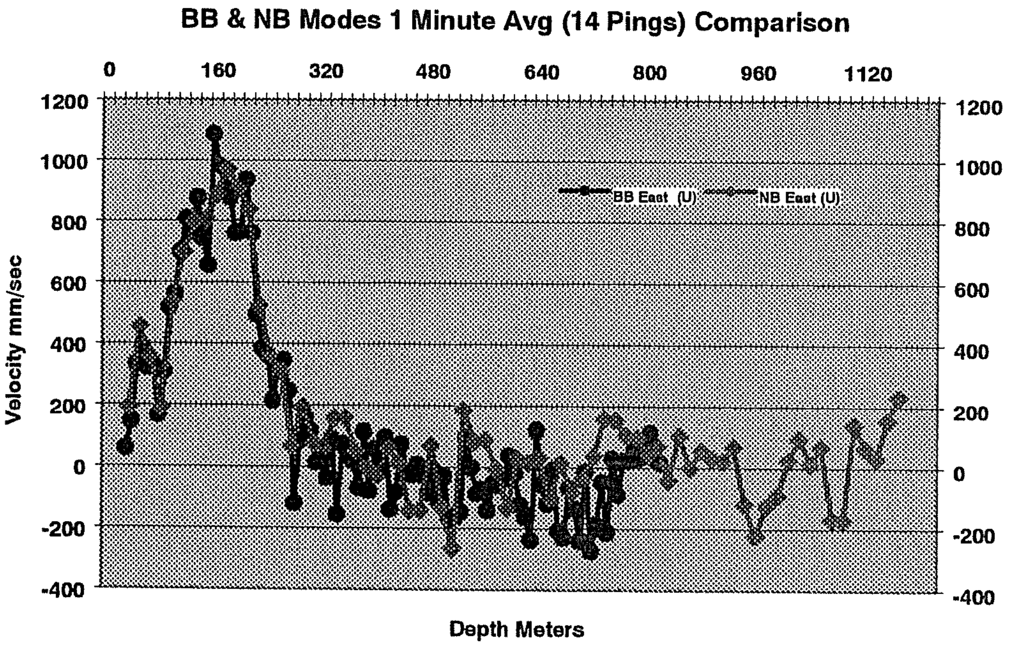


Figure 2 – Comparison of a 1minute average of the East component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

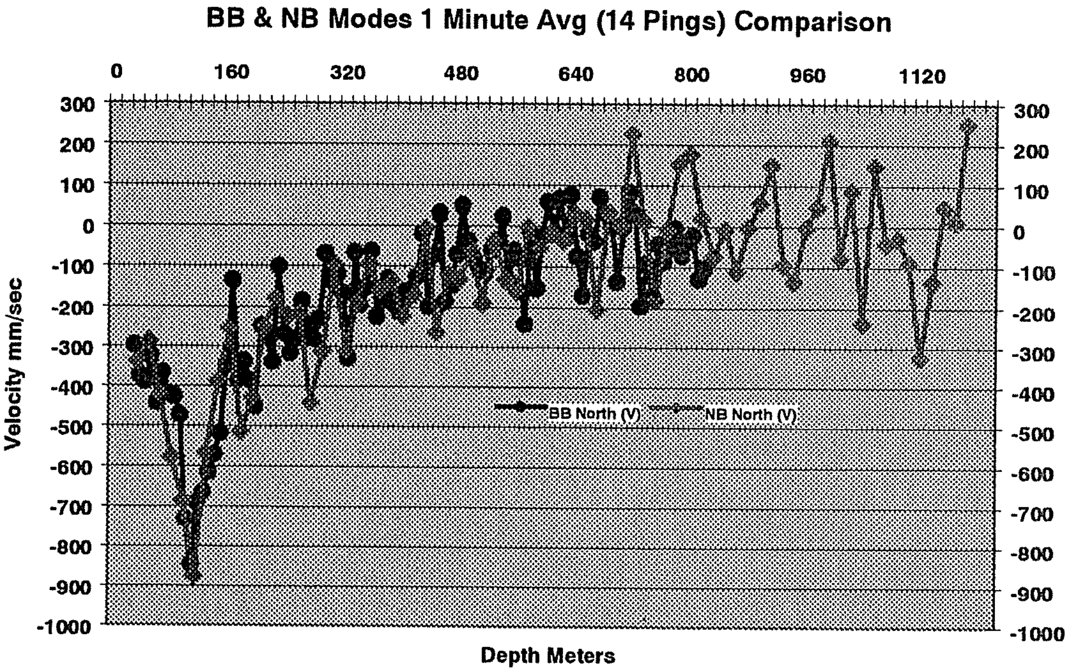


Figure 3 – Comparison of a 1 minute average of the North component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

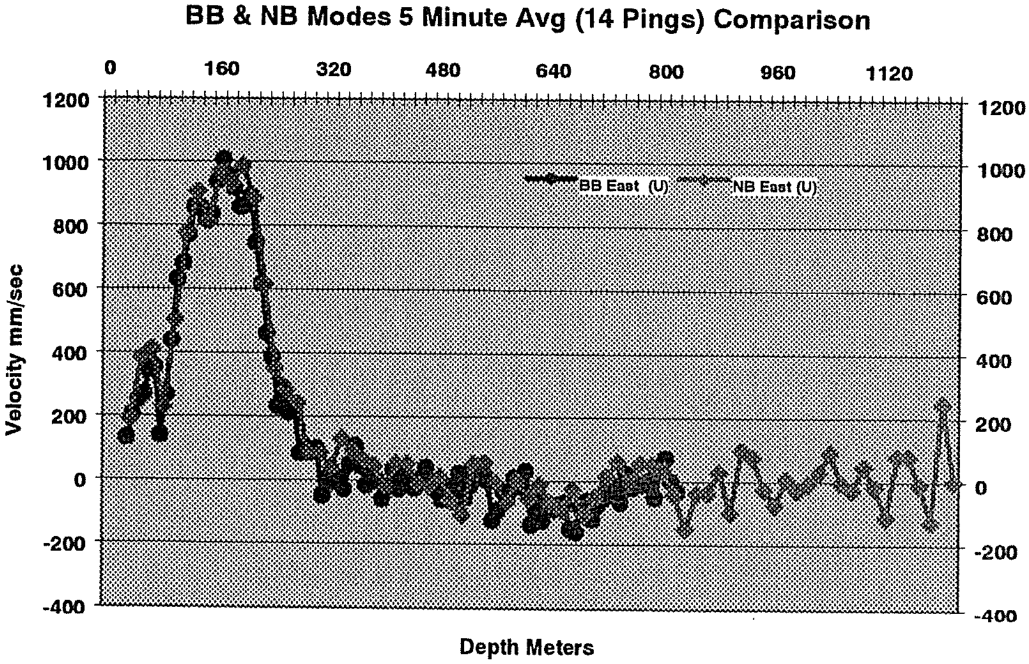


Figure 4 – Comparison of a 5 minute average of the East component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

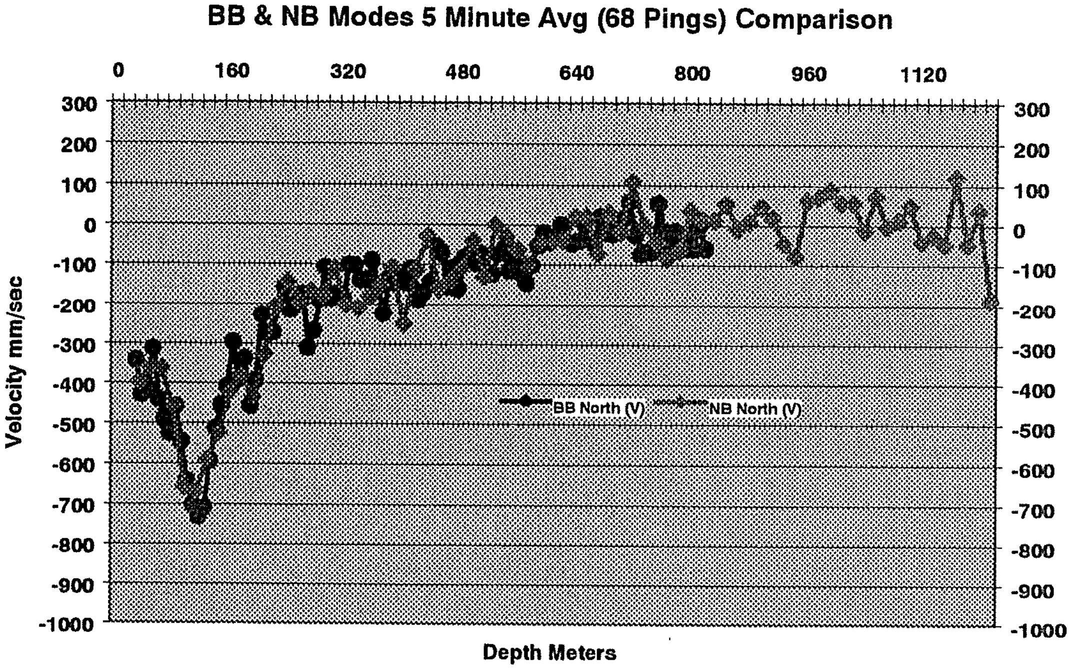


Figure 5 – Comparison of a 5 minute average of the North component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

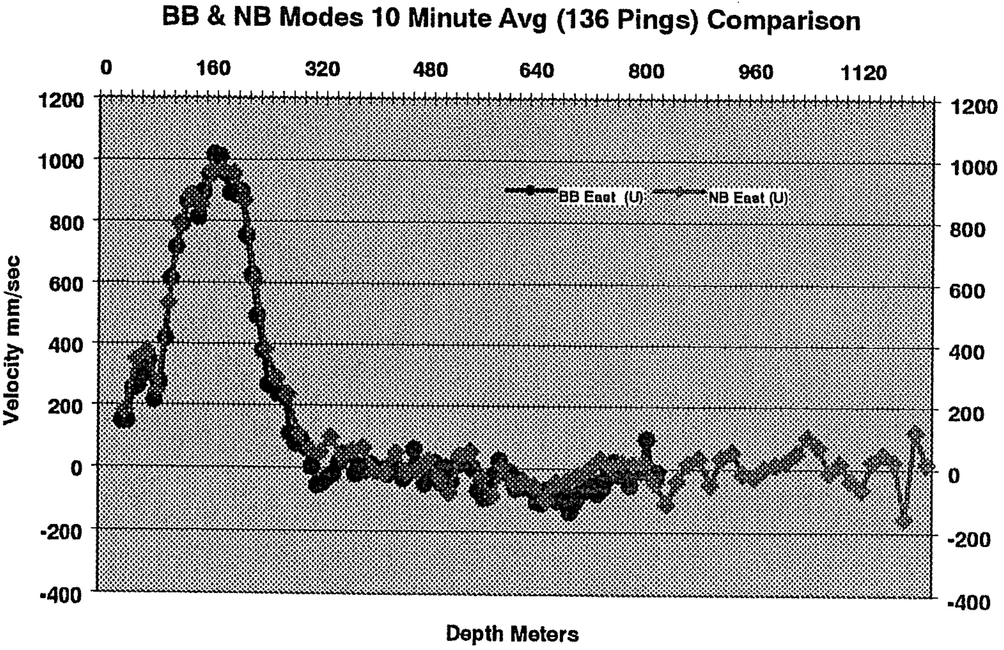


Figure 6 – Comparison of a 10 minute average of the East component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

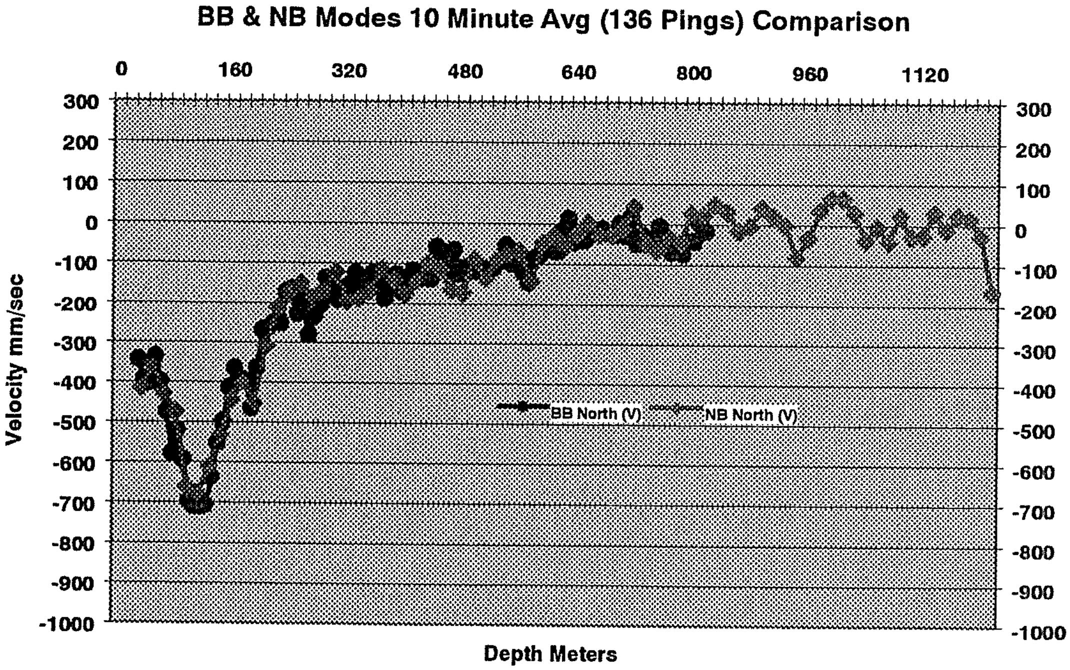


Figure 7 – Comparison of a 10 minute average of the North component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

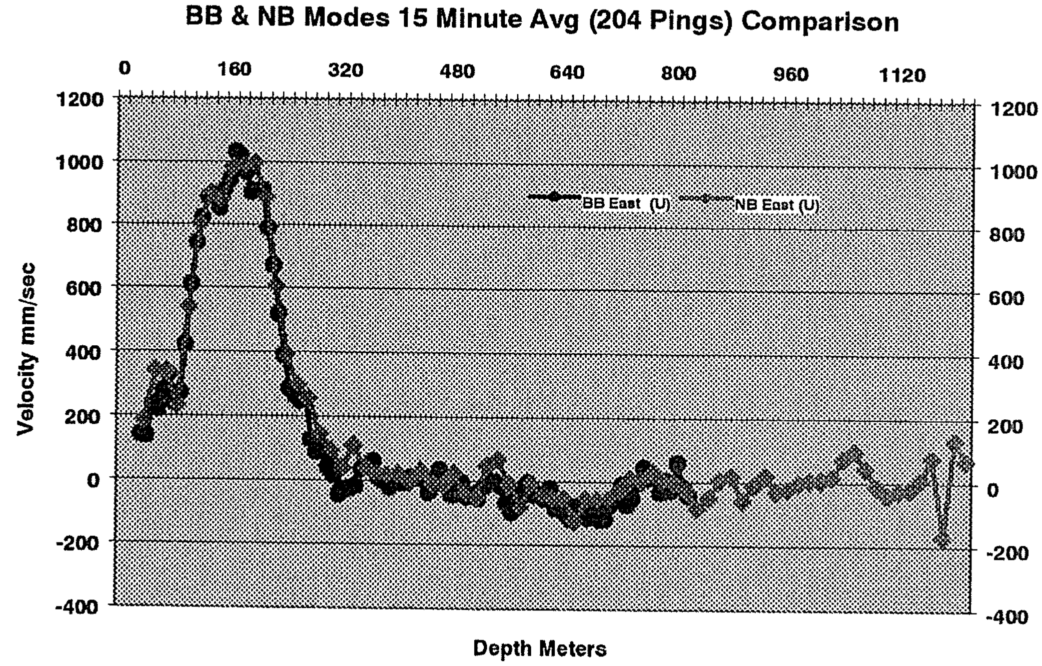


Figure 8 – Comparison of a 15 minute average of the East component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

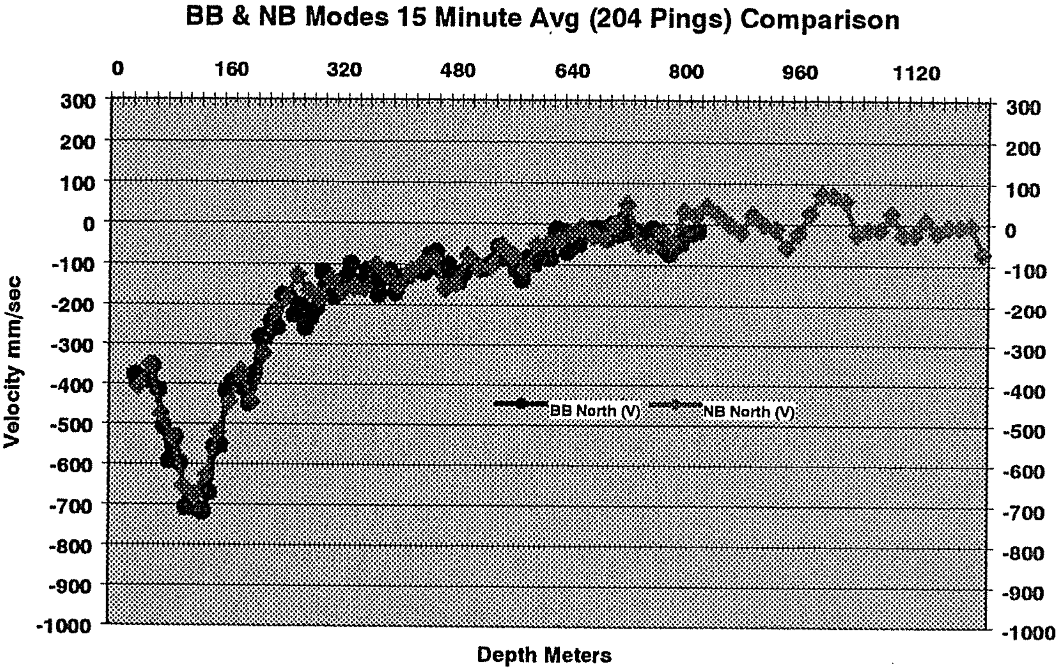


Figure 9 – Comparison of a 15 minute average of the North component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

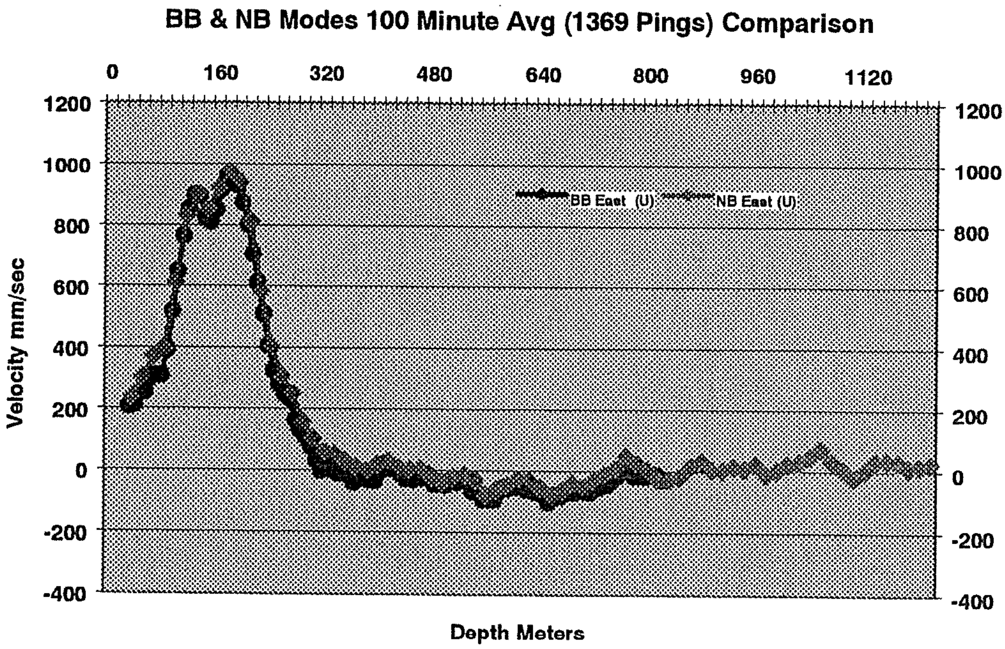


Figure 10 – Comparison of a 100 minute average of the East component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

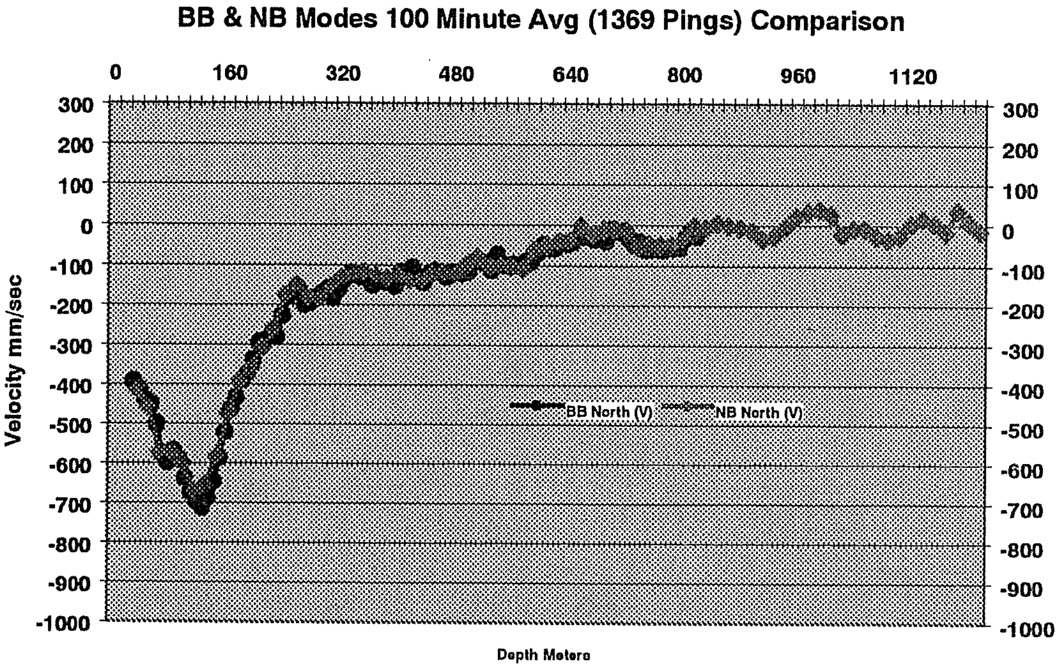


Figure 11 – Comparison of a 100 minute average of the North component measured with an 8 meter Broad Bandwidth (BB) Depth Cell to a 16 meter Narrow Bandwidth (NB) Depth Cell

V. Velocity Accuracy and Reasonableness

In the Setup Analysis it was shown that both the NB and BB modes agreed very well with each other. Each of these modes is completely independent using entirely different transmit pulses and processing methods. Although this is very suggestive of collecting accurate and reasonable data it does not have validation from an outside source.

During the cruise there were 2 sources for independent comparisons. These included current profiles measured by RDI's BBBW 150kHz ADCPs and also data collected by Sontek's ADP installed on the CTD rosette. Comparing data from the shipboard system to each of these systems presents unique issues, which do not necessarily warrant an absolute comparison. However, it is possible to compare the data from each of these systems to the OS-II ADCP and verify if that the data being collected is reasonable.

OS-II ADCP to BBBW 150kHz Comparison

The BBBW 150kHz s/n 1224 was deployed at latitude 2 30 South and longitude 142 00 East (Station 40). In order, to compare to data collected from this data point it was necessary to find OS-II ADCP data that was collected at this location, for a time interval long enough to remove the short term uncertainty, and close to a time when the BBBW 150kHz ADCP was measuring data.

The BBBW 150kHz ADCP was setup to measure currents for 32 seconds at the beginning of each hour. The system was deployed approximately 250 meters below the surface looking up. Reviewing the data collected with the OS-II ADCP revealed only one time when the R/V Kaiyo was stationary for a period of time that would allow a sufficient number of pings to allow for a reasonable comparison. Regrettably, this time was 1 hour after the BBBW ADCP had been recovered.

Therefore, in order to make a comparison possible a trend of velocity as measured by the BBBW ADCP was required. To accommodate this the 6 hours prior to the recovery of the BBBW ADCP were plotted against the single data point from the OS-II ADCP which was for the hour following the last data point of the BBBW ADCP. All of this data was exported into TEXT files using RDI's WINADCP program. The data from both systems was then imported into Microsoft™ EXCEL™ where the components for East (U), North (V), and Vertical (W) were plotted onto individual graphs. These graphs are contained in Figure 12 through Figure 14.

The OS-II ADCP although not exactly like the BBBW ADCP data does show the same trends as the BBBW ADCP and given that this data is taken 1 hour later it is believed that it provides very reasonable agreement. The result is that the OS-II ADCP as well as the BBBW ADCP do appear to measuring the same currents and features.

OS-II ADCP to a lowered ADP Comparison

The Sontek ADP was mounted on a CTD rosette and collected data at many stations while at the same time the OS-II ADCP collected data. The data from the ADP at Station 30 and Station 35 were plotted on to a graph by Eric Firing and then this graph was given to us for use in performing a comparison.

The R/V Kaiyo remained at each Station for over 1 hour. The time for casting at each of these stations was approximately 1 hour. The OS-II ADCP data was averaged in 30 minutes intervals (with VMDAS) during both Station 30 and 35. The 30 minute average that coincided with half way through each cast was plotted with the WINACP and then used to compare to the graphs provided by Eric Firing.

Figure 15 is the comparison at Station 30 and Figure 16 is the comparison at Station 35. In these figures, we are able to see the similarities in both the shears and shapes of the features throughout the water column. Although the magnitudes of these features are not exactly the same the similarities in the data provides enough reassurances that the data from the OS-II is providing reasonable data and that the 2 instruments are measuring the same currents and features.

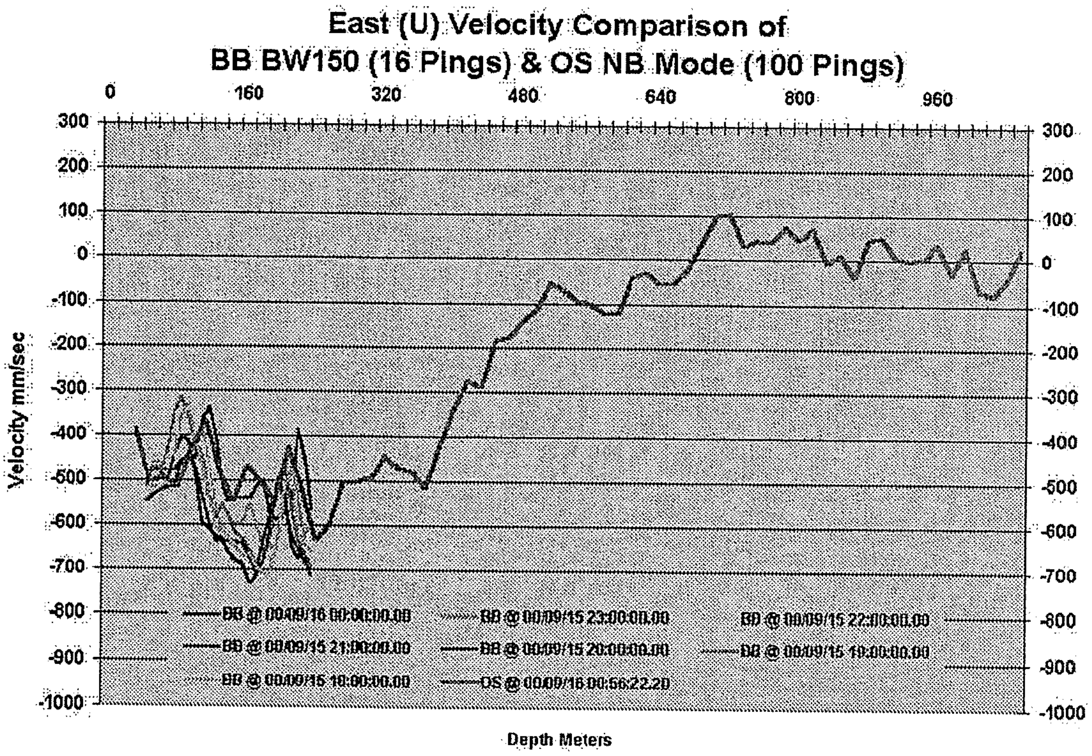


Figure 12 - Comparison of East Component of OS-II 38kHz ADCP to BBBW 150kHz

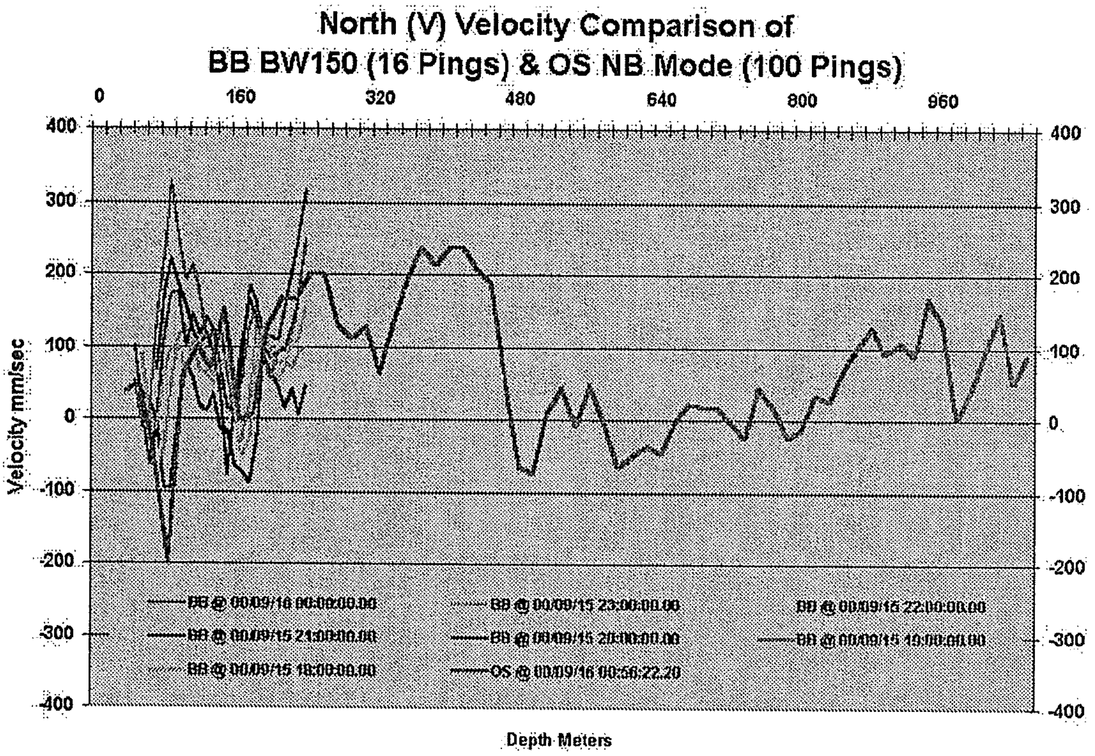


Figure 13 - Comparison of North Component of OS-II 38kHz ADCP to BBBW 150kHz

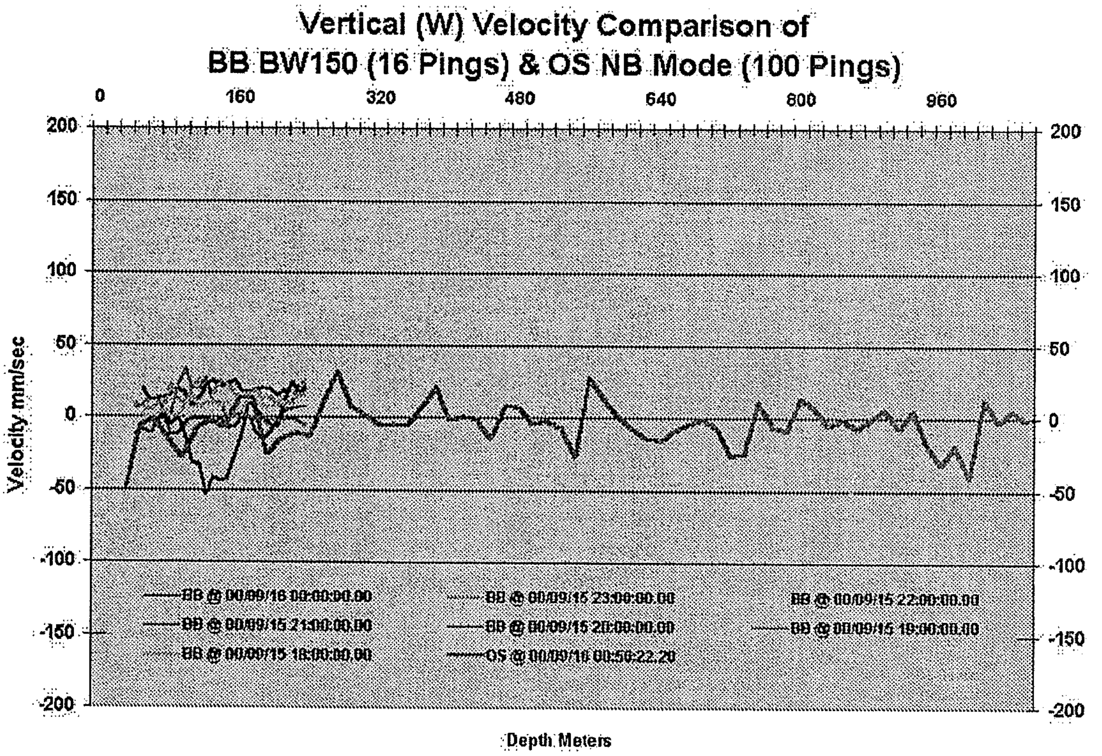
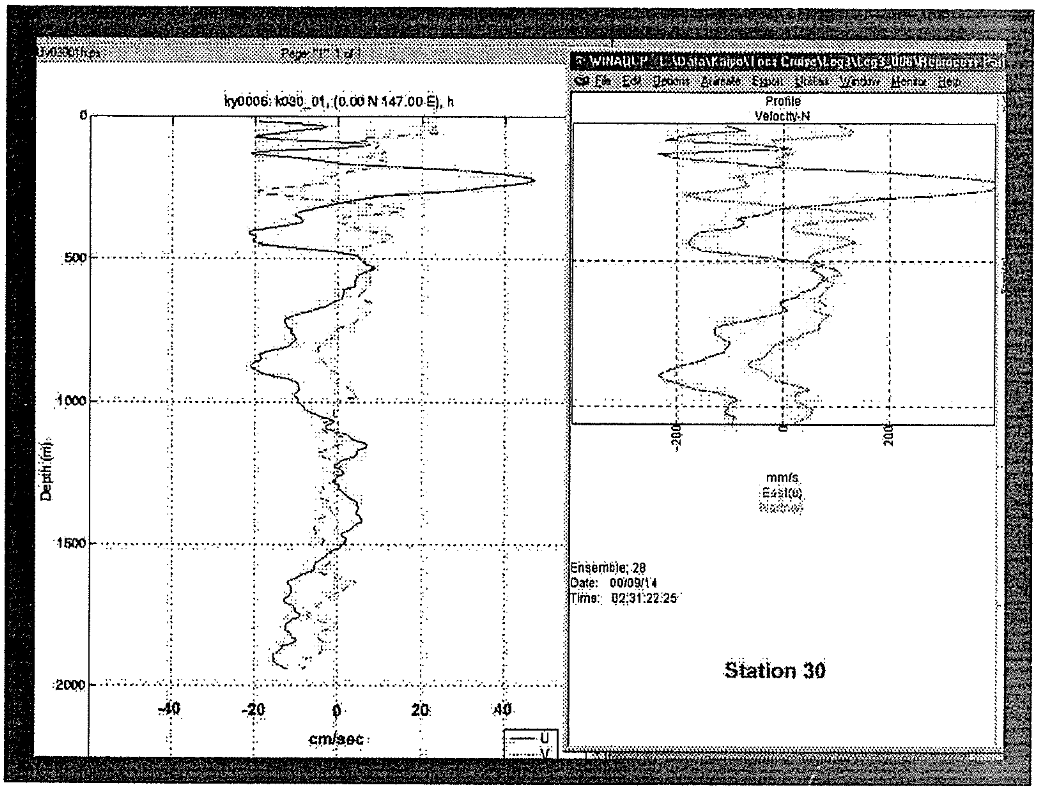


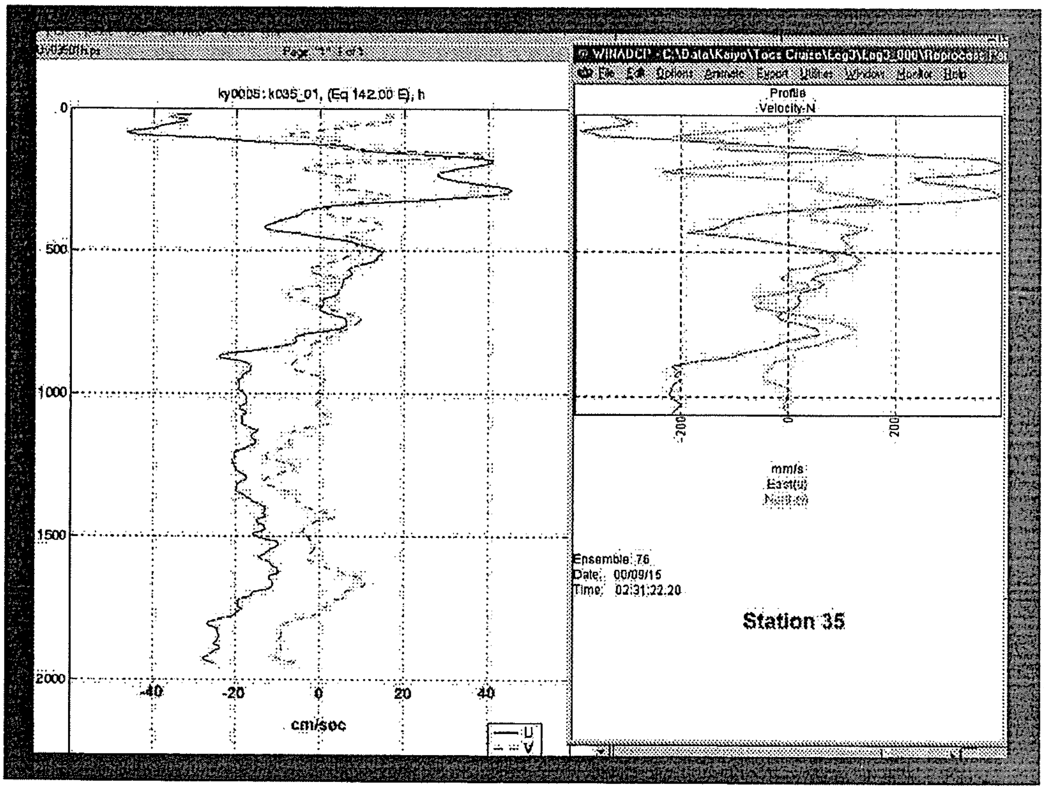
Figure 14 - Comparison of Vertical Component of OS-II 38kHz ADCP to BBBW 150kHz



Ensemble: 28
Date: 00/09/14
Time: 02:31:22.25

Station 30

Figure 15 – OS-II 38kHz ADCP comparison to an ADP Lowered System



Ensemble: 76
Date: 00/09/15
Time: 02:31:22.20

Station 35

Figure 16 – OS-II 38kHz ADCP comparison to an ADP Lowered System

VI. Summary and Conclusions

The OS-II System has proven itself to be reliable and robust by its continued autonomous operation without stopping. It is performing to all of its specifications and in the case of range is exceeding its specifications.

Using 16 meter depth cells in NB mode is sufficient to obtain the maximum range. And, if higher vertical resolution is required then the BB mode can be enabled allowing for 8 meter depth cells. Enabling the BB pings will increase the ping time from 2.41 seconds (NB ping only) to 4.42 seconds. This results in a decrease of the total number of pings possible in a given time period to approximately half to what can be obtained when only one profiling mode is enabled. This relates to an increase in the standard deviation by a factor of 1.4 for either mode. However, the BB mode even with the smaller 8 meter bins will still have a factor of 2-3 lower standard deviation than the NB mode within the same averaging interval. Overall, this results in being able to use the OS-II ADCP to gather both deep data and high vertical resolution simultaneously from a single instrument.

The reasonableness of the data is confirmed by four separate comparisons.

1. The OS-II NB modes measure the same currents when on station and in motion
2. The OS-II NB and BB processing modes.
3. The OS-II 38kHz ADCP to BBBW 150kHz ADCP.
4. The OS-II 38kHz ADCP to the Sontek ADP.

While it is true that each of these comparisons is not conclusive in itself, the fact that all 4 are giving such good comparisons that there can be little doubt that the OS-II is reporting reasonable and accurate information.

During most of the cruise firmware version 23.05 was installed in the OS-II electronics chassis. Version 23.07 was installed the evening of 28 September 2000 (GMT). The only change to the firmware code is to provide on more level of processing for the NB profiling mode and to allow serial firmware downloads in the future. All other processing and basic routines are exactly the same in version 23.07 as they were in version 23.05. The last 2 days of the cruise provided data to confirm that the operation and performance of the system was unchanged but this upgrade.

The OS ADCP was able to obtain bottom track information from depths beyond 1,700 meters. This data agreed well with the navigation data being collected at the same time.

In conclusion, the OS-II 38kHz ADCP is reliably performing to its specification, the setup of the system as used by JAMSTEC is good, and the data being collected can be used with confidence in regards to its reasonableness, accuracy, and reliability.

Acknowledgements

RDI and SEA Crop. thank Yuji Kashino for making it possible (and helping with our arrangements) for us to attend this cruise, Captain Fusao Saitoh for keeping the R/V Kaiyo in excellent condition for shipboard ADCP measurements, and for Eric Firing for providing the plots of the data from the Sontek ADP installed on the CTD rosette and for his advice on data presentation. We would also like to give a special thanks to all the crew, scientists, and support personnel from the R/V Kaiyo who helped us in our job and made our stay on the vessel most enjoyable! We wish all you continued success with all of your efforts and trust that they will find the OS-II ADCP a useful and important part of your Oceanographic research for many years to come.

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Blue Water Business Unit Manager
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SEA Corporation

Table 2. Data Files Used in Creating the Included Figures

File Name	Description
LEG3015_*.*	VMDAS OS-II data file used to estimate the maximum shear measured
LEG3006_*.*	VMDAS OS-II data file used to create figure 1
LEG3011_*.* through LEG3014_*.*	VMDAS OS-II data files used to create Table 1
LEG3009_*.*	VMDAS OS-II data file used to create the figure2 – figure 11
LEG3006_*.* and 0025142.*	VMDAS OS-II data file and BBBW Self-Contained data set to create figure 12 – figure 14
LEG3006_*.*	VMDAS OS-II data file used to create figures 15 and 16

Data Files Description and Location Collected During LEG3 of the TOCS Cruise

LEG3001_000000 ==> Original Real Time Data collected using a 45 degree misalignment. Data collected dock side and in very shallow water <20 meters. NB Mode, 16m bins, 10m blank. INI file Ensemble interval set to 3 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start Time ==> 13Sep2000 02:02:27
End Time ==> 13Sep2000 O2:39:12
Start Pos ==> 2 35 05S : 150 47 18E
End Pos ==> 2 35 05S : 150 47 18E

LEG3002_000000 ==> Original Real Time Data collected using a 45 degree misalignment. Data collected dock side and in very shallow water <20 meters. NB Mode, 16m bins, 16m blank. INI file Ensemble interval set to 3 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start Time ==> 13Sep2000 02:40:42
End Time ==> 13Sep2000 O2:41:23
Start Pos ==> 2 35 05S : 150 47 18E
End Pos ==> 2 35 05S : 150 47 18E

LEG3003_000000 ==> Original Real Time Data collected using a 45 degree misalignment. Data collected just as we are leaving dock side and in very shallow water <20 meters. NB Mode, 16m bins, 10m blank. INI file Ensemble interval set to 3 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction

Start Time ==> 13Sep2000 02:43:23
End Time ==> 13Sep2000 05:28:52
Start Pos ==> 2 35 05S : 150 47 18E
End Pos ==> 2 38 20S : 150 39 17E
LEG3004_000000 ==> Original Real Time Data collected using a 45 degree misalignment. Data collected just as we are leaving dock side and in very shallow water <20 meters. NB Mode, 16m bins, 10m blank. INI file Ensemble interval set to 3 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start Time ==> 13Sep2000 05:29:48
End Time ==> 13Sep2000 05:34:37
Start Pos ==> 2 38 23S : 150 39 09E
End Pos ==> 2 38 38S : 150 38 16E

LEG3005_000000 ==> Original Real Time Data collected using a 45 degree misalignment. Data from start of Leg 3 (leaving Papua New Guinea) and prior to station 30. Contains both bottom track (to >1400 meters) and navigation data. NB Mode, 16m bins, 16m blank. INI file Ensemble interval set to 3 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start Time ==> 13Sep2000 05:35:12
End Time ==> 13Sep2000 13:00:20
Start Pos ==> 2 38 39S : 150 38 11E
End Pos ==> 1 38 58S : 149 23 42E

File LEG3005_000_000000==> This is LEG3005_000000 data that has been reprocessed to use a 43.28 misalignment angle. These files are recommended for use instead of the LEG300_000000.STA/LTA files.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMP ==> Copy of the VMDAS VMO setup used when creating this data set

LEG3006_000000 ==> Original Real Time Data collected using a 45 degree misalignment. Data from prior to station 30 and just after station 40. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. NB Mode, 16m bins, 16m blank. INI file Ensemble interval set to 3 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start Time ==> 13Sep2000 13:01:21
End Time ==> 16Sep2000 03:35:55
Start Pos ==> 1 38 51S : 149 23 31E
End Pos ==> 2 28 49S : 141 55 55E

File LEG3006_000_000000==> This is LEG3006_000000 data that has been reprocessed to use a 43.28 misalignment angle. These files are recommended for use instead of the LEG300_000000.STA/LTA files.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMP ==> Copy of the VMDAS VMO setup used when creating this data set

Special Note
Although LEG3001 - LEG3006 all require reprocessing to rotate velocities to an alignment angle of 43.28 degrees instead of the 45 degree alignment angle used to original collect the data only the data from files LEG3005 an LEG3006 contain data in water deep enough to contain useful data.

LEG3007_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins, 16 meter blank. Data starts just after station 40. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 3 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start Time ==> 16Sep2000 03:40:35
End Time ==> 20Sep2000 01:40:21
Start Pos ==> 2 28 48S : 141 56 07E
End Pos ==> 3 23 32N : 136 22 52E

LEG3008_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. Data collected to see what the shortest possible VMDAS ensemble interval can be accomplished with single ping OS NB ADCP ensembles. NB Mode, 16 meter bins, 16 meter blank, 100 raw ensembles average to 2.41 seconds per ensemble. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 1 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start Time ==> 20Sep2000 01:42:44
End Time ==> 20Sep2000 01:46:43
Start Pos ==> 3 23 23N : 136 22 28E
End Pos ==> 3 23 06N : 136 21 39E

LEG3009_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. This file contains both NB Profiling Mode, 16 meter bins, 16 meter blank and BB Profiling Mode 8 meter bins, 16 meter blank. Although both profiling modes are included in this data file, only the BB profile data is accessible for the VMDAS and WINADCP programs to read. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start Time ==> 20Sep2000 01:51:37
End Time ==> 20Sep2000 03:32:19
Start Pos ==> 3 22 46N : 136 20 42E
End Pos ==> 3 15 08N : 136 00 48E

File LEG3009_000_000000==> This is identical to LEG3009_000000 except now the NB profile data is accessible for the VMDAS and WINADCP programs to read and the BB profile data is not.
STA ==> 1 minute averages

LTA ==> 60 minute averages
VMP ==> Copy of the VMDAS VMO setup used when creating this data set

LEG3010_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> 20Sep2000 03:37:01
End ==> 23Sep2000 23:42:21.80
Start Pos ==> 3 14 47N : 135 59 49E
End Pos ==> 6 47 22N : 126 42 19E

LEG3011_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins and 100 bins. Used to determine the maximum range possible while on station. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> 23Sep2000 23:47:58
End ==> 24Sep2000 00:03:00
Start Pos ==> 6 47 21N : 126 42 18E
End Pos ==> 6 47 09N : 126 42 13E

LEG3012_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 32 meter bins and 60 bins. Used to determine the maximum range possible while on station. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> 24Sep2000 00:06:52
End ==> 24Sep2000 00:21:56
Start Pos ==> 6 47 02N : 126 42 11E
End Pos ==> 6 46 59N : 126 42 06E

LEG3013_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins, and 32 meter transmit pulse with 100 bins. Error in the NB transmit command caused this file to be aborted and no data was collected.
STA ==> N/A
LTA ==> N/A
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> N/A
End ==> N/A
Start Pos ==> N/A
End Pos ==> N/A

LEG3014_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins, and 32 meter transmit pulse with 100 bins. Used to determine the maximum range possible while on station. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> 24Sep2000 00:31:28
End ==> 24Sep2000 00:46:32
Start Pos ==> 6 47 12N : 126 42 07E
End Pos ==> 6 46 43N : 126 42 13E

LEG3015_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins with 75 bins. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> 24Sep2000 00:51:04
End ==> 28Sep2000 20:36:06
Start Pos ==> 6 47 44N : 126 42 14E
End Pos ==> 9 59 60N : 127 58 55E

Special Note
INSTALLED VERSION 23.07 FIRMWARE AT THIS TIME. ALL FILES PREVIOUS TO THIS POINT USED FIRMWARE VERSION 23.05. ALL FILES FORWARD USED FIRMWARE VERSION 23.07.

LEG3016_000000 ==> Quick Test of the new firmware version 23.07 to be sure nothing had changed while we are on station. Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins with 75 bins. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> 28Sep2000 21:26:13
End ==> 28Sep2000 21:31:14
Start Pos ==> 10 00 03N : 128 00 06E
End Pos ==> 10 00 03N : 128 00 07E

LEG3017_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. This file contains both NB Profiling Mode, 16 meter bins, 16 meter blank and BB Profiling Mode 8 meter bins, 16 meter blank. Although both profiling modes are included in this data file, only the BB profile data is accessible for the VMDAS and WINADCP programs to read. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start Time ==> 28Sep2000 21:35:06
End Time ==> 28Sep2000 02:35:08
Start Pos ==> 10 00 03N : 128 00 07E
End Pos ==> 9 01 36N : 127 40 17E

File LEG3017_000_000000==> This is identical to LEG3017_000000 except now the NB profile data is accessible for the VMDAS and WINADCP programs to read and the BB profile data is not.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMP ==> Copy of the VMDAS VMO setup used when creating this data set

LEG3018_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins with 75 bins. Contains only navigation data BT is shutoff at this point to collect as many pings as possible. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> 29Sep2000 02:38:57
End ==> 30Sep2000 10:48:59
Start Pos ==> 9 01 42N : 127 40 14E
End Pos ==> 7 47 36N : 133 23 46E

LEG3019_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins with 75 bins. BT is enabled. Data collection halted so that the maximum bottom track depth to track could be changed to 2000 meters. This would allow for the maximum depth to track the bottom to. INI file Ensemble interval set to 2 seconds.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> 30Sep2000 10:53:14
End ==> 30Sep2000 10:54:51
Start Pos ==> 7 47 34N : 133 24 13E
End Pos ==> 7 47 31N : 133 24 13E

LEG3020_000000 ==> Original Real Time Data collected using a 43.28 degree misalignment. NB Mode, 16 meter bins with 75 bins. BT is enabled. Data collection with the maximum bottom track depth set to 2000 meters. This would allow for the maximum depth to track the bottom to. INI file Ensemble interval set to 2 seconds. Bottom track was detected and locked onto at depths greater than 2000 meters.
STA ==> 1 minute averages
LTA ==> 60 minute averages
VMO ==> Copy of the VMDAS INI setup used when collecting data
LOG ==> Log of the ADCP setup command transaction
Start ==> 30Sep2000 10:57:36
End ==> 1Oct2000 00:47:37
Start Pos ==> 7 47 26N : 133 24 43E
End Pos ==> 7 19 48N : 134 27 25E

OS-II 38kHz ADCP Command File

The following is a copy of the OS-II 38kHz ADCP Command File KAIYODEFAULT.TXT The ADCP Command File provides the commands and setup for the ADCP when not bottom tracking along LEG 3 of the TOCS cruise. This command file was used for most of the cruise. The section on Data File Descriptions details any differences to this setup shown here.

```
;----------------------------------------------------------------------------\
; ADCP Command File for use with VmDas software.
; ADCP type:    38 Khz Ocean Surveyor
; Setup name:   default
; Setup type:   Low resolution, long range profile(narrowband)
;
; NOTE:  Any line beginning with a semicolon in the first
;        column is treated as a comment and is ignored by
;        the VmDas software.
;
; NOTE:  This file is best viewed with a fixed-point font (eg. courier).
;----------------------------------------------------------------------------/
; Restore factory default settings in the ADCP
cr1
; set the data collection baud rate to 38400 bps,
; no parity, one stop bit, 8 data bits
; NOTE:  VmDas sends baud rate change command after all other commands in
; this file, so that it is not made permanent by a CK command.
cb611
; Set for narrowband profile mode, single-ping ensembles,
; seventy-five 16 meter bins, 16 meter blanking distance
WP0
NP00001
NS1600
NF1600
NN075
; Disable single-ping bottom track,
; Set maximum bottom search depth to 1700 meters
BP000
BX17000
; output velocity, correlation, echo intensity, percent good
ND111100000
; 1.25 seconds between bottom and water pings
TP000125
; 1.5 seconds between ensembles
; Since VmDas uses manual pinging, TE is ignored by the ADCP.
; You must set the time between ensemble in the VmDas Communication options
TE00000150
; Set to calculate speed-of-sound, no depth sensor,
; external synchro heading sensor, use internal
; transducer temperature sensor
EZ10200010
; Output beam data (rotations are done in software)
EX00000
; Set transducer depth to 5 meters
ED00050
; save this setup to non-volatile memory in the ADCP
CK
```

5.2 Data acquisition

Shipboard ADCP measurements were conducted from Aug.30 to Sep.11 (Leg.2 ; Chuuk - Kevieng) and from Sep.13 to Oct.2 (Leg.3 ; Kevieng - Palau) . R/V Kaiyo mounts Narrow Band ADCP instrument (38kHz, 30 degree beam angle) that manufactured by RD Instrument. The configurations were set as follows.

PC (personal Computer) time	: GMT
Depth cell length	: 16m
Number of cell	: 50
Ping per ensemble	: 1
Time per ping	: 1.25sec
Time per ensemble	: 2.00sec

During Leg.2 cruise, the ADCP measurements were started from Aug.30. On Sep.1, The trouble that motion of our computer's mouse pointer became slow, And we stopped the ADCP measurements. Because we thought that this trouble is dat to large max size of deployment files (about 1400MB), we changed it to 10MB and restarted the ADCP . After that, the similar trouble was not happened until end of Leg.2.

Shipboard ADCP measurements were conducted from Aug.30 to Sep.11 (Leg.2 ; Chuuk - Kevieng) and from Sep.13 to Oct.2 (Leg.3 ; Kevieng - Palau) . R/V Kaiyo mounts Narrow Band ADCP instrument (38kHz, 30 degree beam angle) that manufactured by RD Instrument. The configurations were set as follows.

ADCP	: Ocean Surveyor
PC (personal Computer) time	: GMT
Application	: VM-DAS

Leg2

Aug.30 23:47－Aug.31 14:51

Mode	: Water Tracking(Narrow Band)
Depth cell length	: 16m
Blanking Distance	: 16 m
Number of cell(bin)	: 50
File Size	: 1.4G
FileName_FileNo	: Leg2001_000000.* － Leg2001_000000.*

Sep.1 23:21 －Sep.10 06:57

Mode	: Water Tracking(Narrow Band)
Depth cell length	: 16m
Blanking Distance	: 16 m
Number of cell(bin)	: 50
File Size	: 10MB
FileName_FileNo	: Leg2_1001_000000.* － Leg2_1001_000049.*

<NOTE>
Sep.1 23:15

During Leg.2 cruise, the ADCP measurements were started from Aug.30. On Sep.1, The trouble that motion of our computer's mouse pointer became slow, and we stopped the ADCP measurements. Because we thought that this trouble is due to large max size of deployment files (about 1400MB), we changed it to 10MB and restarted the ADCP . After that, the similar trouble was not happened until end of Leg.2.

Leg3

Sep.13 05:35 －Sep.13 13:00
Mode : Bottom Tracking(Narrow Band)
Depth cell length : 16m
Blanking Distance : 16 m
Number of cell(bin) : 65
File Size : 10MB
FileName_FileNo : leg3005_000000*

Sep.13 13:01 －Sep.16 03:36
Mode : Water Tracking(Narrow Band)
Depth cell length : 16m
Blanking Distance : 16 m
Number of cell(bin) : 65
File Size : 10MB
FileName_FileNo : leg3006_000000.*－leg3006_000011.*

Sep.16 03:40 －Sep.20 01:40
Mode : Water Tracking(Narrow Band)
Depth cell length : 16m
Blanking Distance : 16 m
Number of cell(bin) : 75
File Size : 10MB
FileName_FileNo : leg3007_000000.*－leg3007_000011.*

Sep 20 01:42 －Sep20 01:46(TEST DATA)
Mode : Water Tracking(Narrow Band・Broad Band)
Depth cell length : NB 16m BB 8m
Blanking Distance : NB 16 m BB 8m
Number of cell(bin) : NB 75m BB 100
File Size : 10MB
FileName_FileNo : leg3008_000000.*

Sep20 01:51 －Sep.20 03:32(TEST DATA)

Mode : Water Tracking(Narrow Band・Broad Band)
Depth cell length : NB 16m BB 8m
Blanking Distance : NB 16 m BB 8m
Number of cell(bin) : NB 75m BB 100
File Size : 10MB
FileName_FileNo : leg3009_000000.*

Sep.20 03:37 －Sep.23 23:46
Mode : Water Tracking(Narrow Band)
Depth cell length : 16m
Blanking Distance : 16 m
Number of cell(bin) : 75
File Size : 10MB
FileName_FileNo : leg3010_000000.*－leg3010_000023.*

Sep.23 23:47 －Sep.24 00:03 (TEST DATA)
Mode : Water Tracking(Narrow Band)
Depth cell length : 16m
Blanking Distance : 16 m
Number of cell(bin) : 100
File Size : 10MB
FileName_FileNo : leg3011_000000.*

Sep.24 00:06 －Sep.24 00:23 (TEST DATA)
Mode : Water Tracking(Narrow Band)
Depth cell length : 32m
Blanking Distance : 16 m
Number of cell(bin) : 60
File Size : 10MB
FileName_FileNo : leg3012_000000.*

Sep.24 00:31 －Sep.24 00:49 (TEST DATA)
Mode : Water Tracking(Narrow Band)
Depth cell length : 16m
Blanking Distance : 16 m
Number of cell(bin) : 100
File Size : 10MB
FileName_FileNo : leg3014_000000.*

Sep.24 00:50 －Sep.28 20:36
Mode : Water Tracking(Narrow Band)
Depth cell length : 16m

Blanking Distance : 16 m
Number of cell(bin) : 75
File Size : 10MB
FileName_FileNo : leg3015_000000.* －leg3015_00000029.*

Sep.24 00:50 －Sep.28 20:36
Mode : Water Tracking(Narrow Band)
Depth cell length : 16m
Blanking Distance : 16 m
Number of cell(bin) : 75
File Size : 10MB
FileName_FileNo : leg3016_000000.* －leg3015_00000029.*

Sep.28 21:35 －Sep.29 02:38(TEST DATA)
Mode : Water Tracking(Narrow Band・Broad Band)
Depth cell length : NB 16m BB 8m
Blanking Distance : NB 16 m BB 8m
Number of cell(bin) : NB 75m BB 100
File Size : 10MB
FileName_FileNo : leg3017_000000.* －leg3017_000001.*

Sep.29 02:38 －Sep.
Mode : Water Tracking(Narrow Band)
Depth cell length : 16m
Blanking Distance : 16 m
Number of cell(bin) : 75
File Size : 10MB
FileName_FileNo : leg3018_000000.*

<NOTE>
Sep.16 03:15

We changed the "EA(Transforms)"45 to 43.28 . (EA is Angle of Transducer setting.) This is fix value of Kaiyo.

Data before changing should be calculate this error at analysis.

Sep.28 21:20

We installed New Version of Farm Wear in ROM(Read Only Memory) .

Ver 23.05 → Ver23.07

4.6 Dissolved Oxygen Measurement

K. Akizawa and T. Ohama [1)]

[1)] :Marine Works Japan, LTD.

Objectives:

Measurement of dissolved oxygen (below D.O.) using D.O. meter corrected by the Winkler titration processed to the WHP Operations and Methods(Culberson,1991).

Comparison of D.O. meter data corrected by the Winkler titration with CTD D.O. data.

Instruments:

D.O. meter	; TOA Portable Dissolved Oxygen Meter Model DO-25A
Titrator	; Metrohm Model 716 DMS Titrino/ 10ml of titration vessel
Detector	; Pt Electrode/ 6.0401.100
Software	; Data acquisition/ Metrohm,METRODATA/ 6.6040.100

Methods :

The 12 piston Niskin water samplers (Go 1015) sampled sea water during CTD upcast.

The water samples for D.O. were sampled from the 5-liter Niskin water samplers into 100ml D.O. glass bottles. In several cast, water samples for the Winkler titration were also sampled to calibrated BOD flasks (ca, 180 ml) (see Green and Carritt 1966).

During sampling, water corresponded to three times of D.O. bottles was used to flush, and then water temperature was measured during sampling. After the sampling, we analyzed D.O. with salinity correction within 30 minutes. (Before measurement, the D.O. meter was adjusted to 0-100% (see TOA D.O. meter operation manual).

The samples for the titration method were analyzed within 2 hours. These samples were analyzed by Metrohm piston burette of 10ml with Pt Electrode. The standardizations have been performed every day before the sample titration.

The data from the D.O. meter were corrected with calibration factors. The factors were decided by linear regression based on the Winkler titration value vs. D.O. meter Value.

Reproducibility:

(1) D.O. meter Value

85pairs of samples were analyzed as replicates taken by same Niskin bottle. The average and standard deviation (2 sigma) of difference of replicates were 0.018ml/l and 0.026ml/l (0.498% of D.O. maximum (5.21ml/l) in this cruise) .

(2) Winkler Titration Value

46pairs of samples were analyzed. The average and standard deviation（2 sigma）of difference of replicates were 0.003ml/l and 0.004ml/l（0.11% of D.O. maximum (3.706ml/l) in this cruise）.

Results:

(1) Correction of D.O. meter Values

Linear regression line listed below was obtained form 133 pairs of D.O. meter-Winkler data (Fig4.6.1).

All D.O. meter data were calibrated by this formula (Corrected D.O. data were Shown in Tables4.6.1-1～3).

$$\text{Formula : } Y = 0.0904 + 0.7111 \times X \ (n = 133)$$

$$R = 0.9914$$

Y : Winkler Value (ml/ l)　　X : D.O. meter Value (ml/ l)

(2) CTD-D.O. Sensor Value correction

Linear regression line listed below was obtained from 251 pairs of CTD D.O. Sensor and corrected D.O. data. (Fig.4.6.2)

$$\text{For upcast : } Y = 0.2077 + 1.0014 \times X \ (n = 251)$$

$$R = 0.989$$

Y : Corrected D.O. Value (ml/ l)　　X : CTD-D.O. Sensor Upcast Value (ml/ l)

(3) Contour plots

Contour plots in Figs.4.6.3-1～3 were made from corrected dissolved oxygen data in Table4.6.1～3.

142 E Line : Stn C35,C36,C37,C38,C39,C40
138 E Line : Stn C42,C43,C45,C47,C49,C51,C53
Mindanao-New guinea Line : Stn C70,C72,C74,C76,C78,C80,C82,C84,C86
7 N Line : Stn C88,C90,C92,C95,C97
8 N Line : Stn C98,C99,C101,C104,C106
10 N Line : Stn C107,C109,C111,C113,C116,C118

(4) Vertical profiles

All vertical profiles in this cruise are showed in Figs.4.6.4-1～6. These data were used from corrected D.O. data in Tables.4.6.1-1～3.

References :

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Culberson,C.H.,G.Knapp,R.T.Williams and F.Zemlyak (1991) A comparison of methods for the determination of dissolved oxygen in sea water (WHPO 91-2),Woods Hole.

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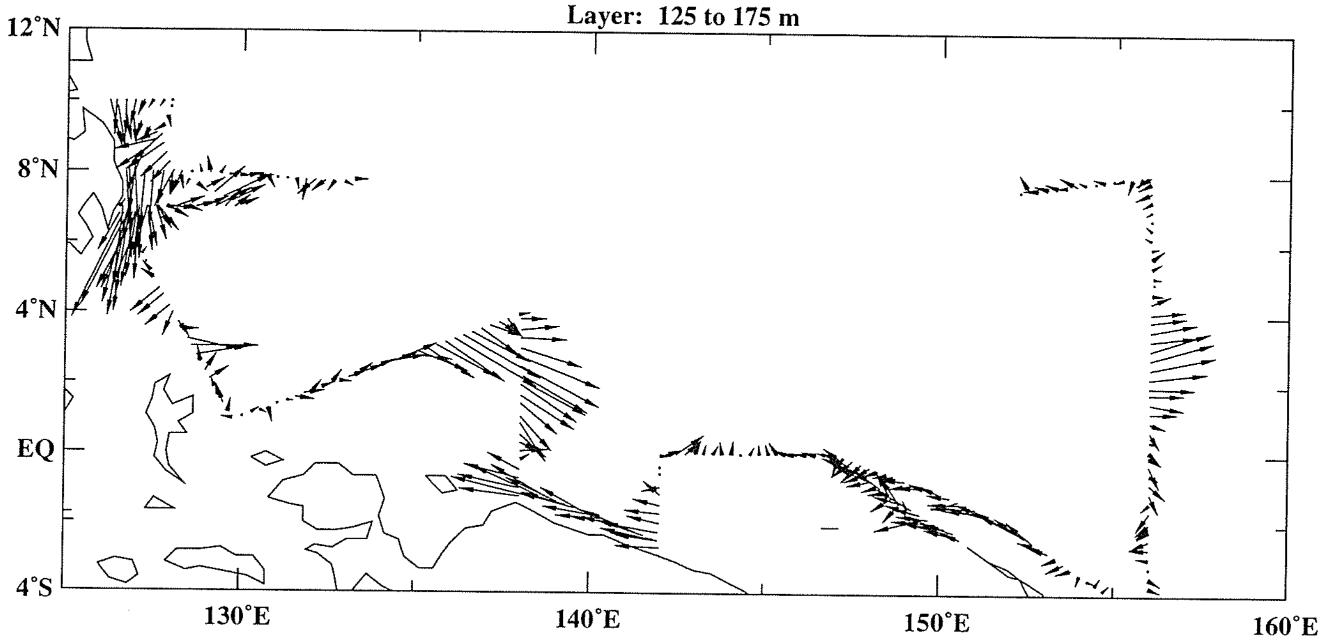
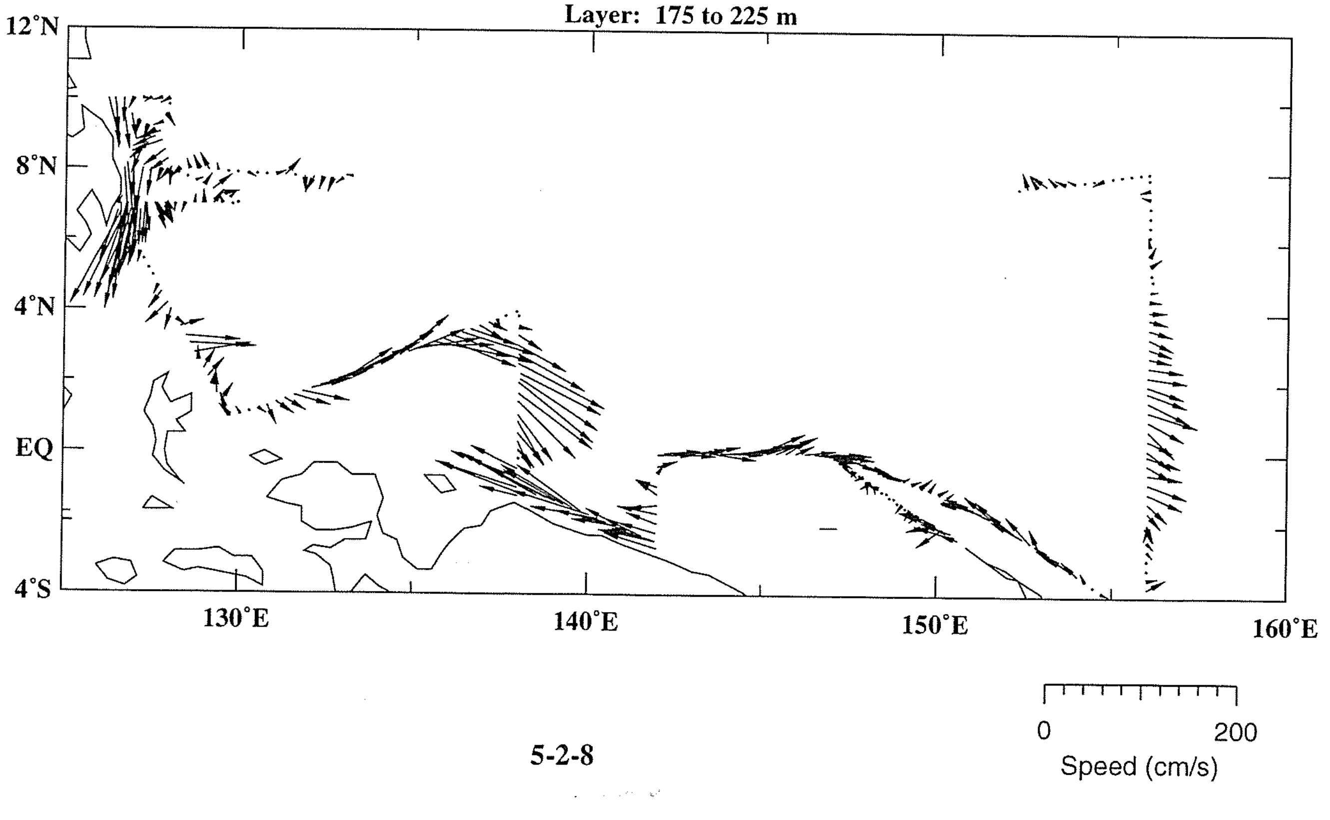
S.Kitagawa and K.Taira (1993) Measurement of dissolved oxygen by an electrode method,

Umi no Kagaku (in Japanese), 2, 15-18.TOA Electronics Ltd. (1991) DO-25A Portable Dissolved Oxygen meter Operation Manual,Tokyo, 29

TOCS, Kaiyo 0006 Legs 2 and 3

Aug 30 to Oct 1, 2000





TOCS, Kaiyo 0006 Legs 2 and 3

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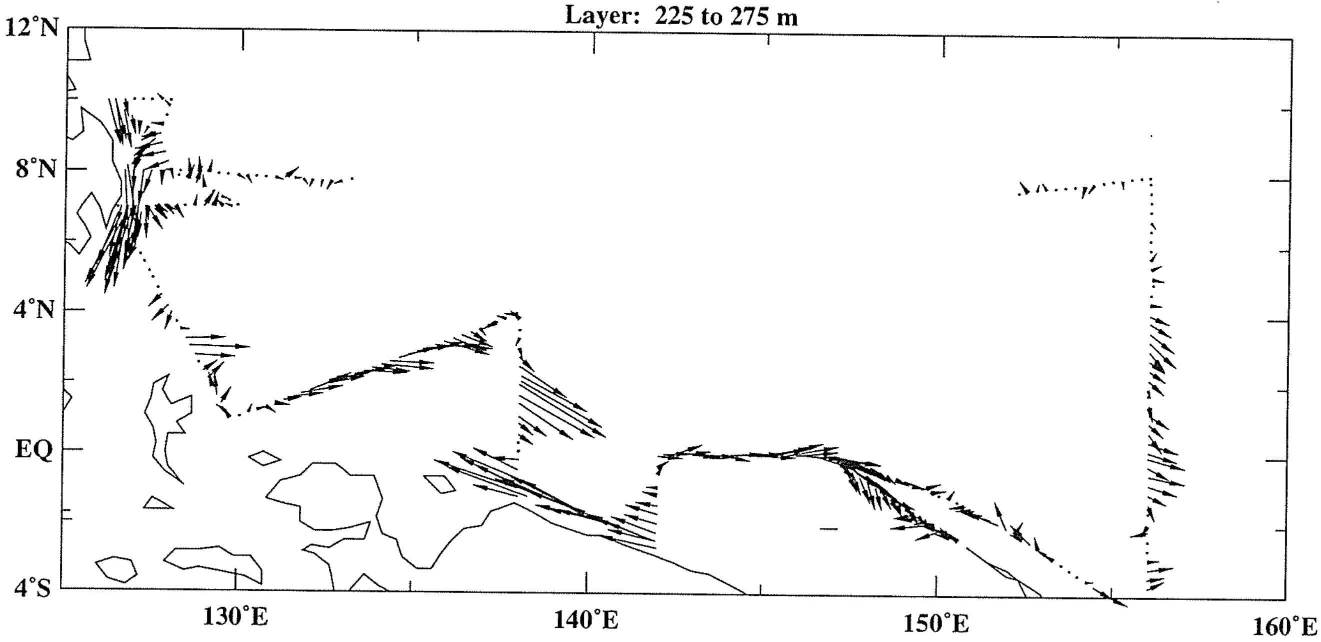
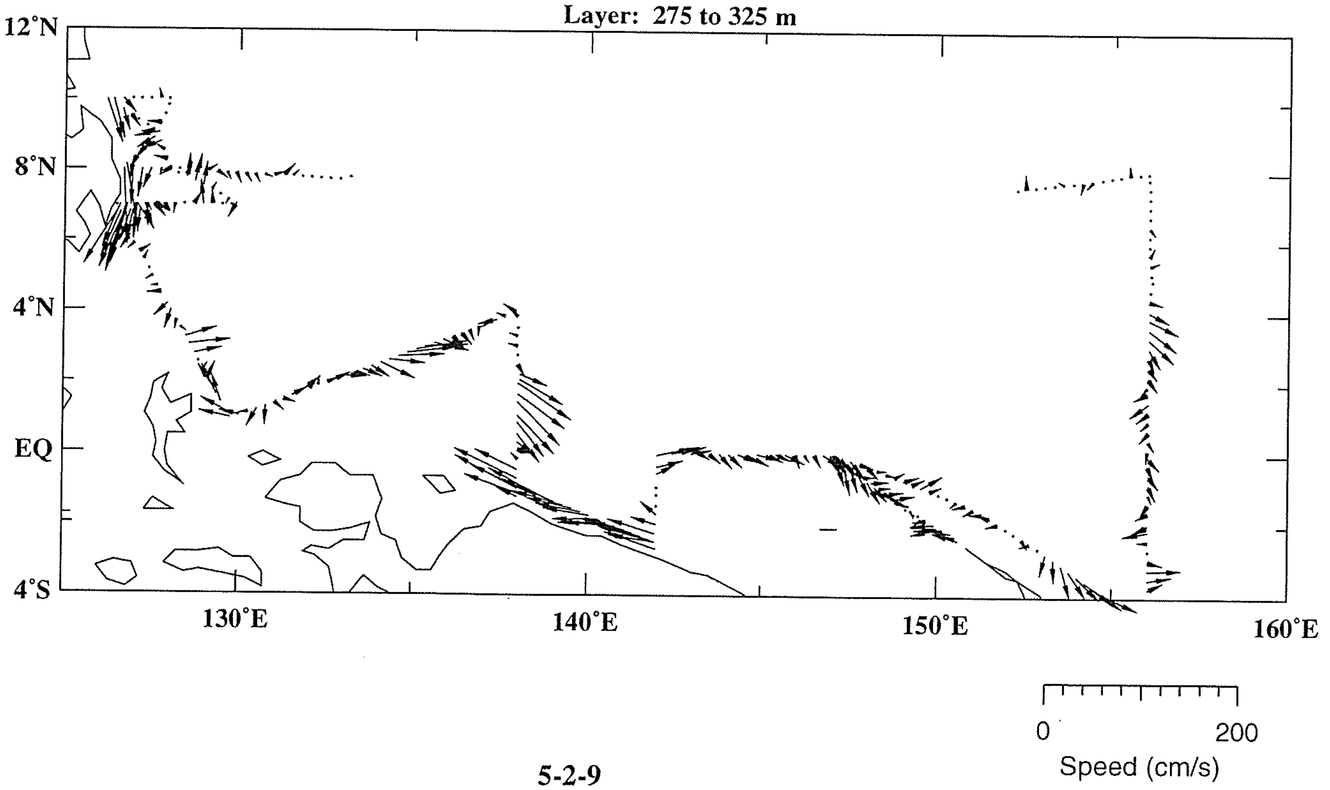
Layer: 225 to 275 m



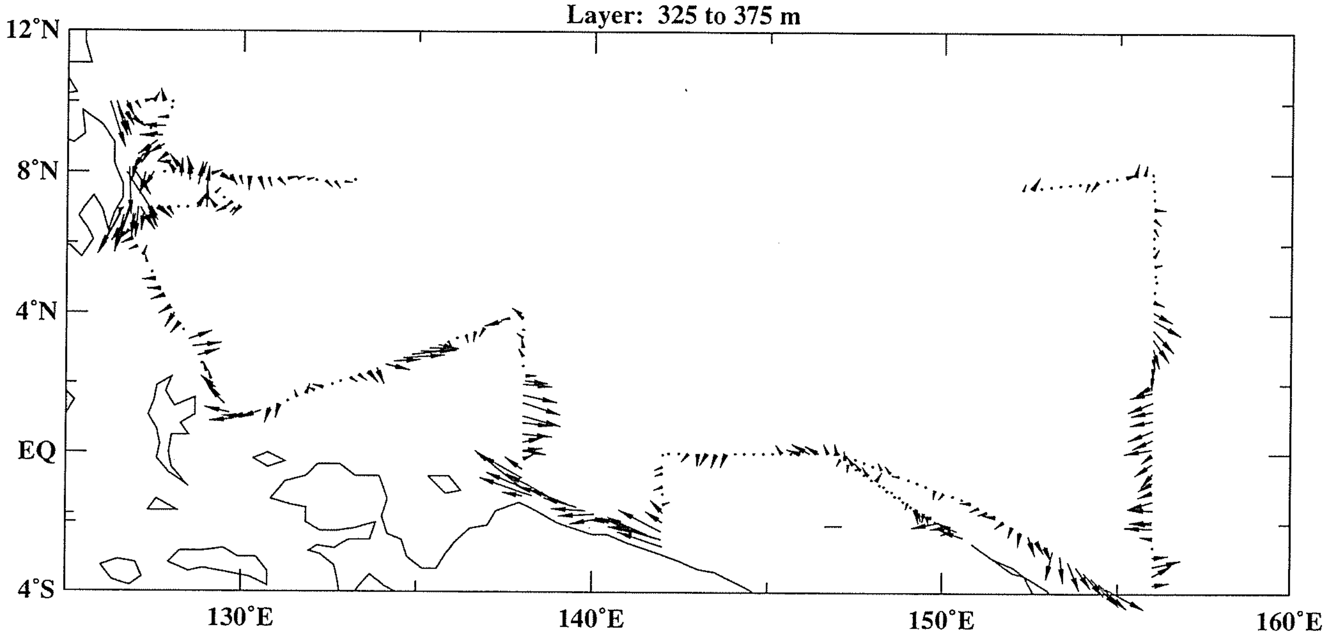
Layer: 275 to 325 m



TOCS, Kaiyo 0006 Legs 2 and 3

Aug 30 to Oct 1, 2000

Layer: 325 to 375 m



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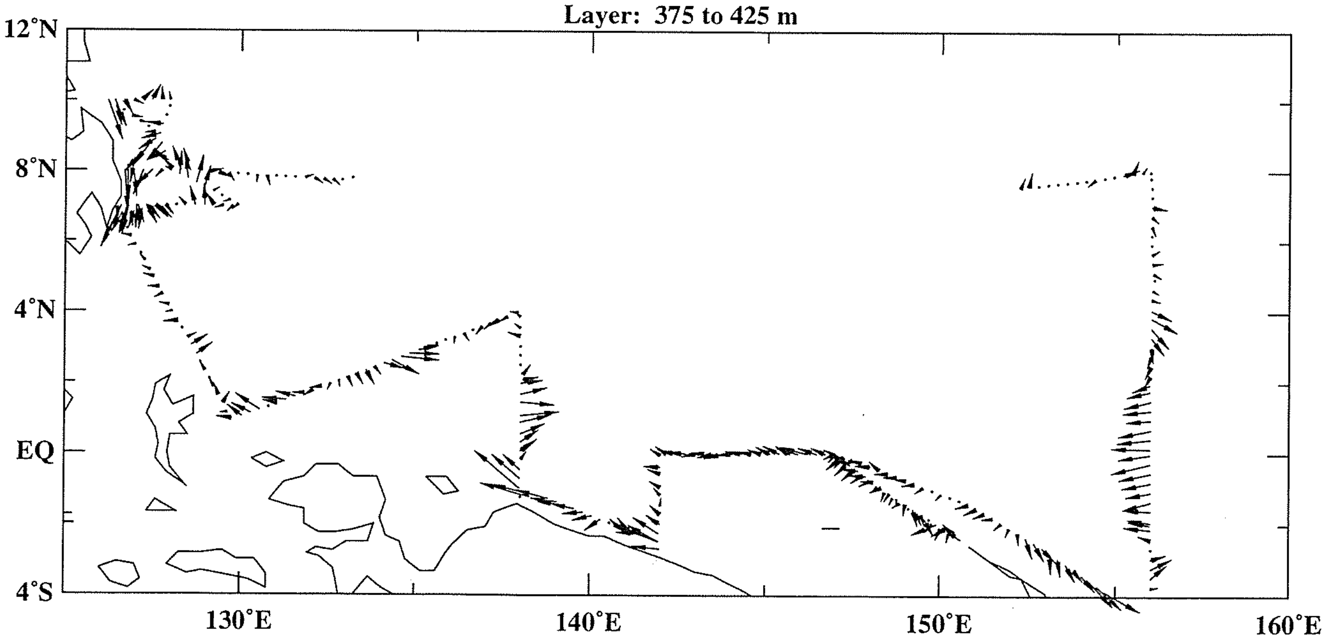
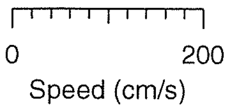
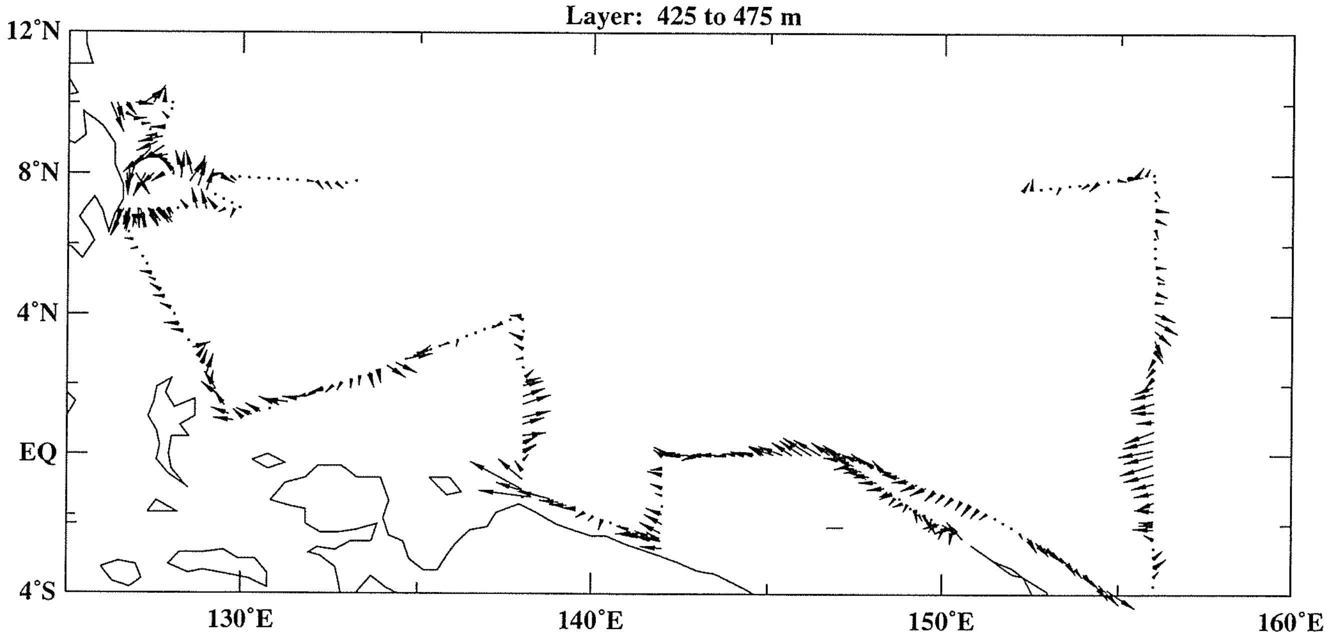
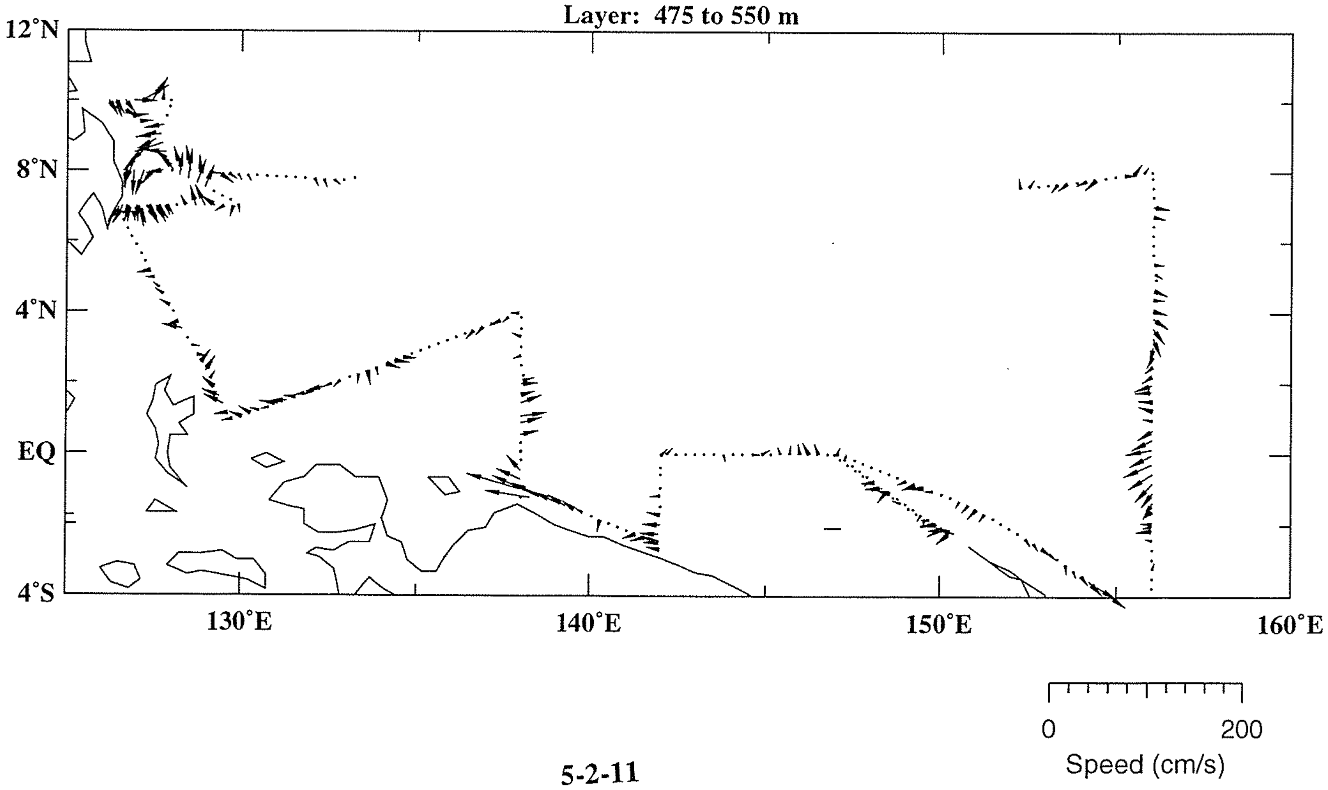




TOCS, Kaiyo 0006 Legs 2 and 3

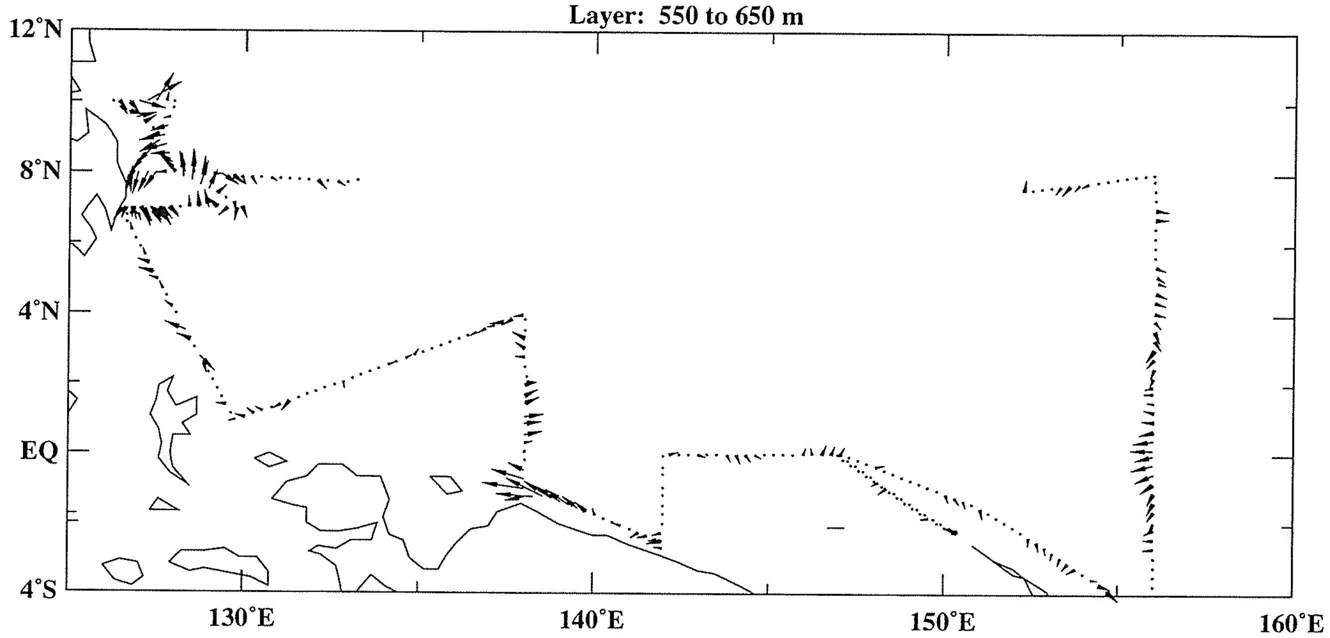
Aug 30 to Oct 1, 2000

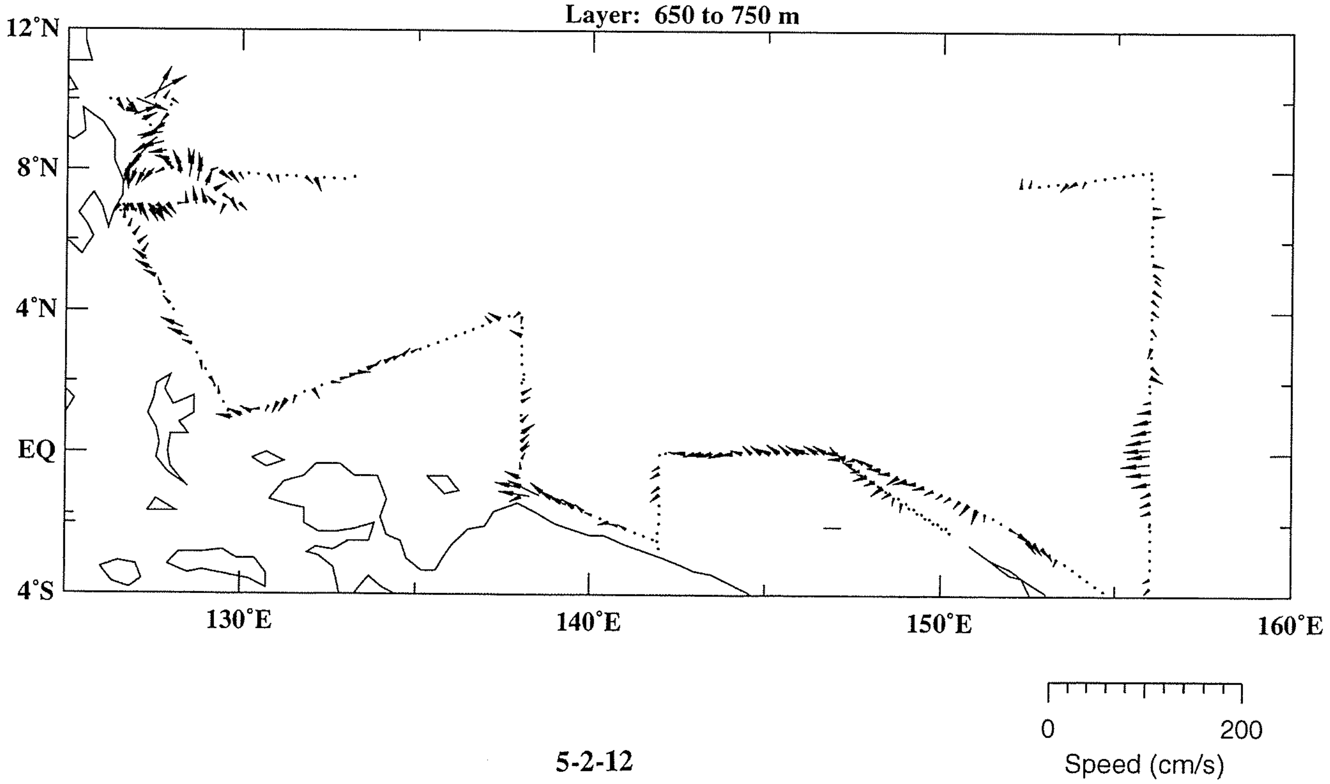




TOCS, Kaiyo 0006 Legs 2 and 3

Aug 30 to Oct 1, 2000

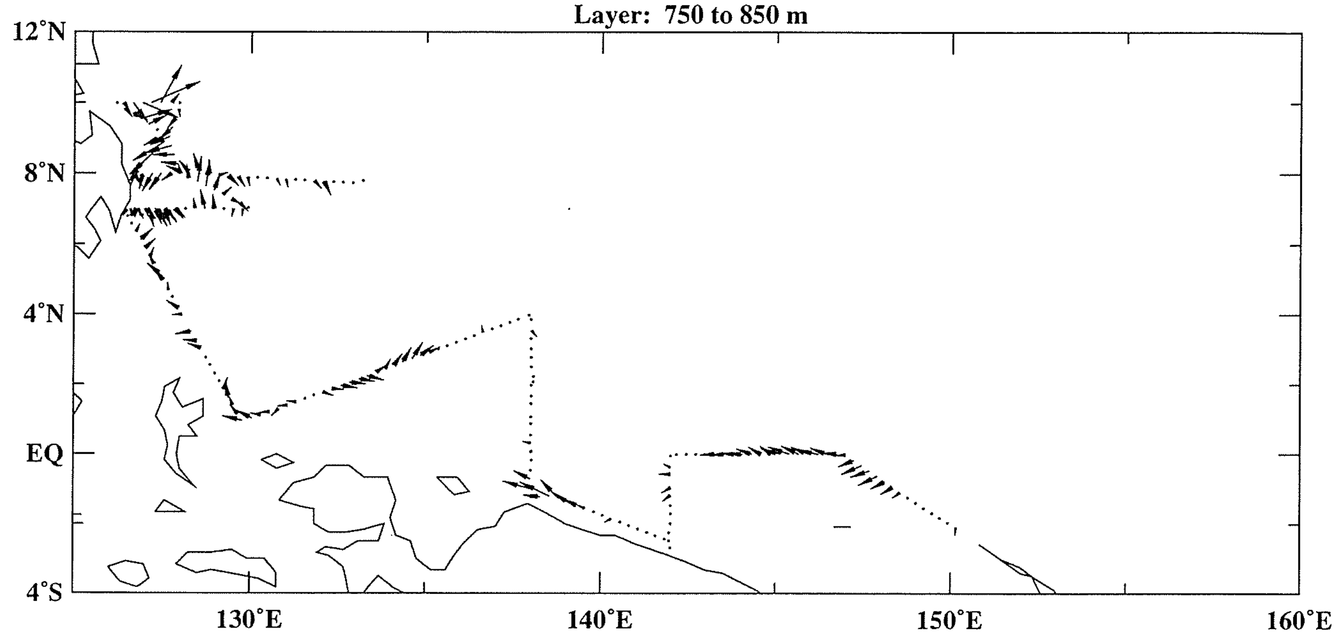




TOCS, Kaiyo 0006 Legs 2 and 3

Aug 30 to Oct 1, 2000

Layer: 750 to 850 m



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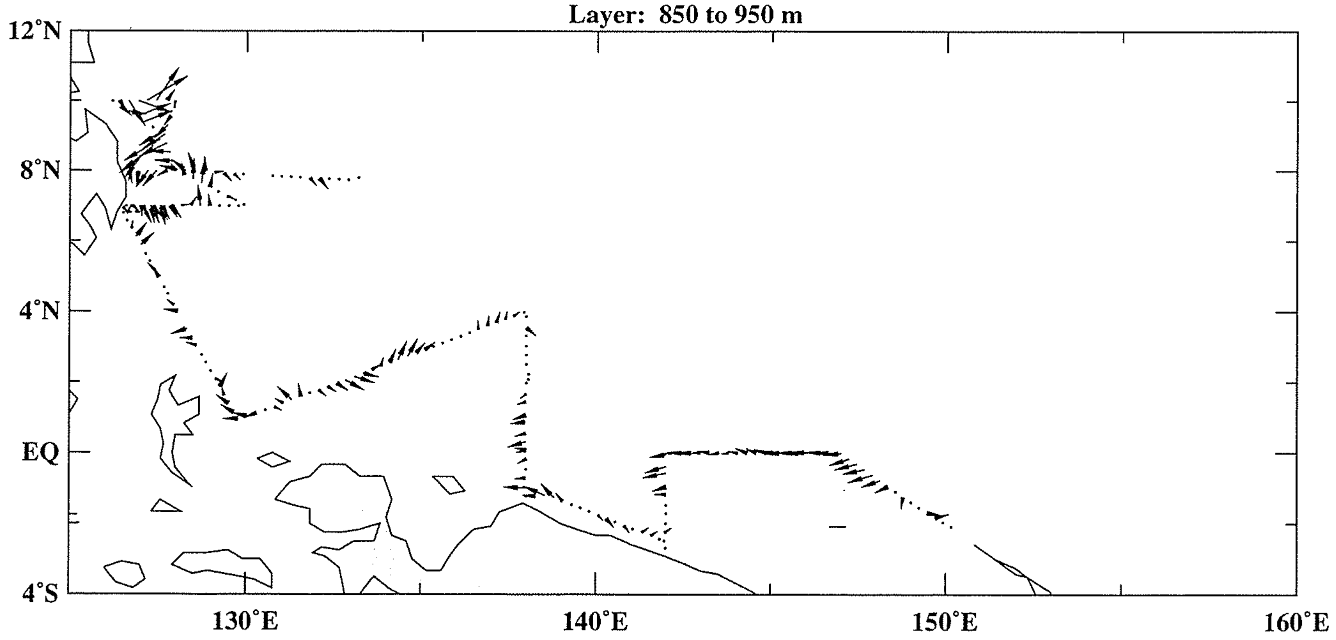

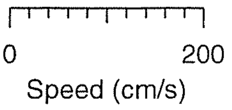

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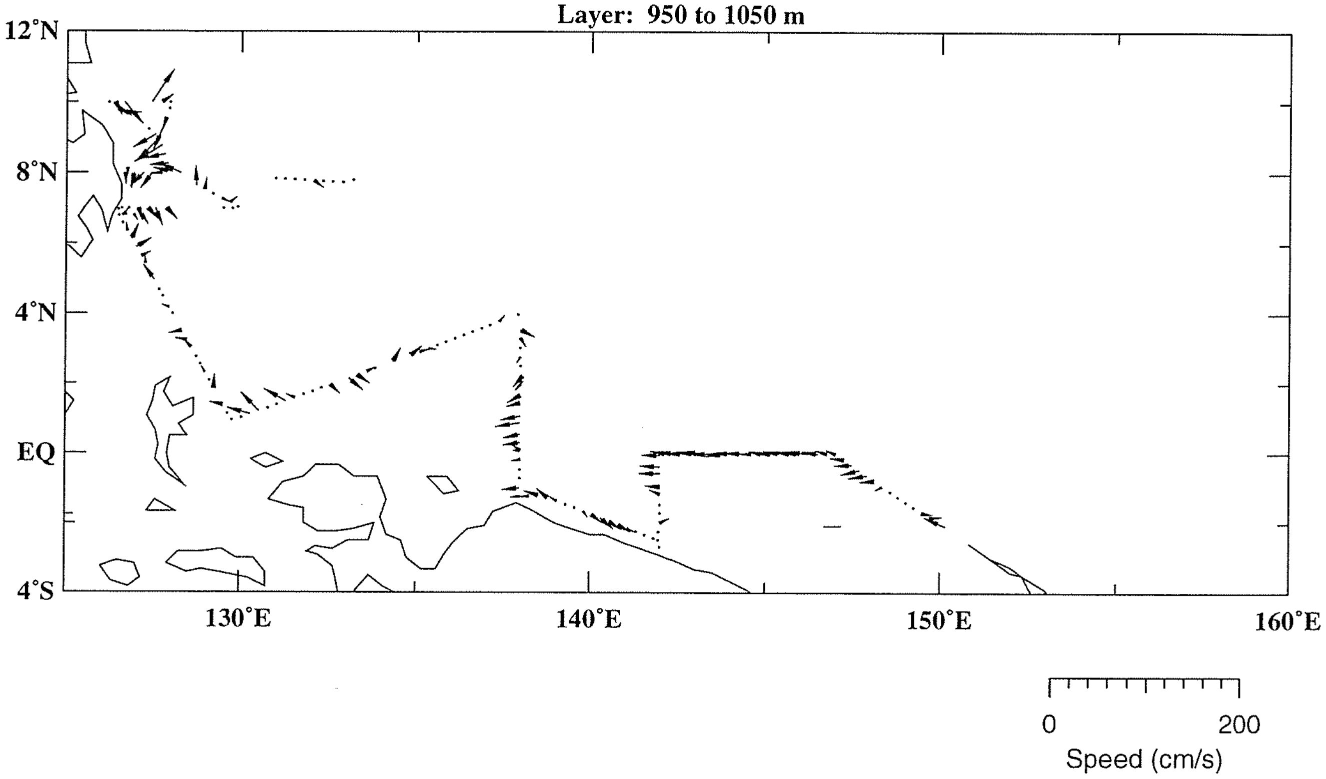

TOCS, Kaiyo 0006 Leg 2

Aug 30 to Sept 10, 2000

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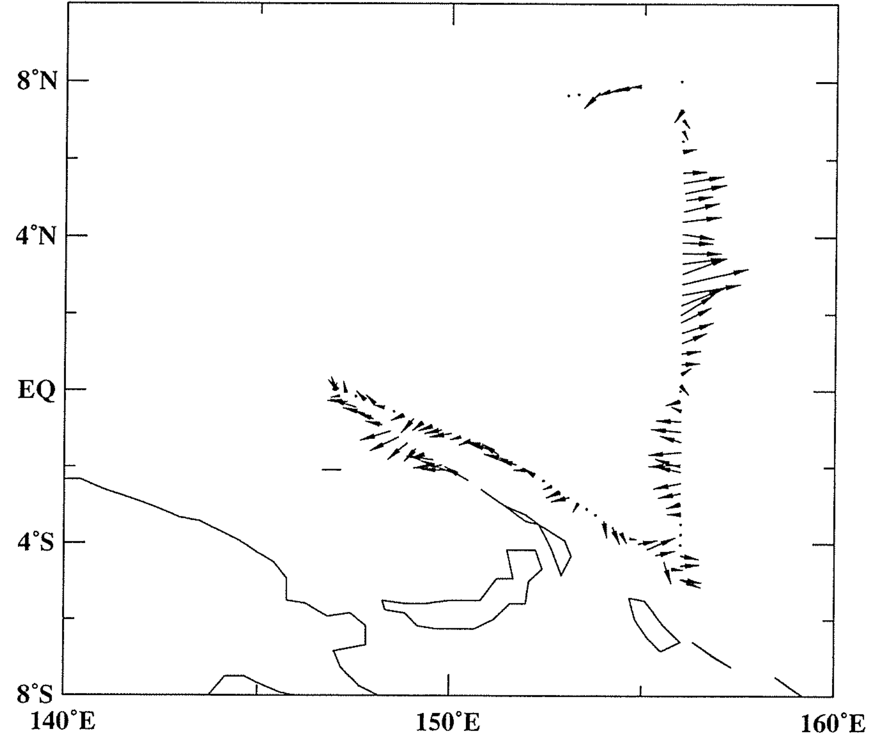

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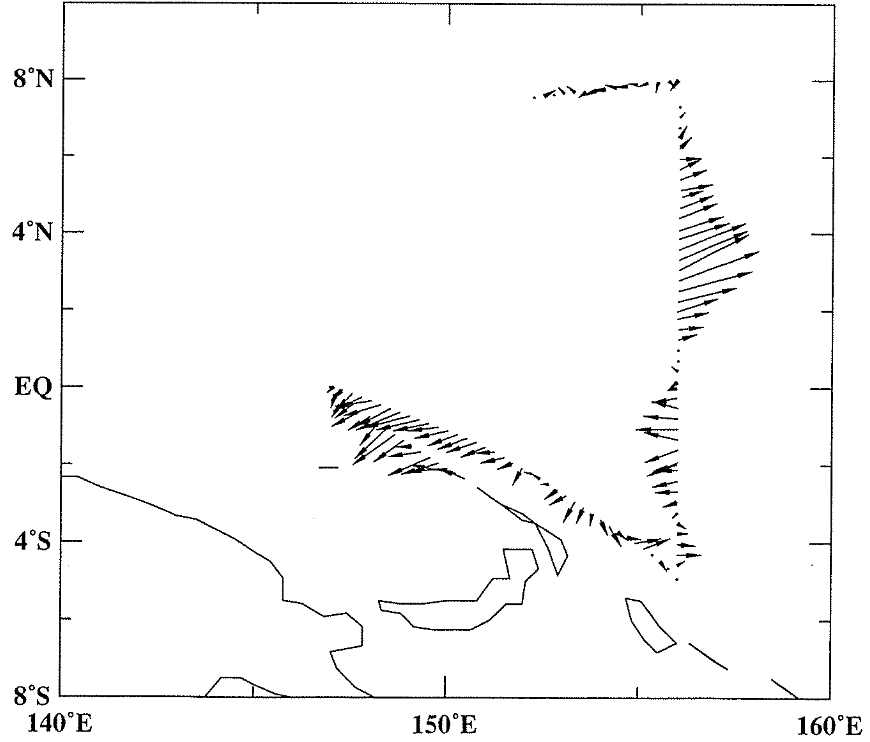

TOCS, Kaiyo 0006 Leg 2

Aug 30 to Sept 10, 2000

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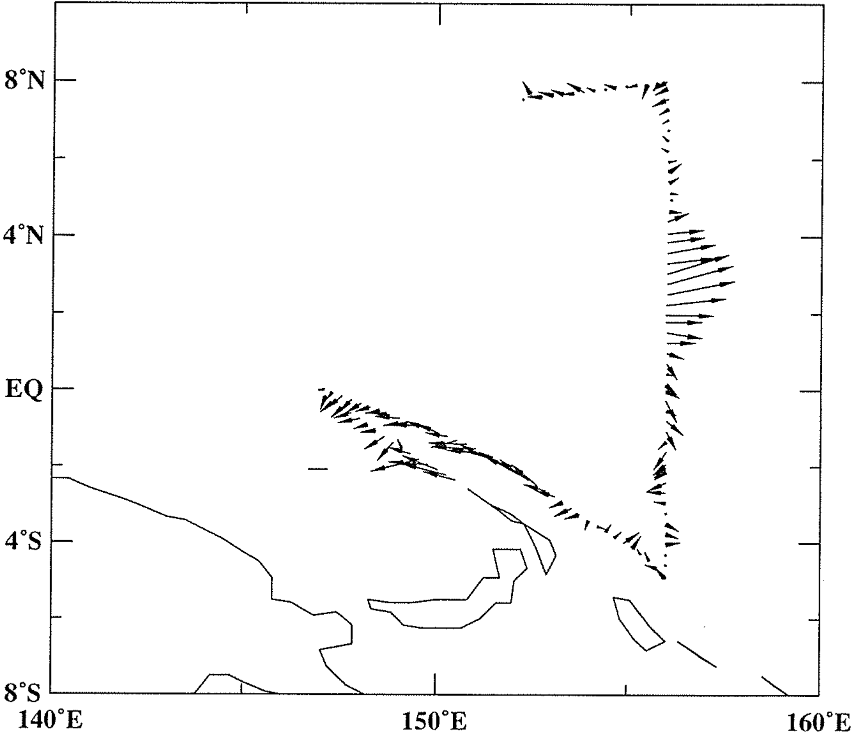

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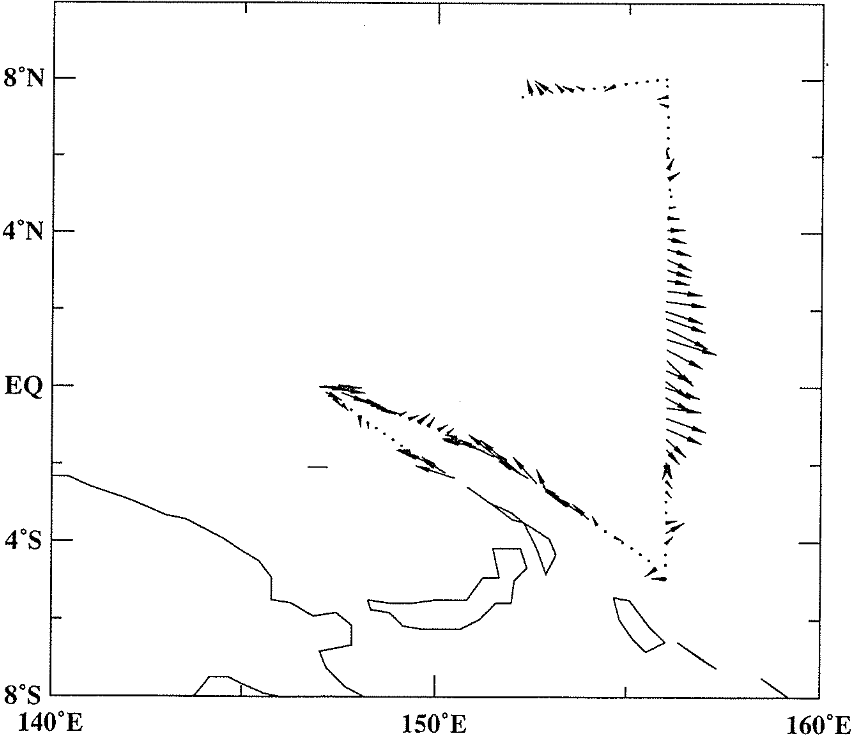
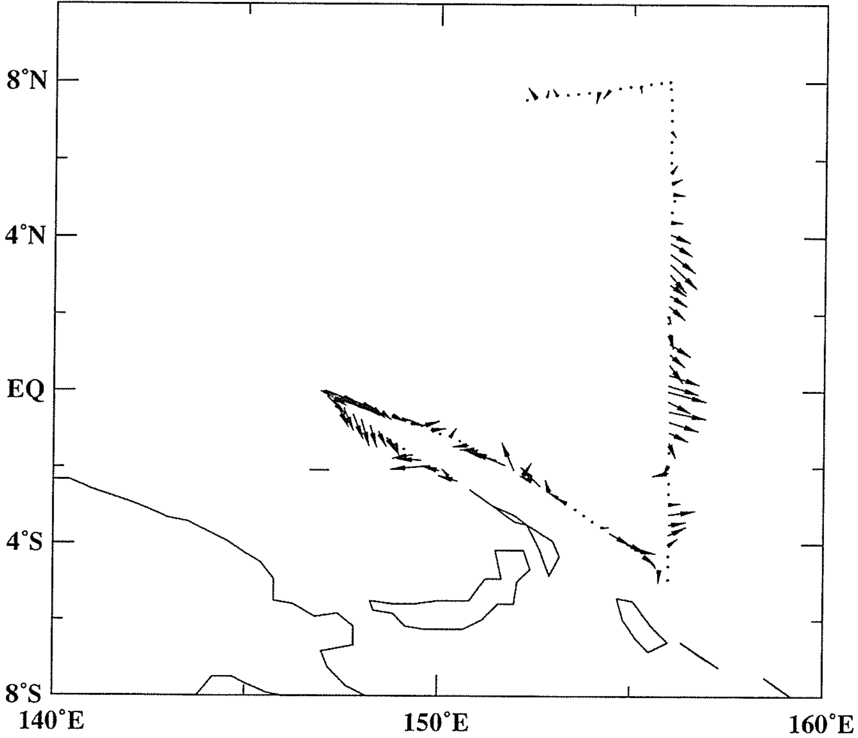


TOCS, Kaiyo 0006 Leg 2

Aug 30 to Sept 10, 2000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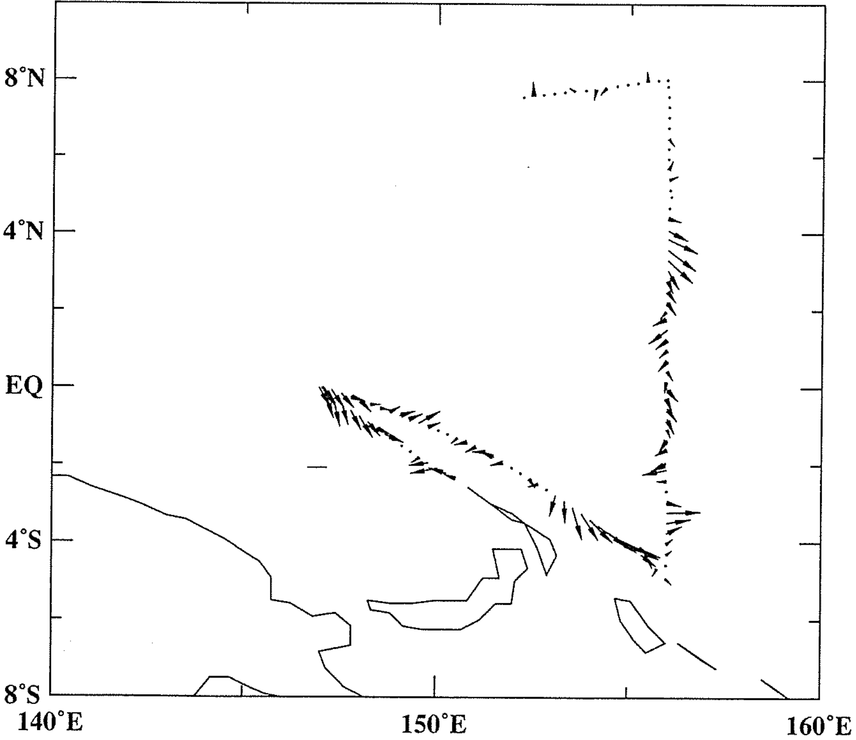
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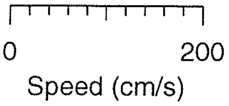

TOCS, Kaiyo 0006 Leg 2

Aug 30 to Sept 10, 2000

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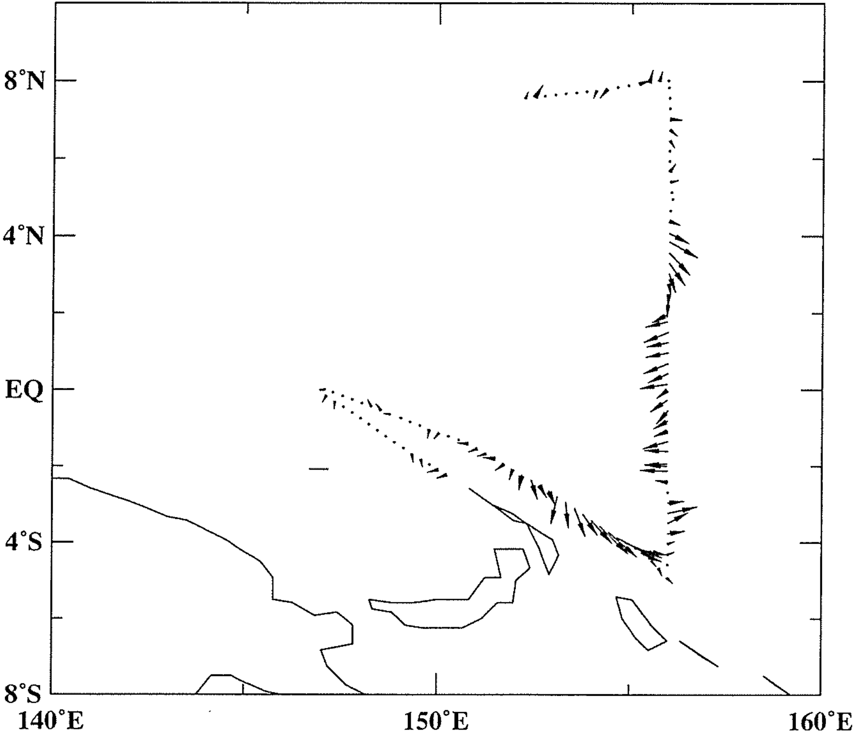

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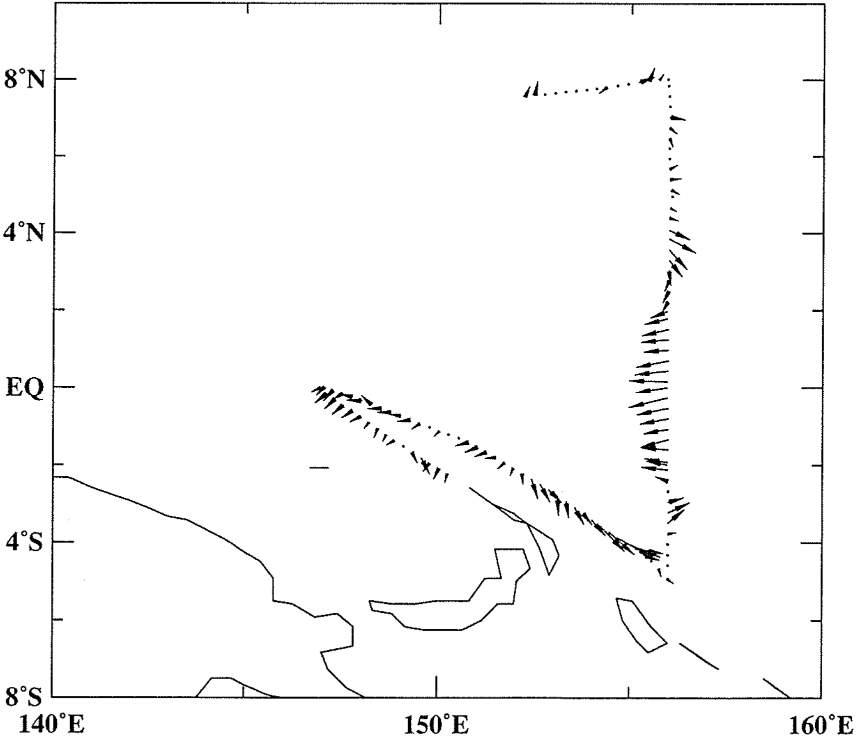

TOCS, Kaiyo 0006 Leg 2

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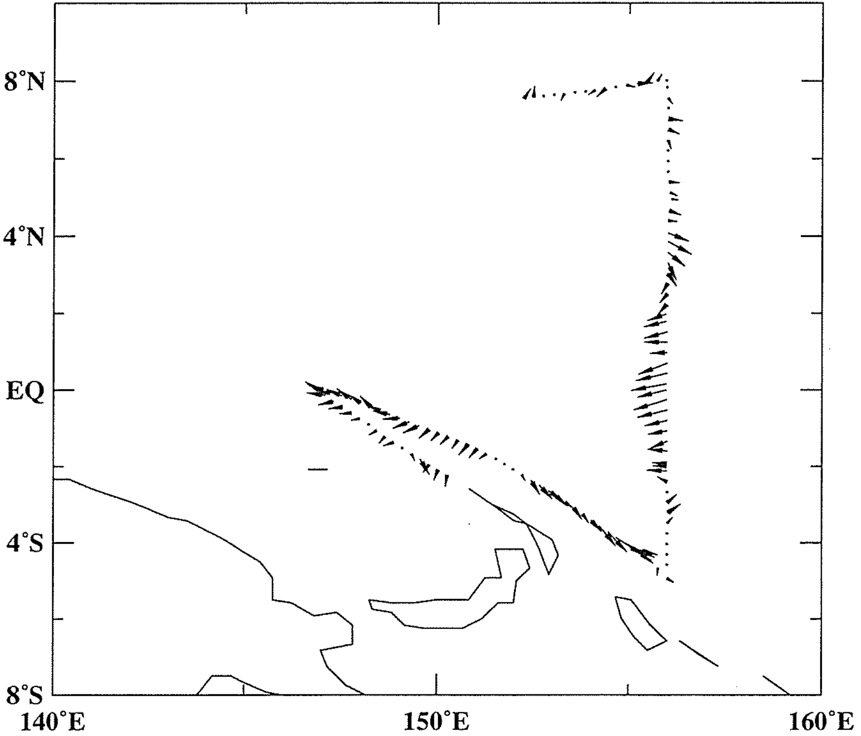

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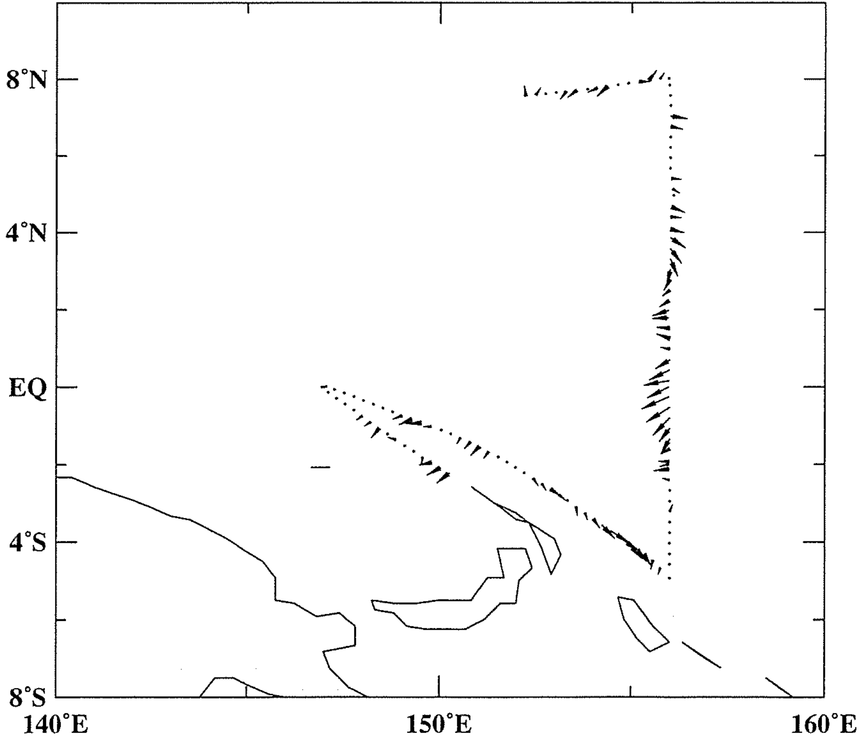

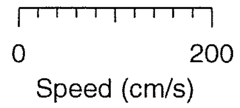

TOCS, Kaiyo 0006 Leg 2

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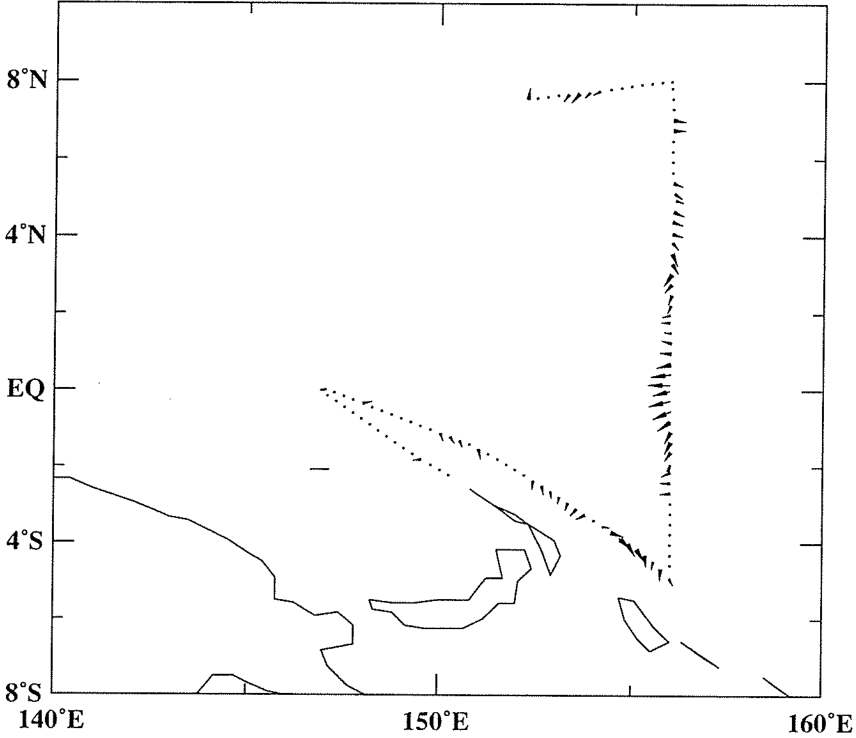
Layer: 550 to 650 m



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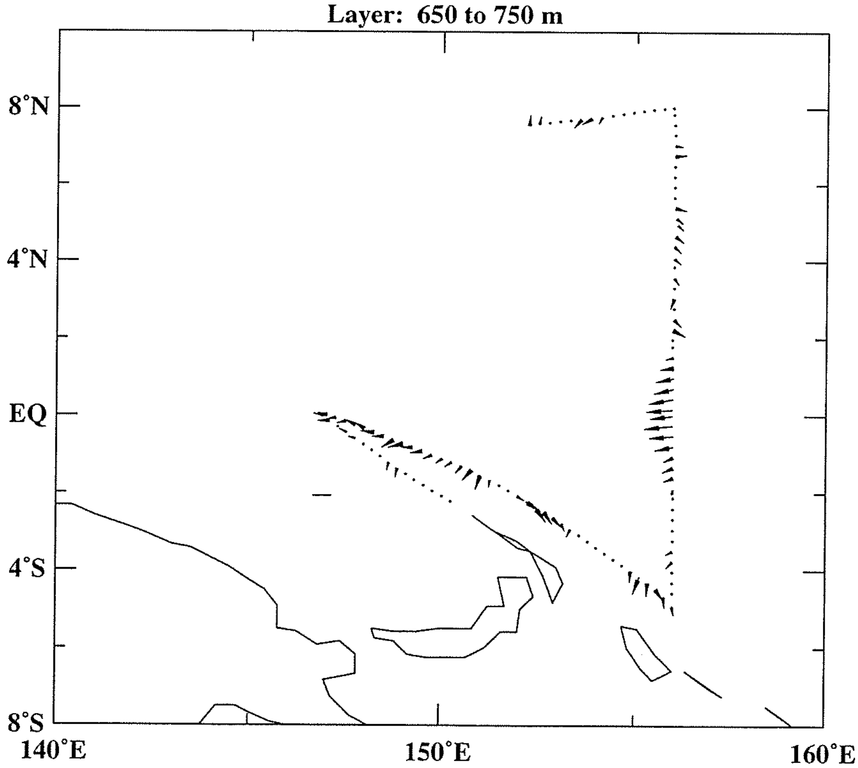

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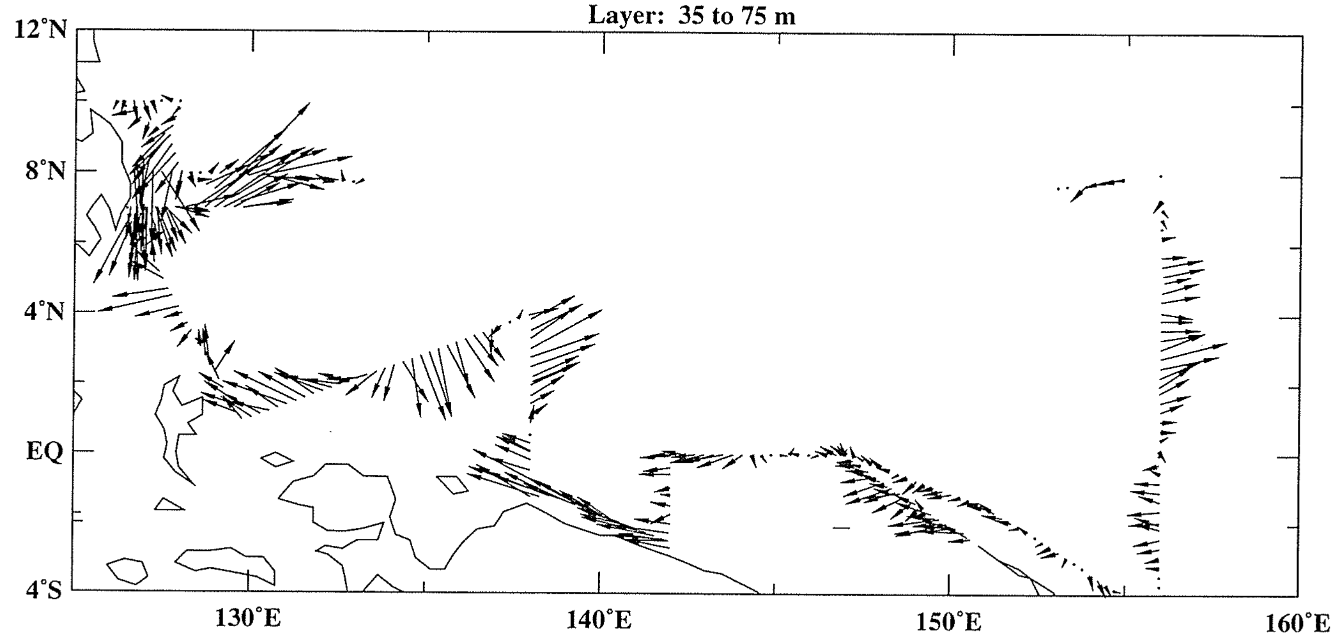
Layer: 35 to 75 m



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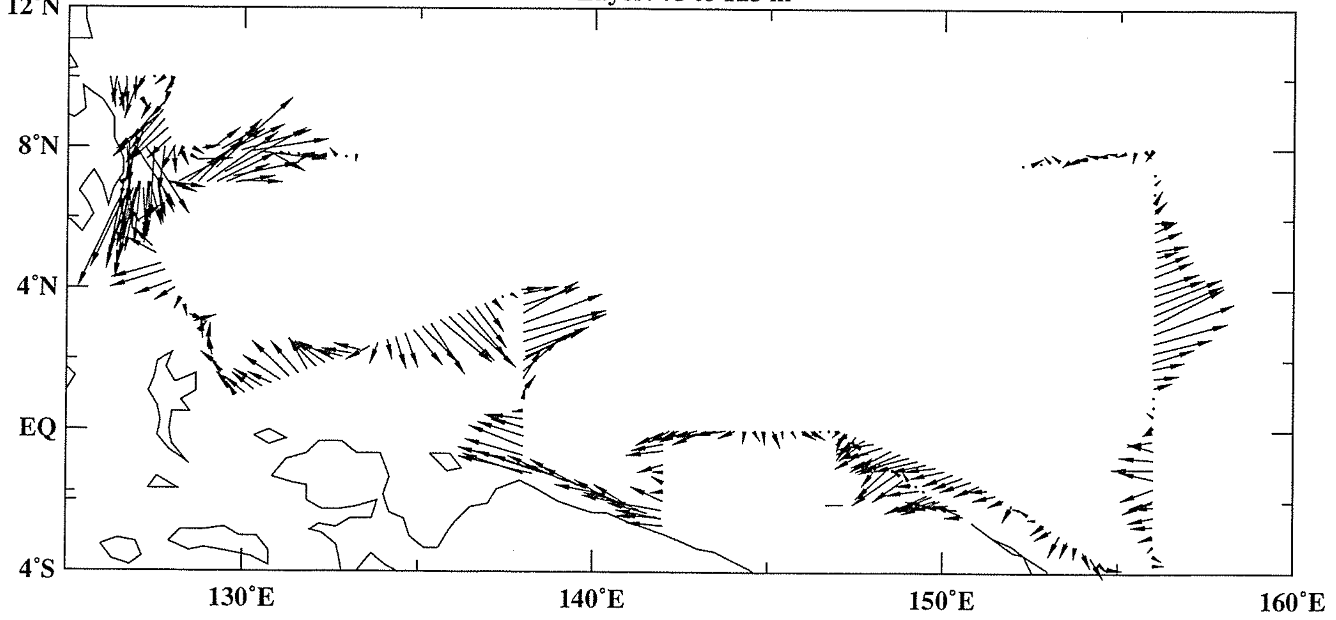
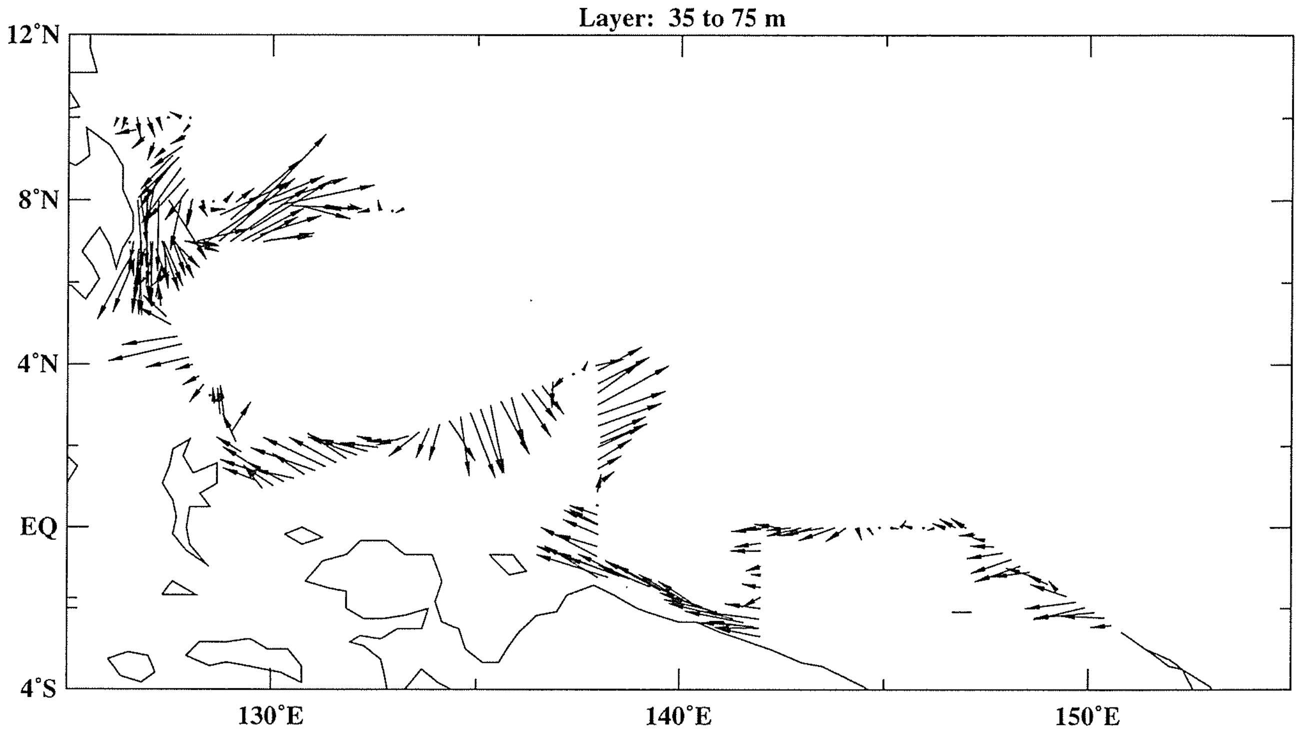
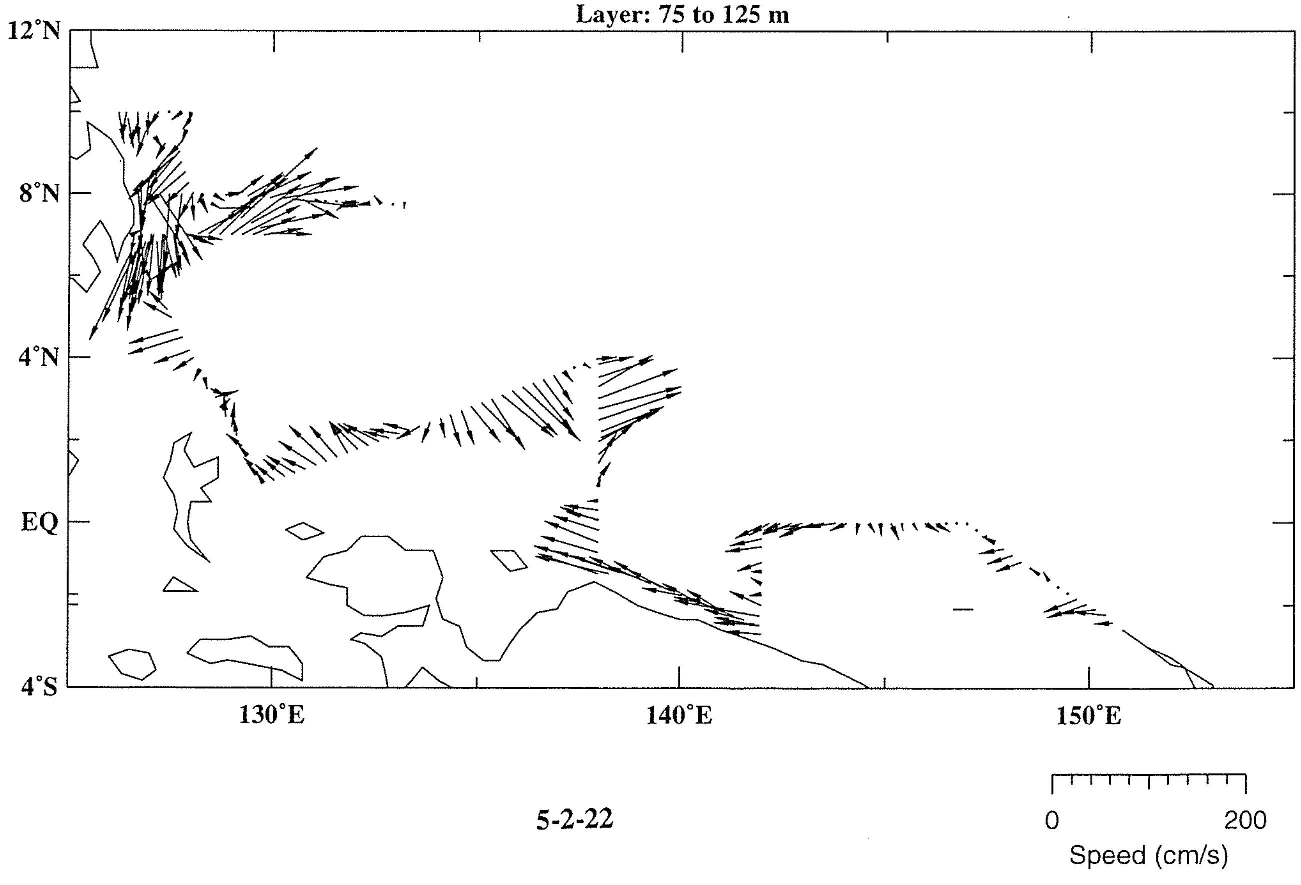


TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000





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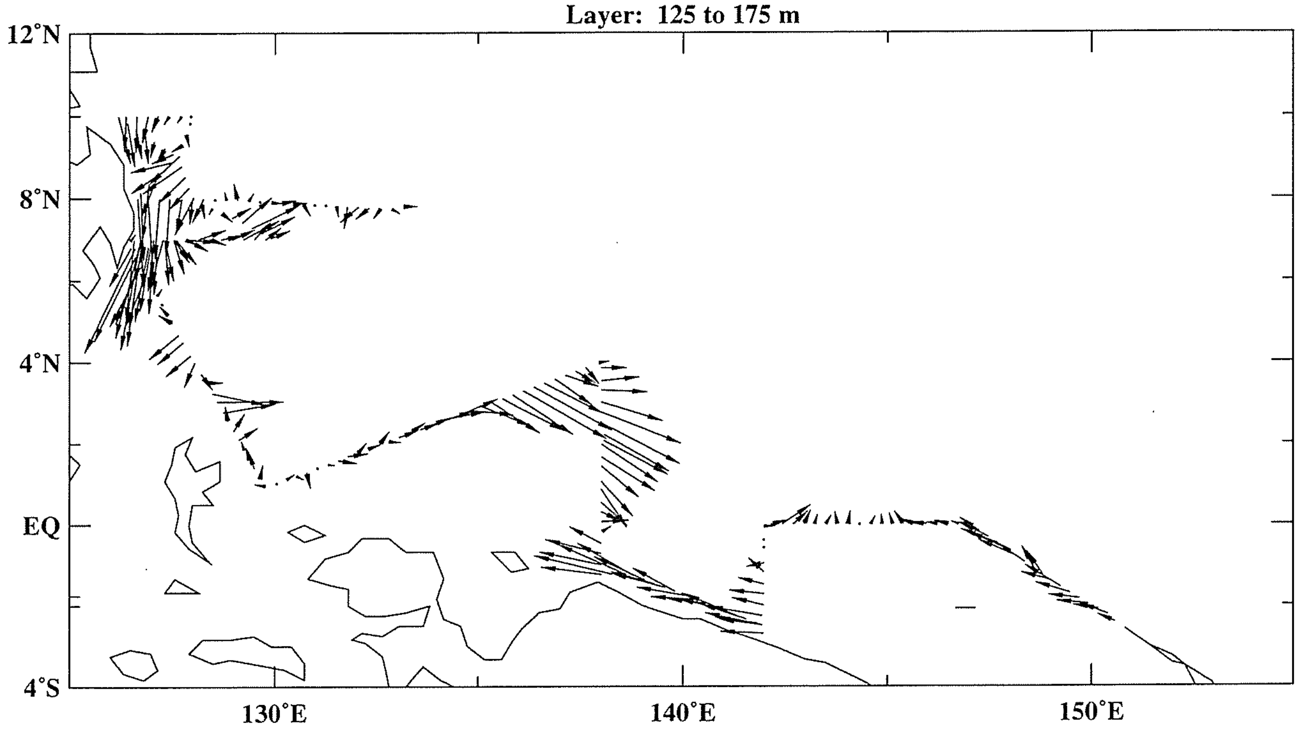
TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000

Layer: 125 to 175 m



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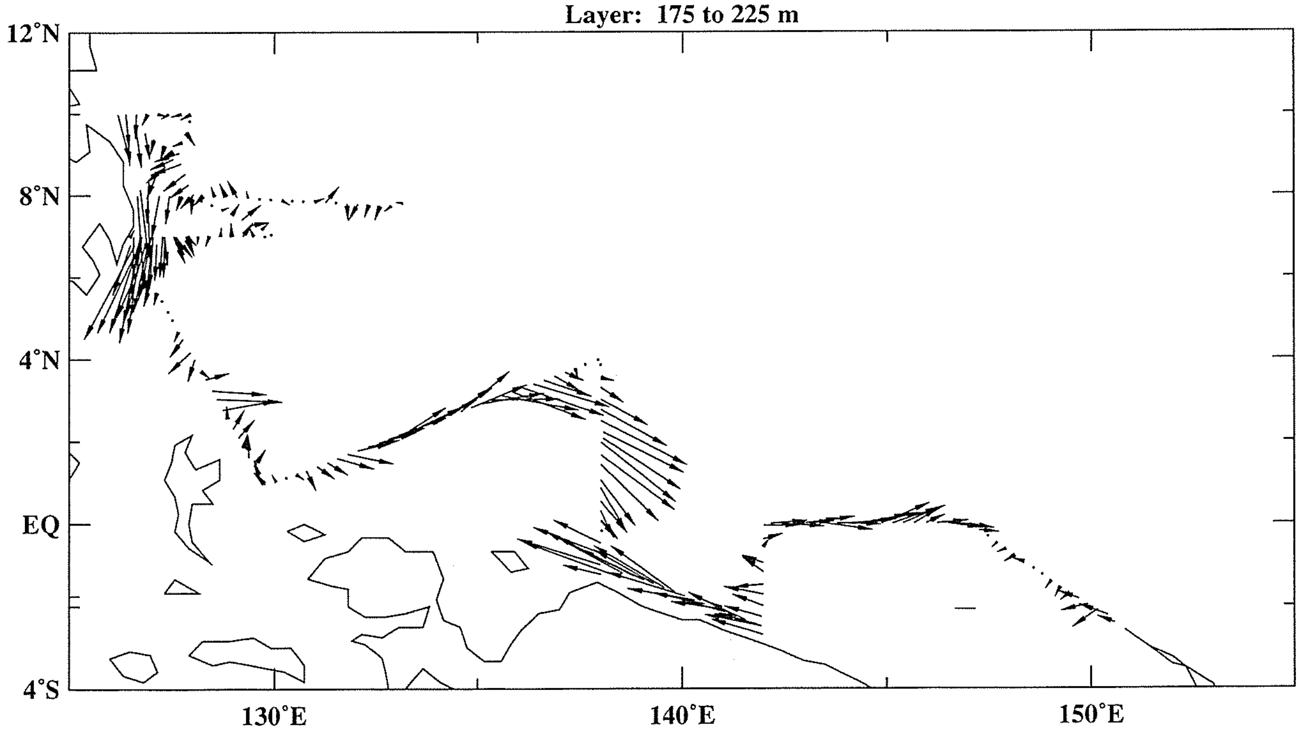

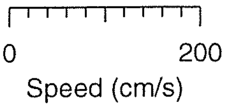

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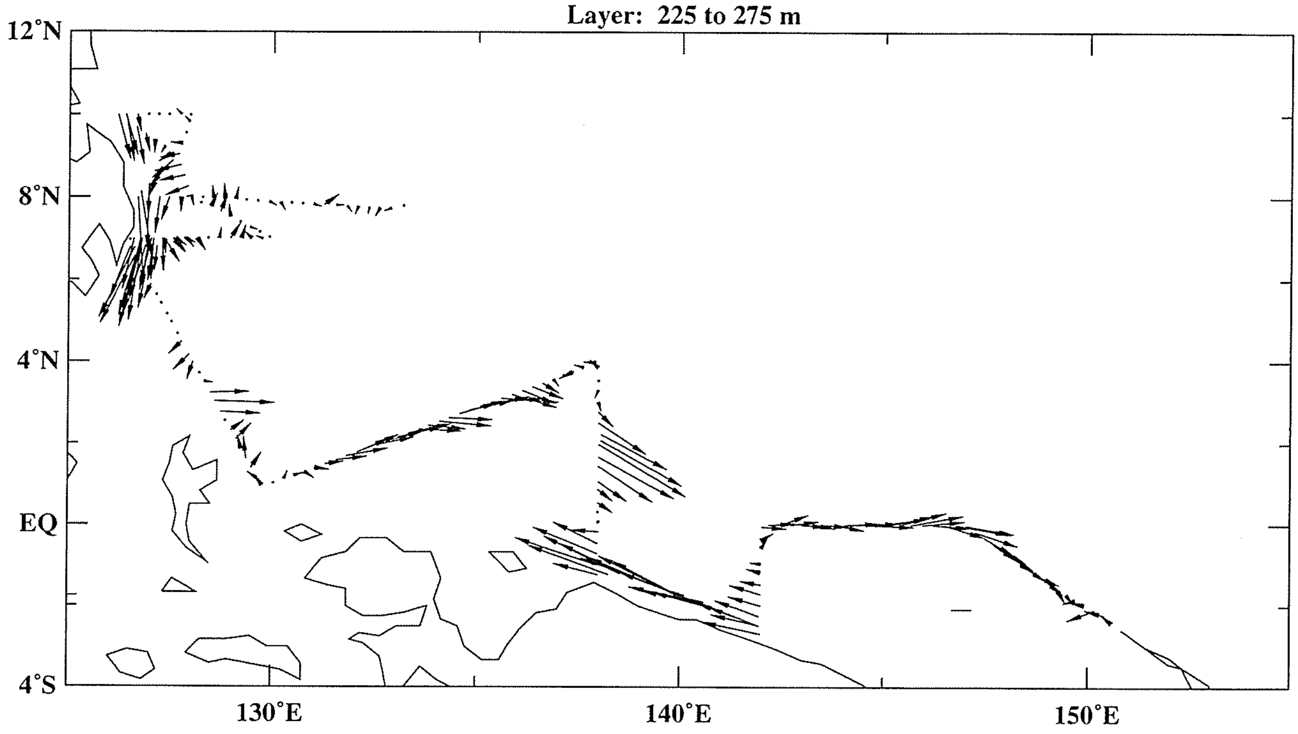
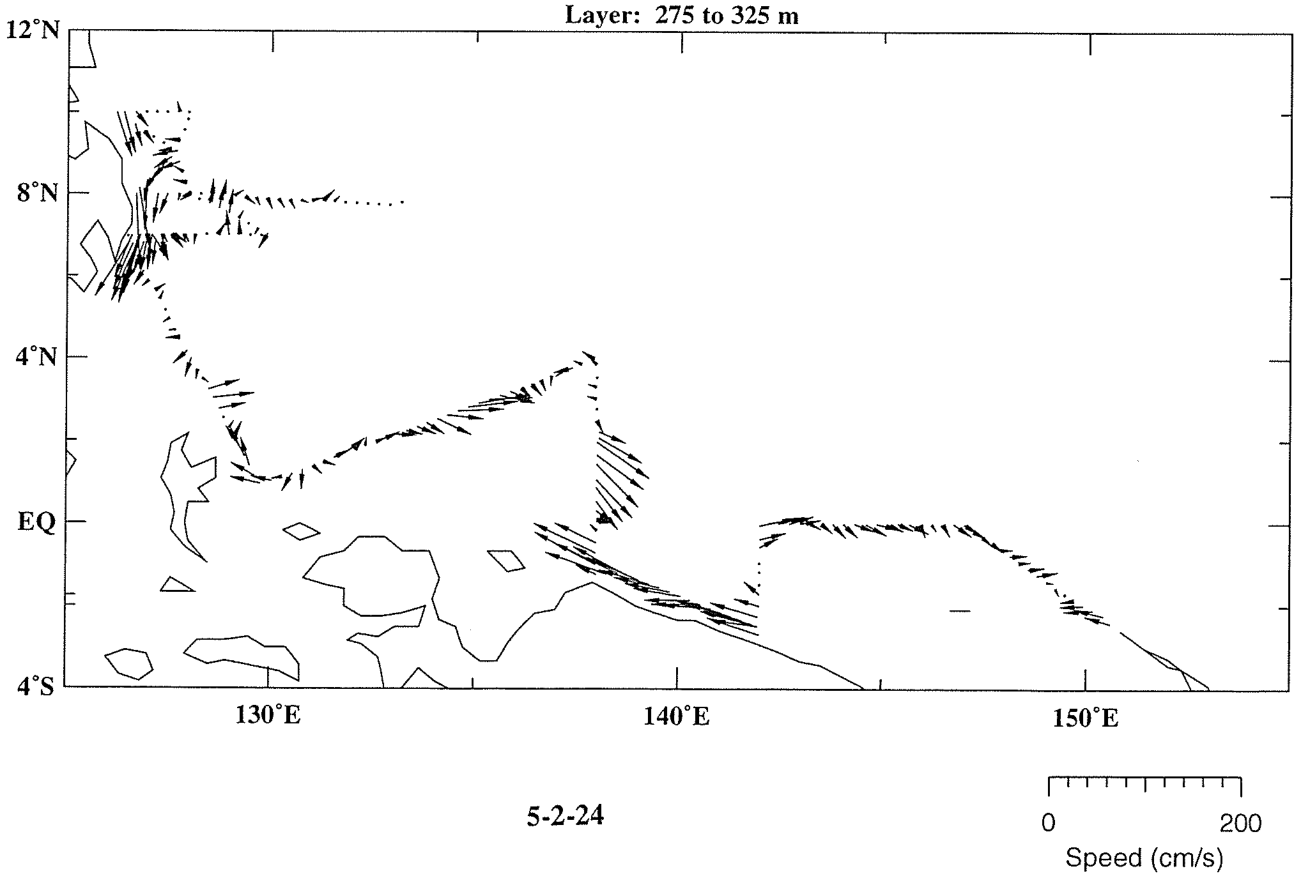
TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000

Layer: 225 to 275 m

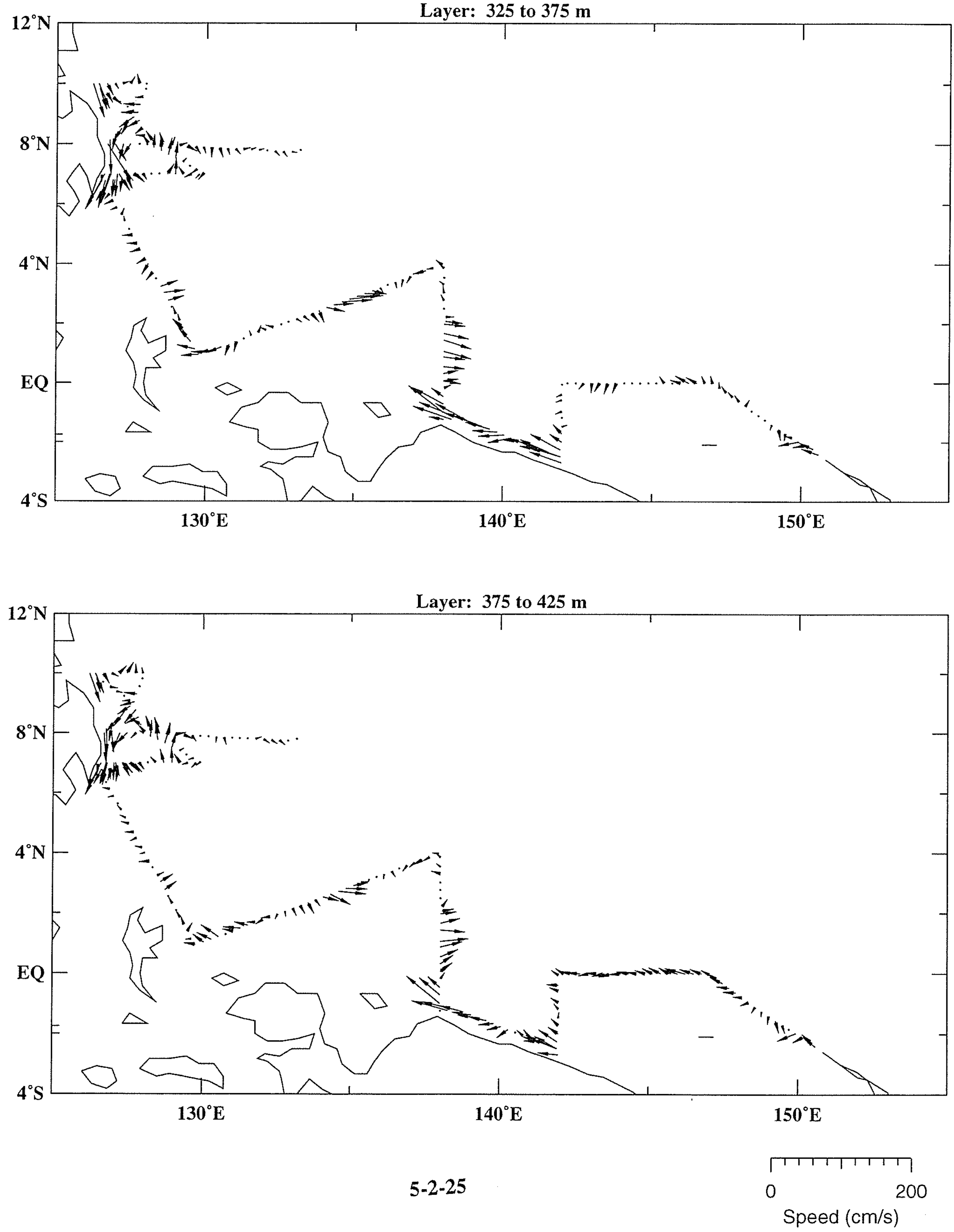


Layer: 275 to 325 m



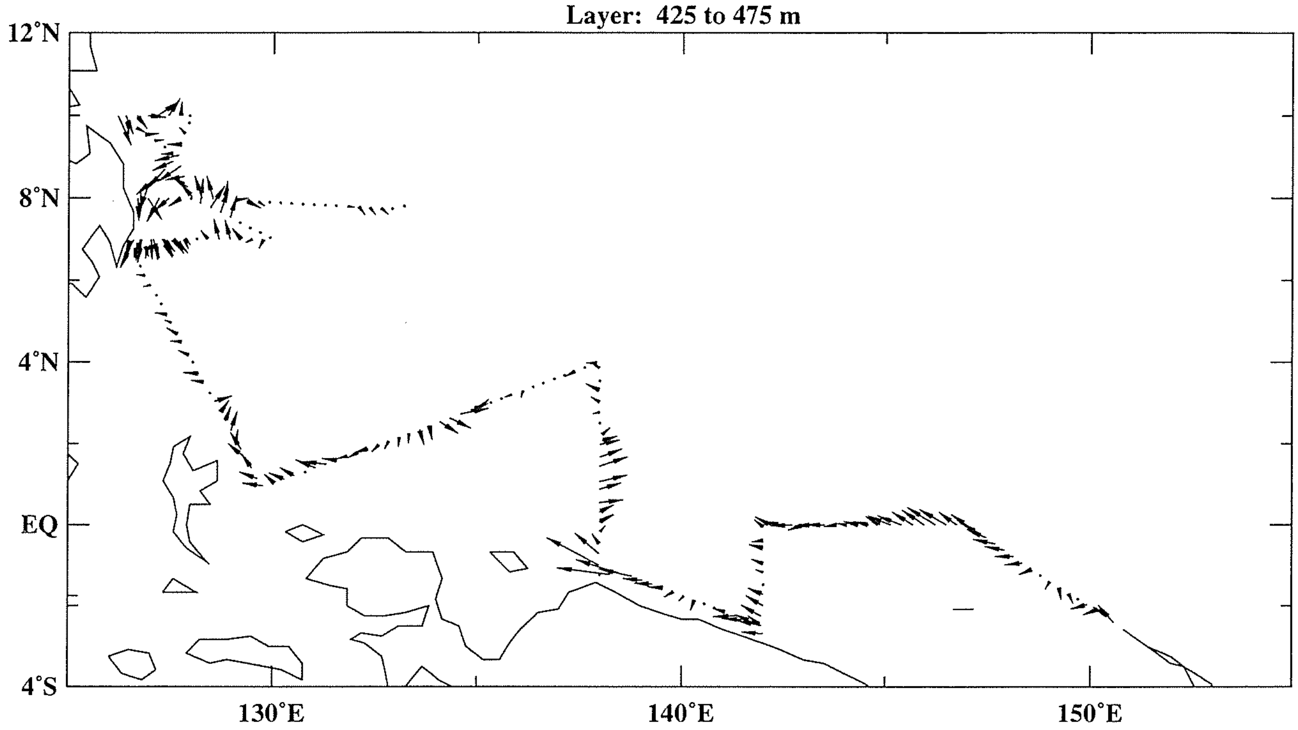
TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000

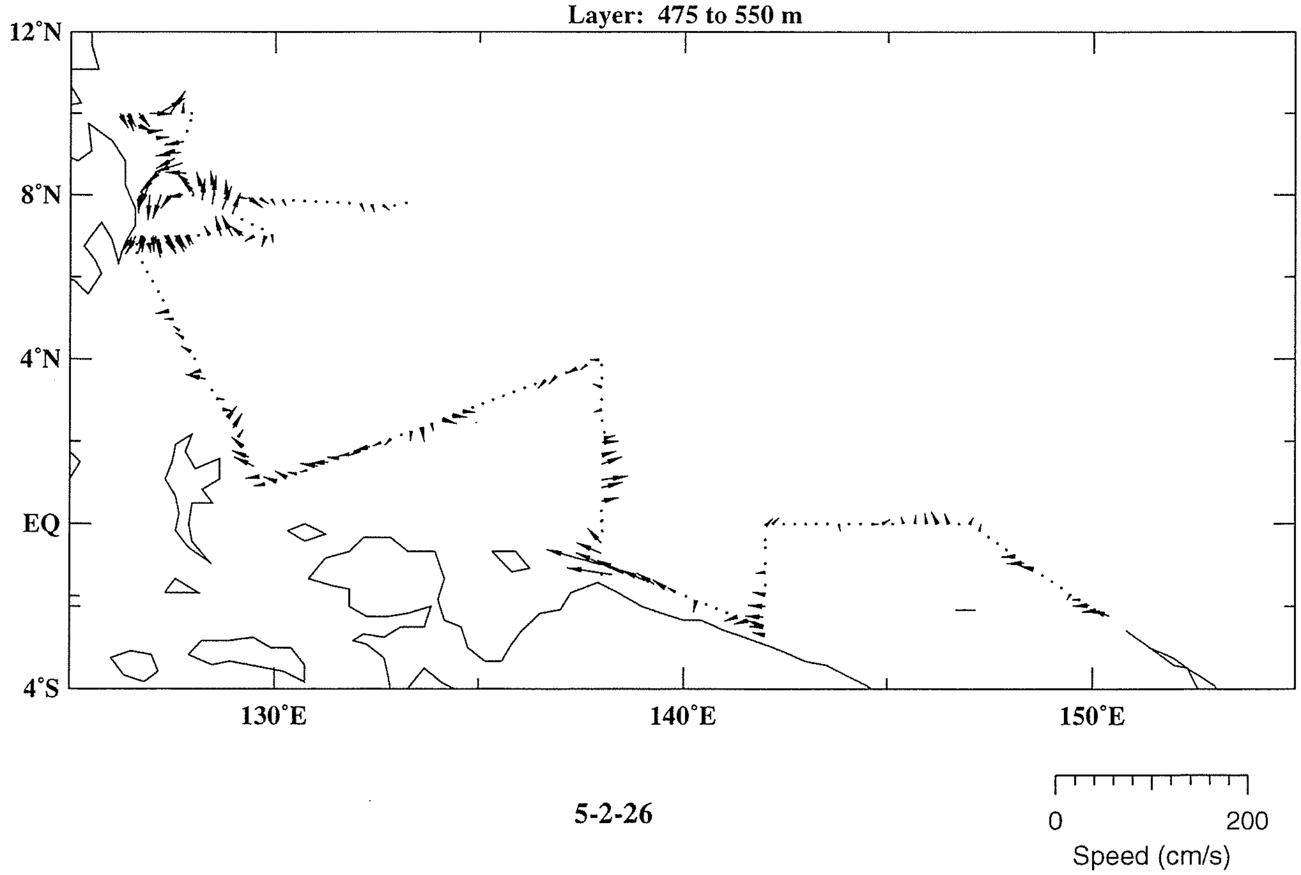


TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000



Layer: 425 to 475 m

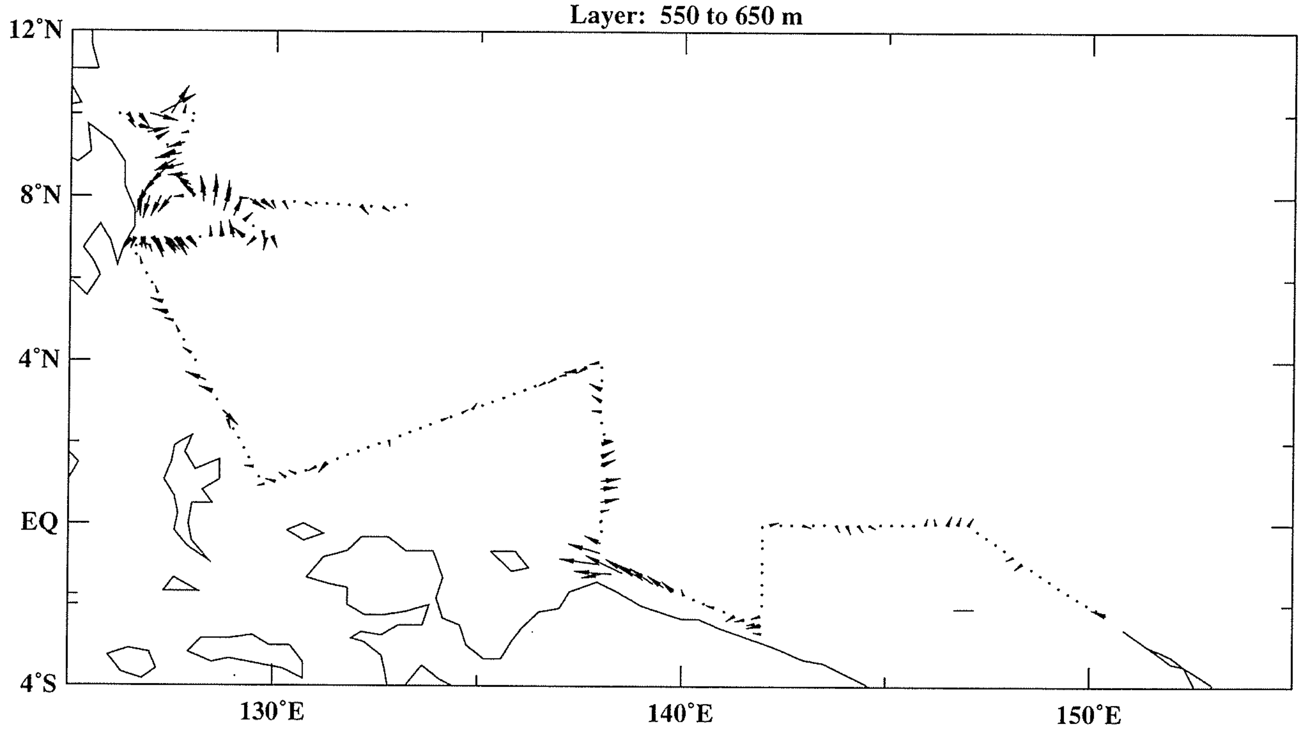


Layer: 475 to 550 m

TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000

Layer: 550 to 650 m



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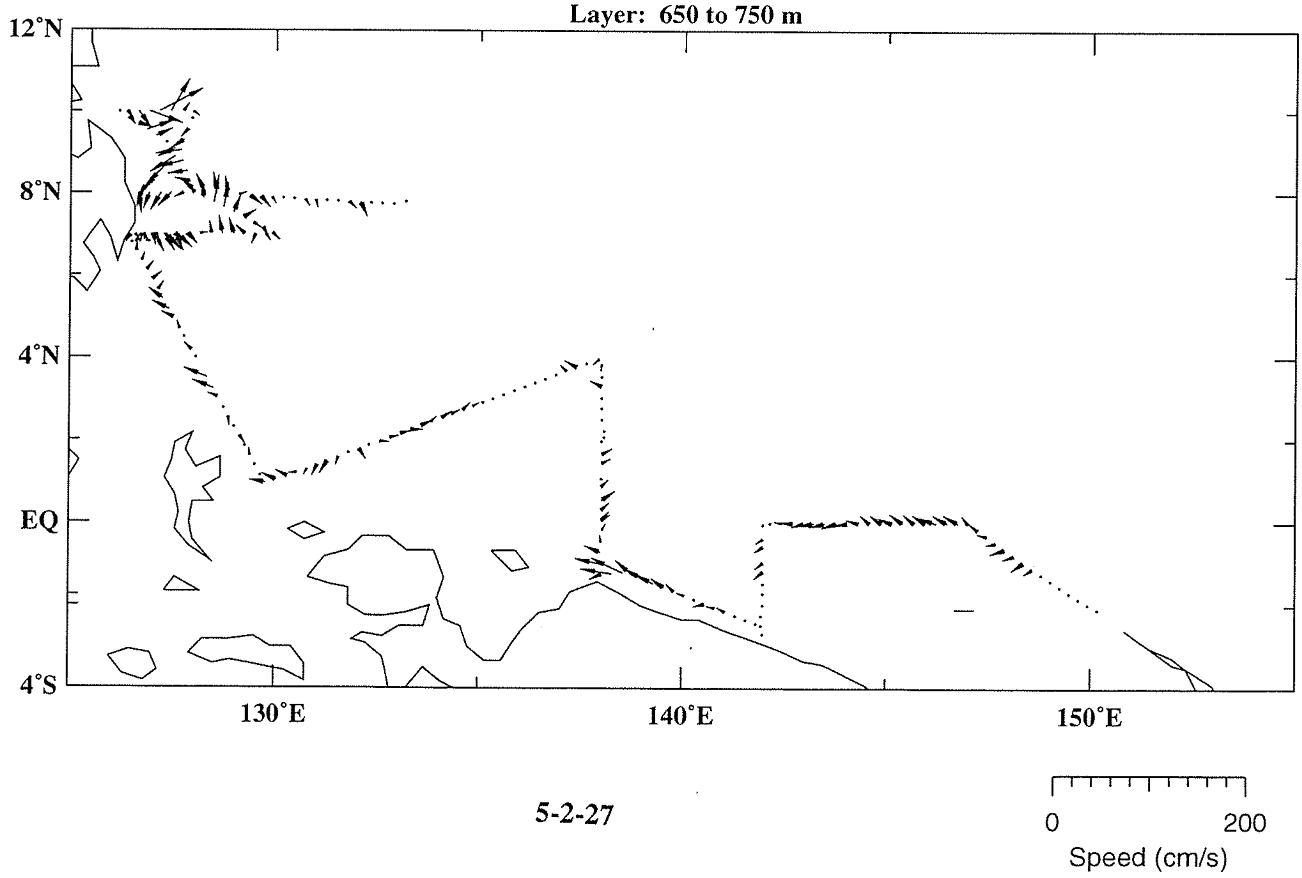
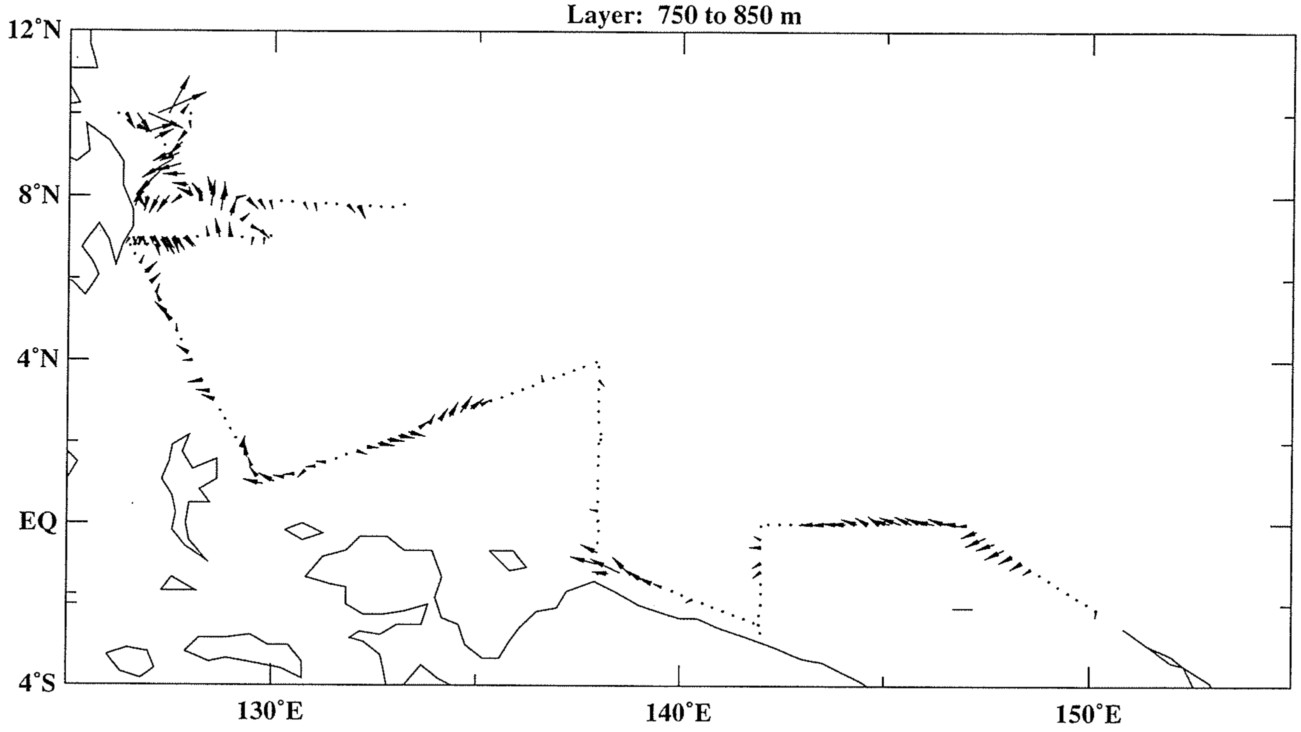


TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000

Layer: 750 to 850 m



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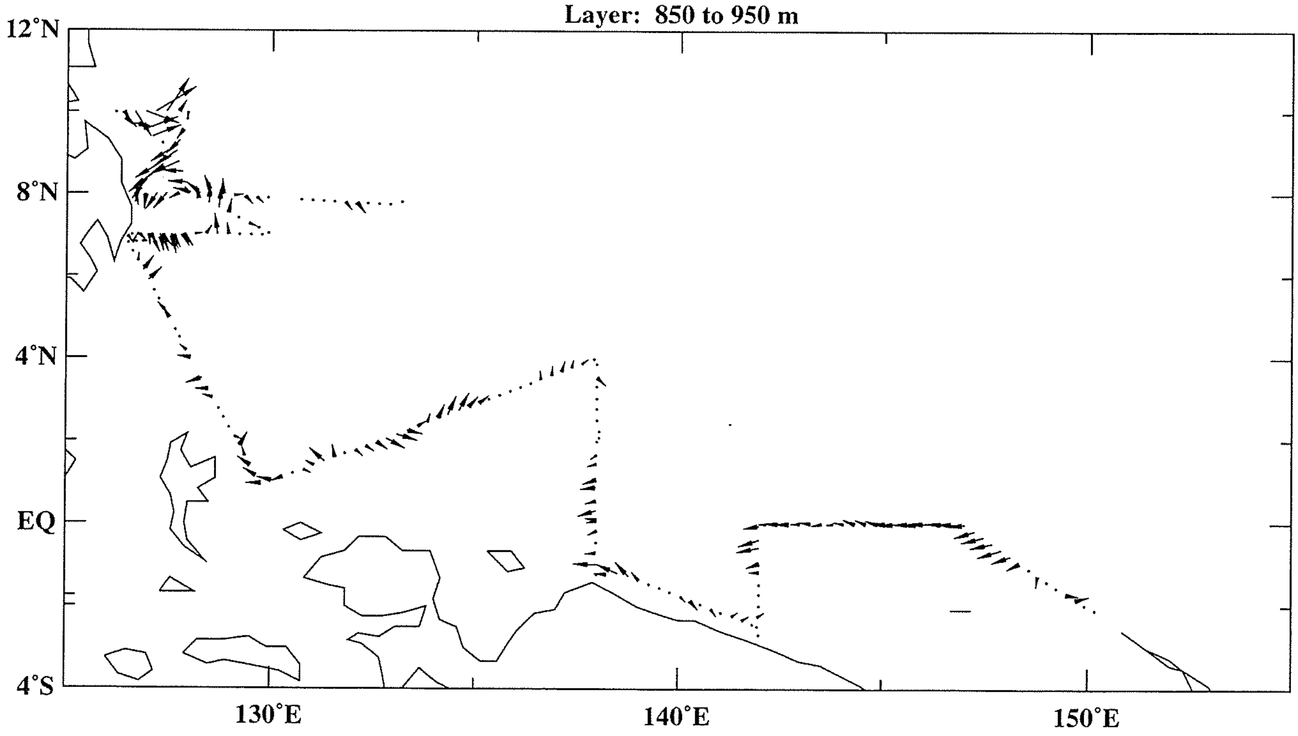
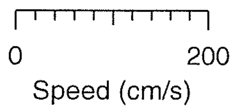
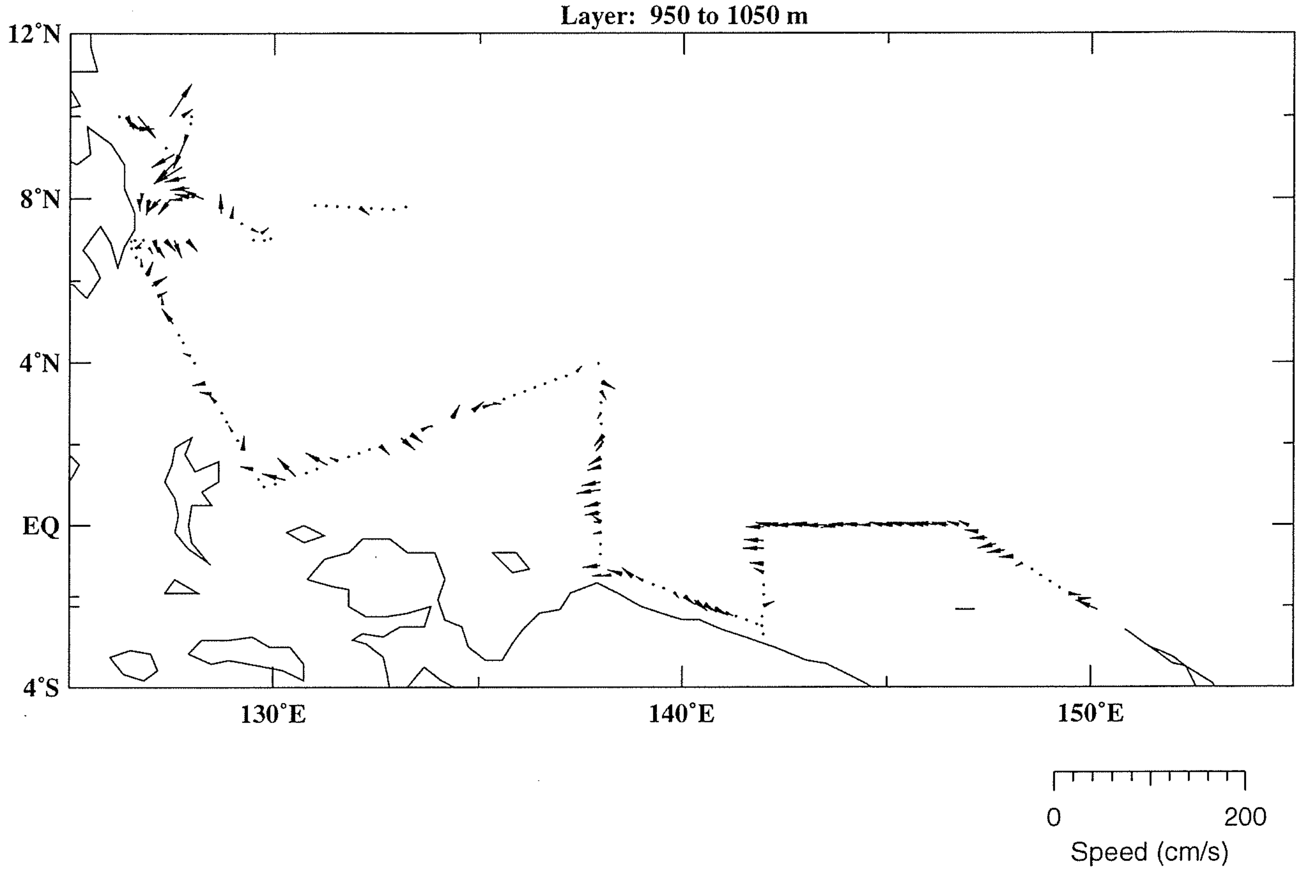




TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000

Layer: 950 to 1050 m



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TOCS, Kaiyo 0006 Leg 3

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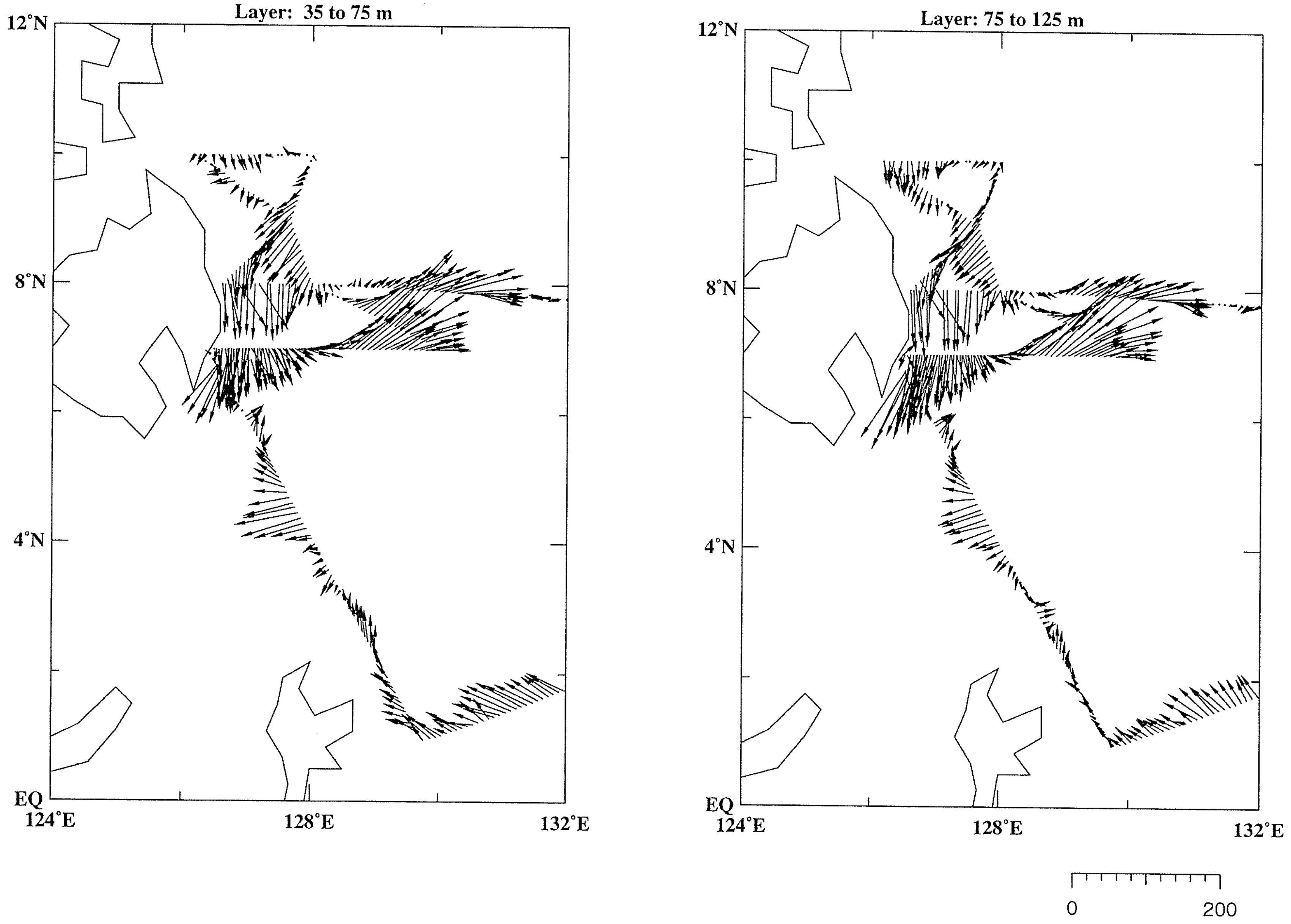

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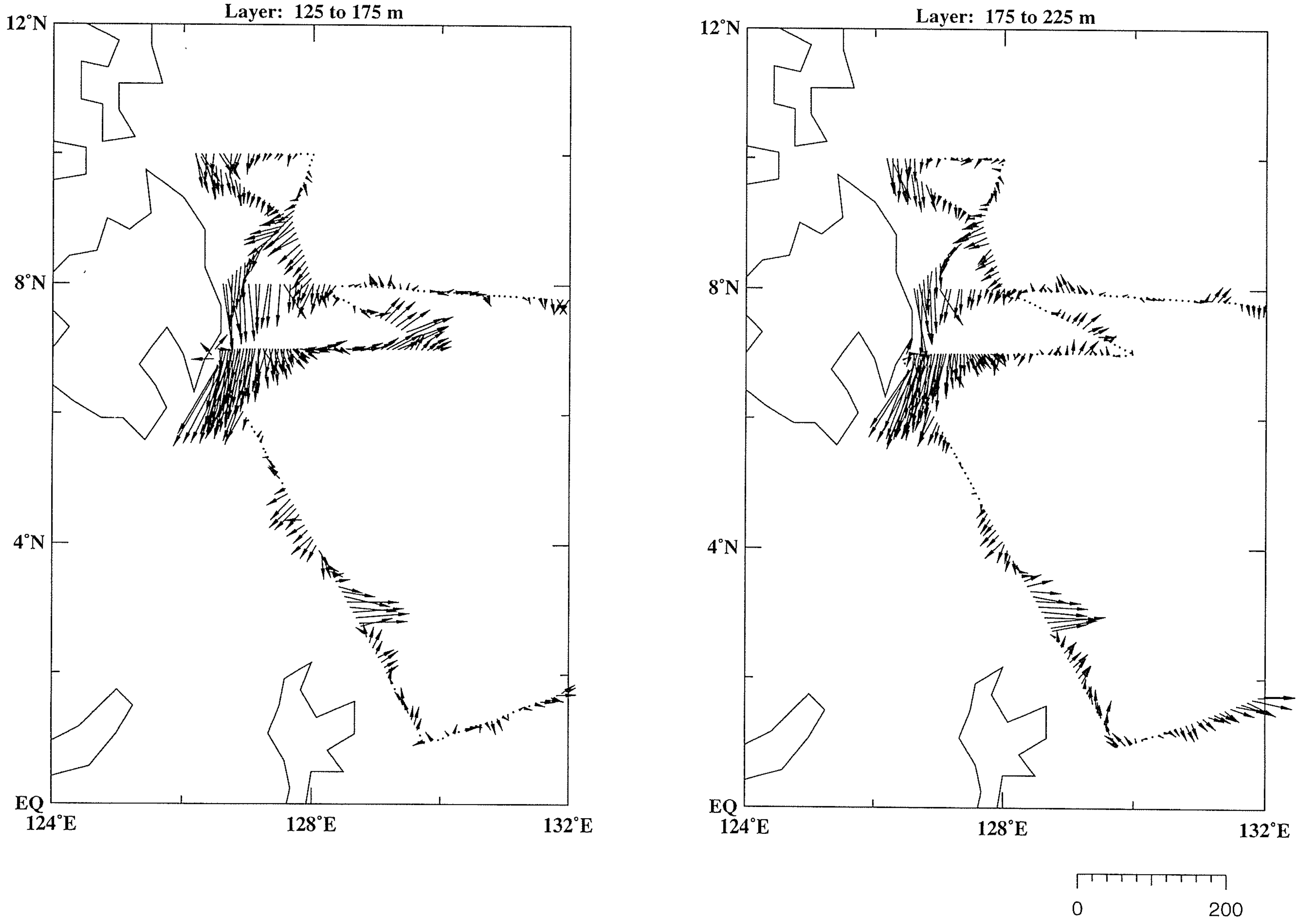

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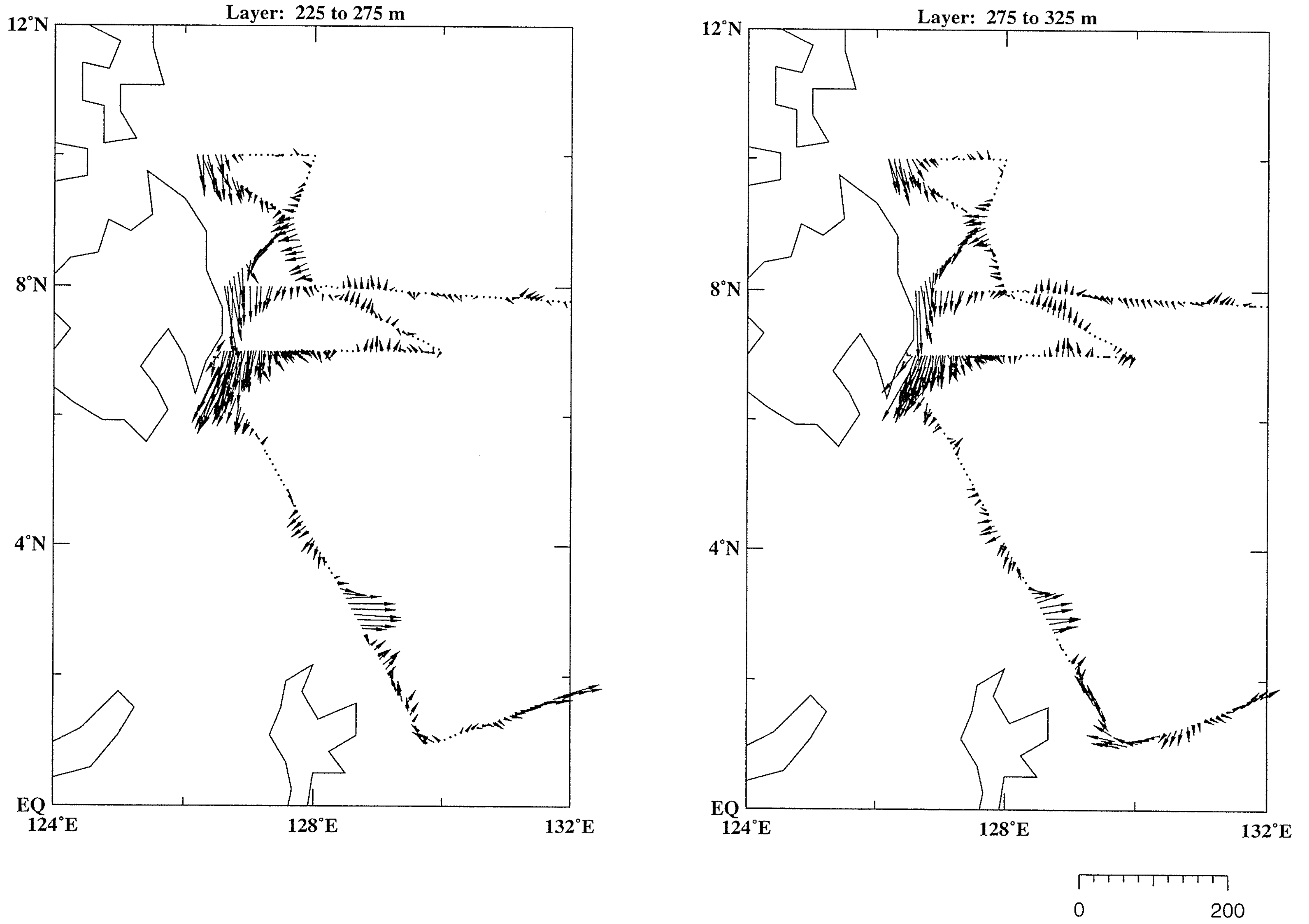

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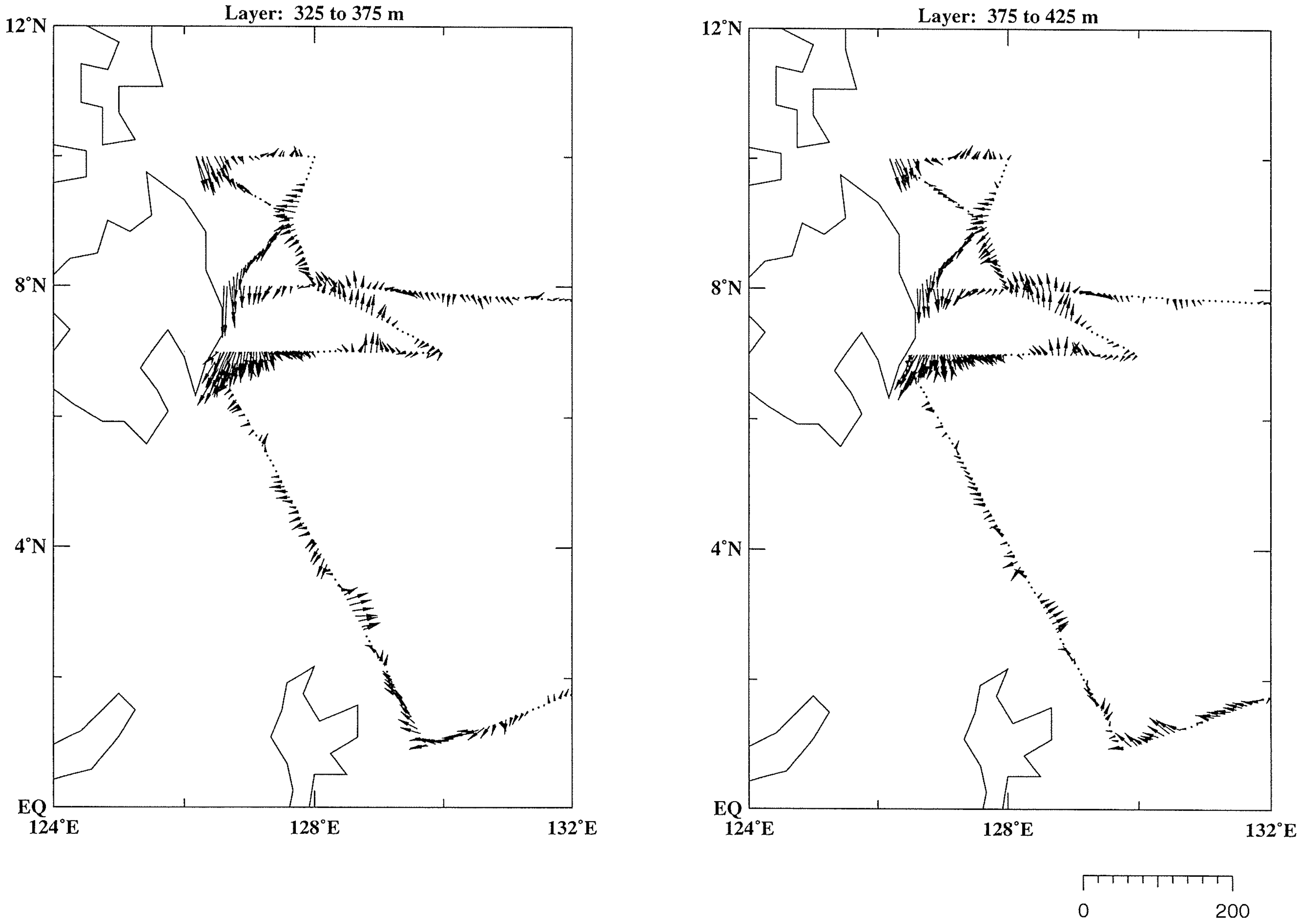
TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000



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TOCS, Kaiyo 0006 Leg 3

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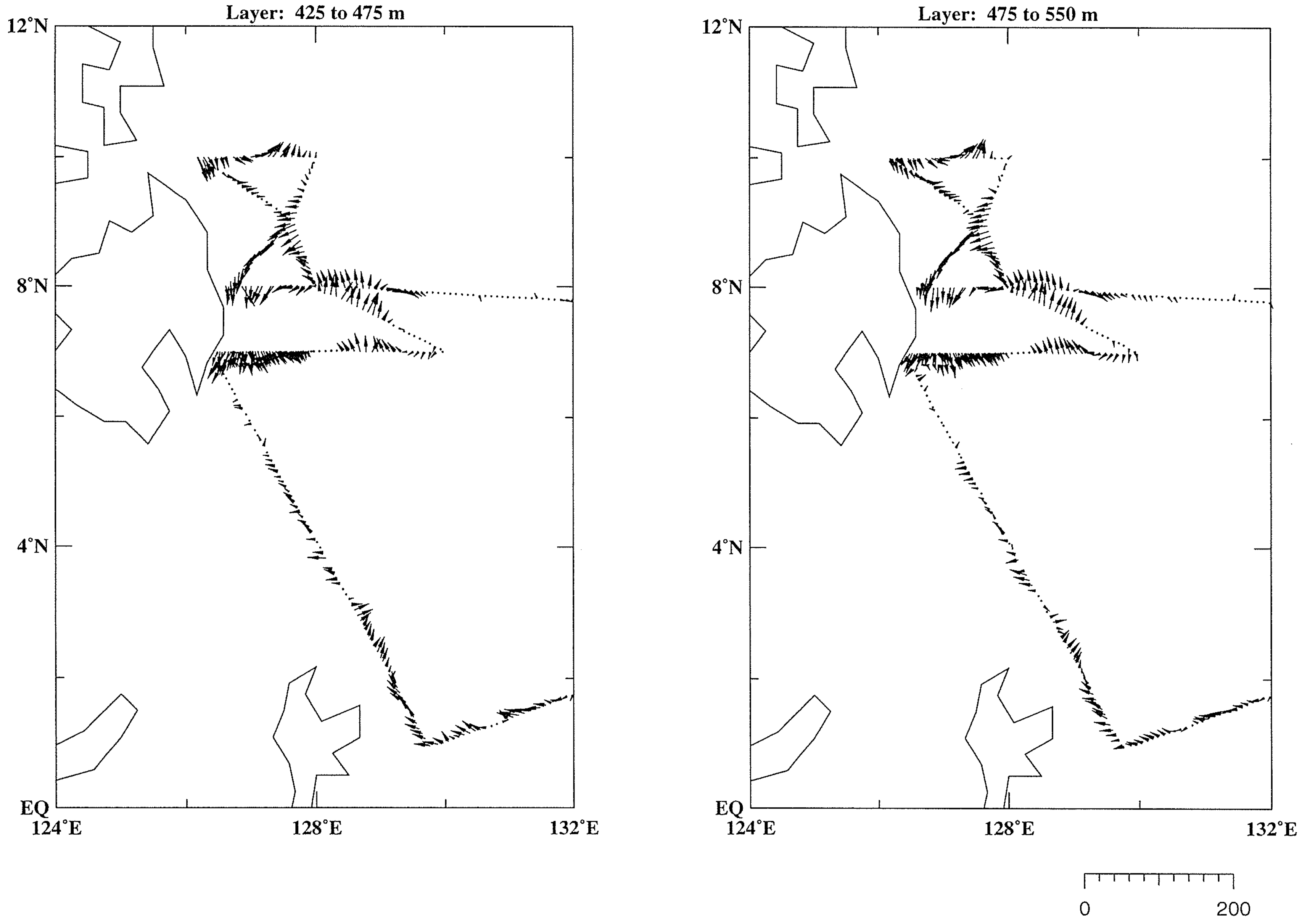

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TOCS, Kaiyo 0006 Leg 3

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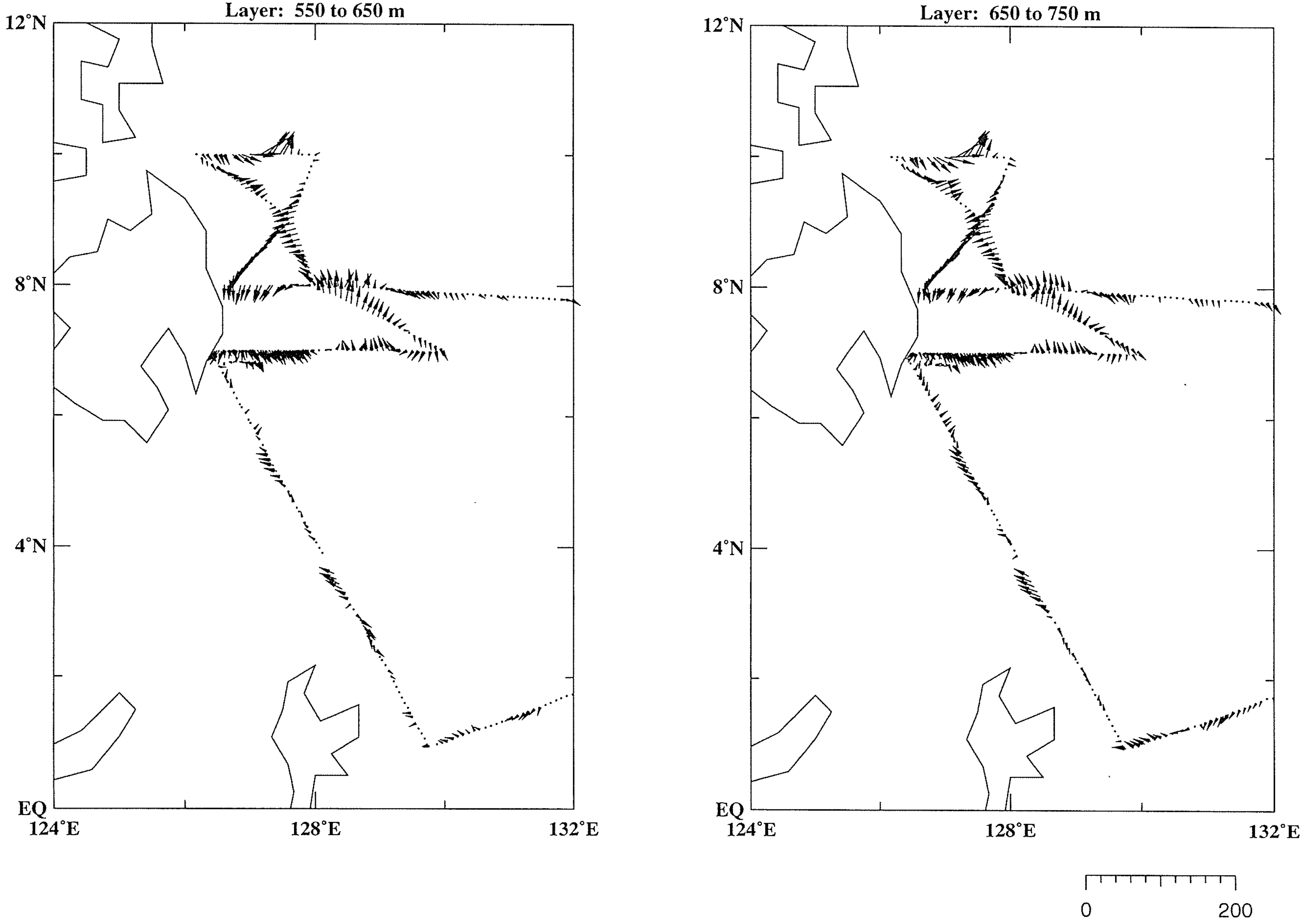
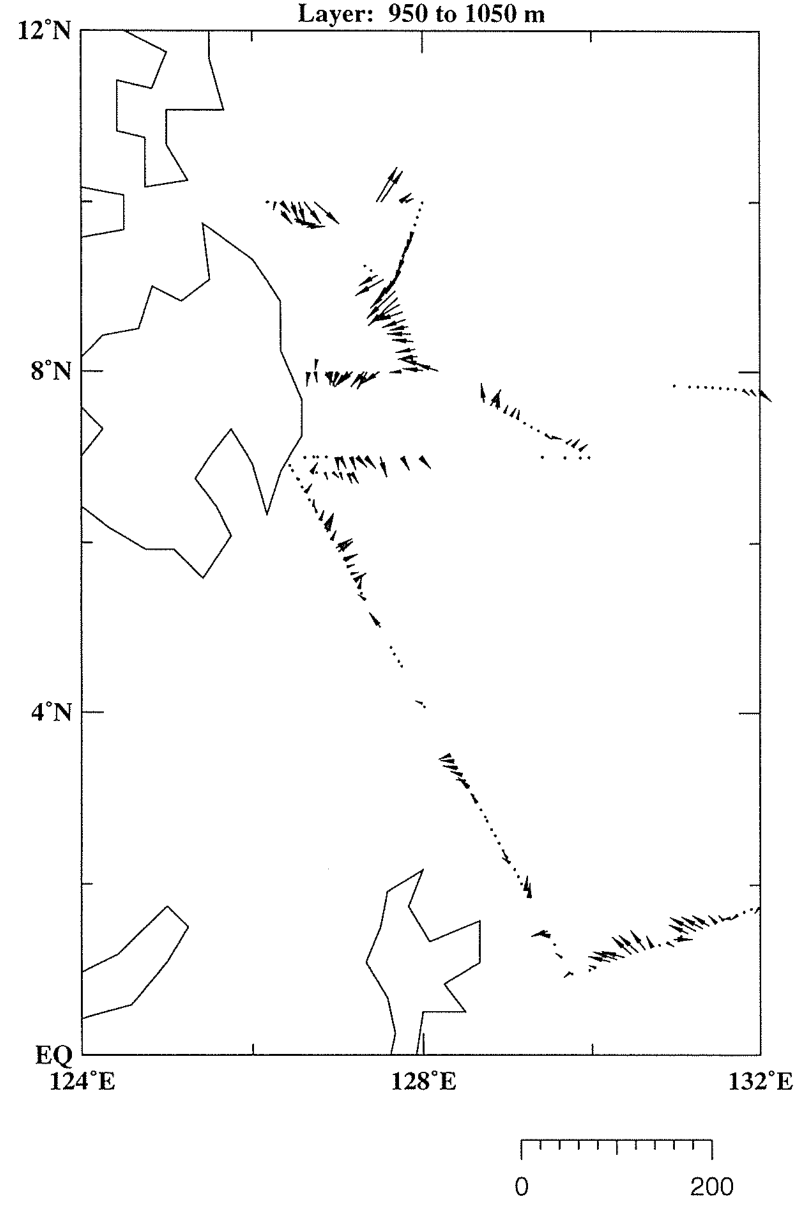


TOCS, Kaiyo 0006 Leg 3

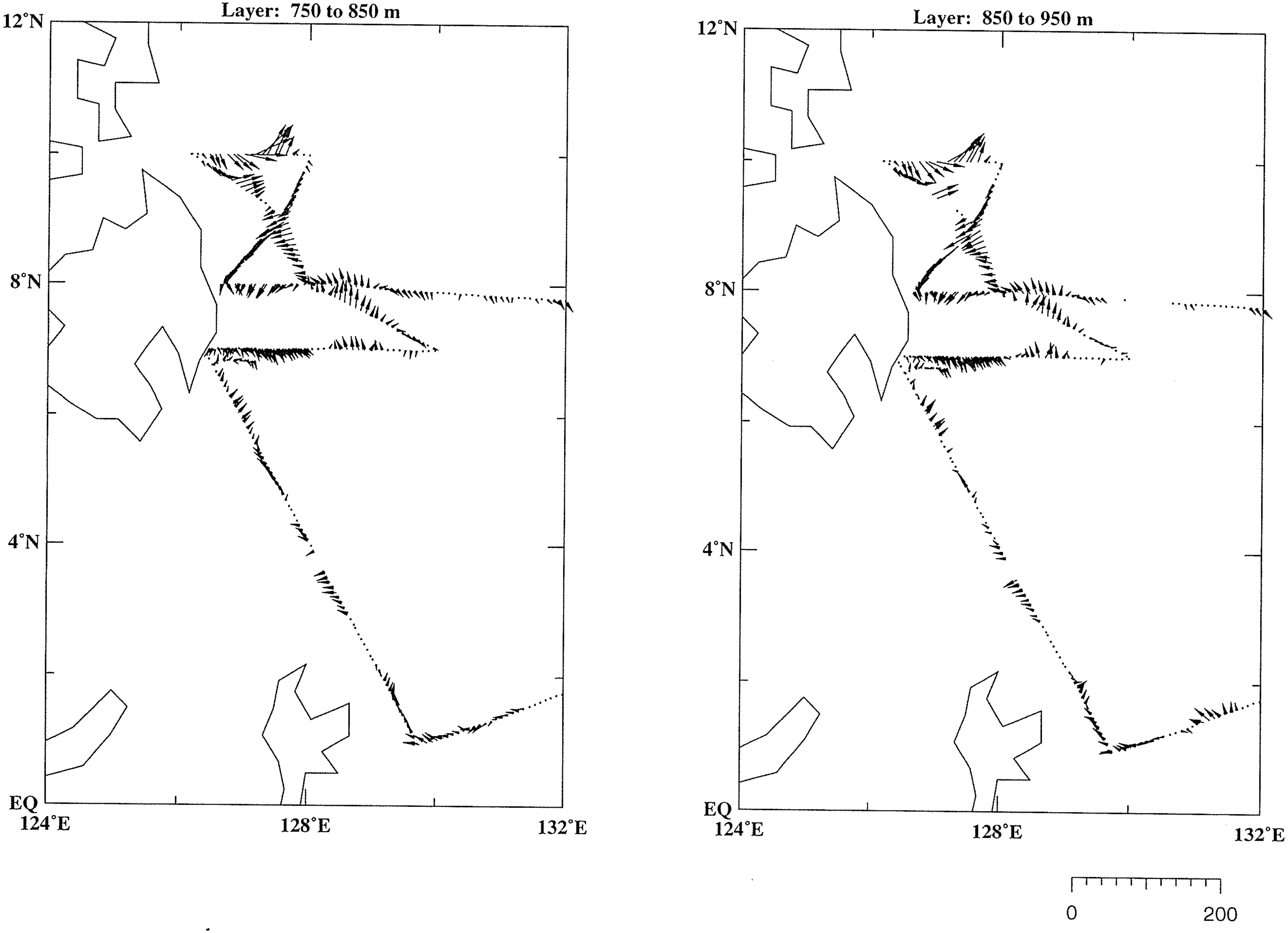
Sept 13 to Oct 1, 2000

Layer: 950 to 1050 m



TOCS, Kaiyo 0006 Leg 3

Sept 13 to Oct 1, 2000



6. LADCP

6. Lowered ADCP

Instrumentation and methods

A Sontek dual ADP-250 lowered acoustic Doppler profiler system was mounted on the rosette throughout the cruise. The underwater part of the system consists of a rechargeable battery pack, two Doppler profilers (ADP in Sontek terminology, more widely known as ADCPs), and cables connecting each ADP to the battery. A third short cable is connected to the battery unit; the other end is connected to a longer deck cable providing charging power and communications when the instrument is on deck, and covered with a dummy plug when the instrument is deployed. Data is recorded internally in the 80-Mbyte recorder in each ADP. The underwater system is rated for use to 6000 m depth.

The two ADPs (serial numbers C117 and C118) transmit at 250 kHz, with four beams at 30-degree angles from the vertical, and at 90-degree intervals of azimuth. The instruments are identical except for the orientation of the compass and tilt sensor. One ADP was mounted at the top of the rosette frame, looking up. Its transducer elements were completely above the top ring of the frame. The other instrument was mounted above and inside the bottom ring of the frame, next to the CTD, looking down, but with its axis tilted inward about 10 degrees to avoid interference from the bottom ring of the frame.

The Sontek ADPs use incoherent (narrow bandwidth) signal processing and feature shaded transducers for reduced sidelobes in their beam patterns. They are designed to ping at nearly the maximum possible rate as limited by the travel time to the last depth cell. Lowered ADP cabling and circuitry allow the two instruments to ping synchronously; this is essential to prevent interference between them.

The calculation of absolute velocity profiles requires accurate position fixes at the start and end of each cast. These were provided by the Kaiyo's differential GPS (DGPS) system. NMEA GGA messages were logged continuously at 5-s intervals throughout the cruise (excluding the transit back to Palau) via a serial line to the LADCP processing PC. The logging process (running under Linux) writes the fixes to files with a uniform naming convention, and with one file per day; this facilitates automated processing of the LADCP profiles.

Although each Sontek ADP includes a good pressure sensor, it is advantageous to use the depth estimate from the CTD for the final LADCP profile. For this purpose, 1-second time-averaged CTD profiles were used. The CTD and LADCP time series are synchronized in the LADCP software by matching their respective vertical velocity estimates.

The ADP system was prepared for each station by sending a set of commands using the Sontek program `sonterm`, unplugging the charger, disconnecting the deck cable, and dummying and securing the end of the short underwater cable that remains connected to the battery pack. The entire process takes about 5 minutes. A script was used to modify the command files for each station; only the deployment name needed to be changed. At the end of each station, the system was reconnected, charging commenced, and the data were dumped from each ADP in turn, using the Sontek program `sonrec`. Serial communications was via RS-485, with data downloading at 115,200 baud. Typical raw data file size from each 2000-

m cast was 6 MB for each instrument.

With one exception, the instrument setup was identical for all stations, and the only difference between the two instruments was that the up-looker was designated the master and the down-looker the slave. Commands were sent first to the slave (instrument number 1) and then to the master (number 2), at which point both began to ping. Setup parameters include 8-m blanking interval, 8-m cell size, 16-m ping length, 20 depth cells, and maximum ping rate, which was just under 3 pings per second. The only exception was station 40, for which 16-m cells were used. Data were recorded in beam coordinates.

Data processing was done using software developed at the University of Hawaii and available via anonymous ftp or web browser (see `http://currents.soest.hawaii.edu`). The general method is described by Fischer and Visbeck (1993). The UH implementation includes routines written in C, Perl, and Matlab, and runs under Windows or Unix. It is designed for automated processing of many profiles at a time, and for flexibility with respect to editing and other processing parameters. The system handles data from RDI as well as Sontek profilers. At the end of this cruise a method for blending data from the up-looker and down-looker was implemented, including using the shear measurement between the respective first depth cells of each instrument. Although the method needs to be refined, it is still yields better profiles than the previous method of processing the data from the two instruments separately, so it had been used to make the plots in this report.

Results

Profiles were obtained from both instruments on all stations except 85, 86, and 88, when cable and connector failures blocked communications with the instruments. There were no other hardware or software problems, and data downloading was flawless.

Acoustic scattering is extremely weak below about 1000 m in the region of this cruise. It is better closer to the equator than in and north of the NECC. Conditions are marginal for lowered ADCP profiling, and data below about 1500 m are particularly suspect. At present, the comparison between the LADCP profiles and the corresponding on-station shipboard ADCP data is mixed; some profiles compare very well, others show disturbing discrepancies, sometimes in the shear, sometimes as a general offset. More work is needed to track down the causes of the discrepancies (which are almost certainly dominated by error in the LADCP, not the shipboard ADCP), and correct them where possible. Nevertheless, it appears that we have useful information on most stations. Use of the shear between the up-looking and down-looking instruments helps considerably in these low scattering conditions.

Maps and Sections

The preliminary LADCP currents are displayed here as vector maps of currents in 250-m layers starting at 500—750 m and ending with 1500—1750 m, and as contoured sections. The most interesting feature is the energetic set of deep eddies immediately to the east of Mindanao. The pattern is mapped most thoroughly by the shipboard ADCP; the LADCP indicates that the strong velocities seen in the shipboard data from 500—1000 m actually extend down to 2000 m or more in much of the region near Mindanao. The complete circulation pattern is not entirely clear, but inspection of the vector maps suggests that there are two cyclonic deep eddies, one centered near 8N, 128E, and the other slightly north of 10N, 127E. As on KY9909, deep southward flow is found below the Mindanao Current; but the present cruise indicates that this was most likely not part of a long western boundary current, or even a meridionally elongated recirculation, but rather the western side of a cyclonic eddy as in the sections on this cruise. The temporal variability of these eddies remains to be determined.

On the equatorial sections, a striking feature is the predominance of deep westward flow near the equator, reminiscent of what we saw on the WOCE P10 section. The eastward flow below 800 m and between 2N and 3N on the 138E section is suggestive of the northern intermediate countercurrent previously seen on sections to the east.

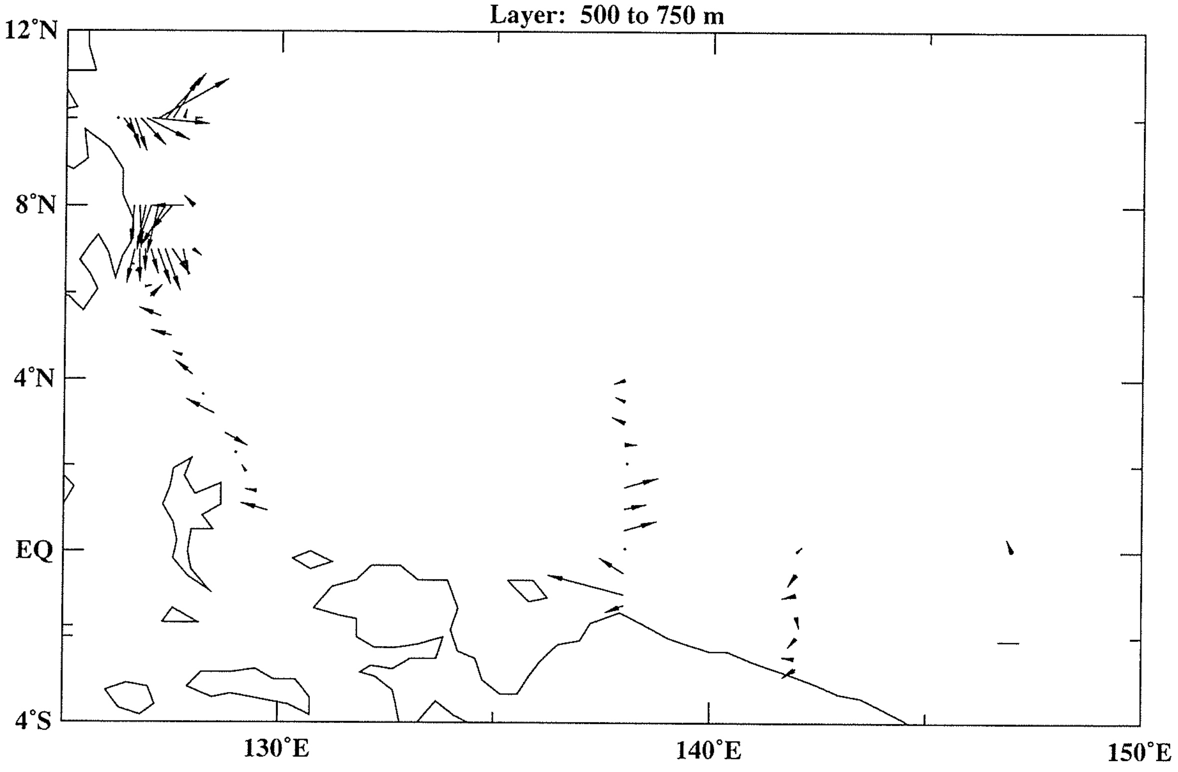
The northwestward diagonal section from 1N to Mindanao includes a nearly zonal subsurface jet between 2N and 3.5N, with maximum eastward current near 200 m.

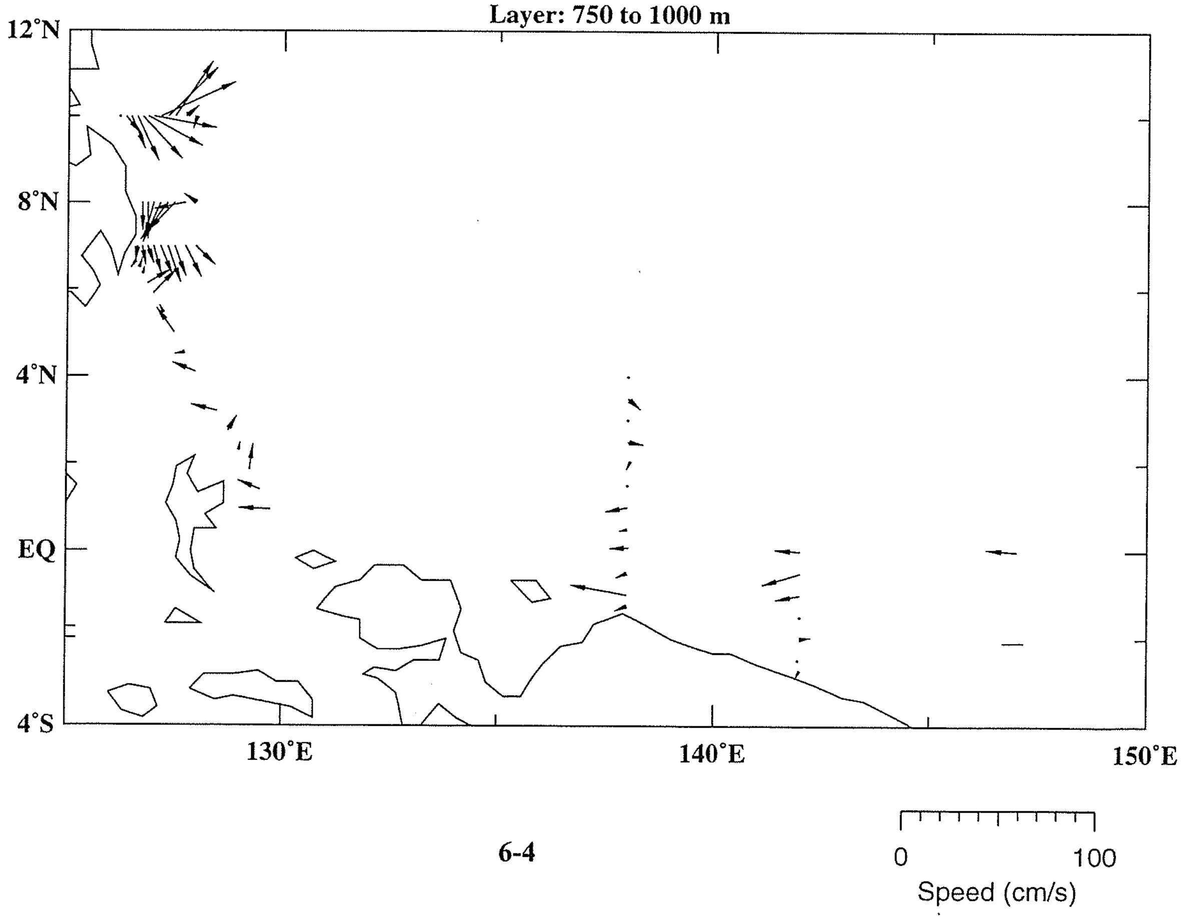
References

Fischer, J., and M. Visbeck, 1993. Deep velocity profiling with self-contained ADCPs. J. Atmos. Oceanic Technol., 10, 764-773.

Kaiyo 0006 Leg 3

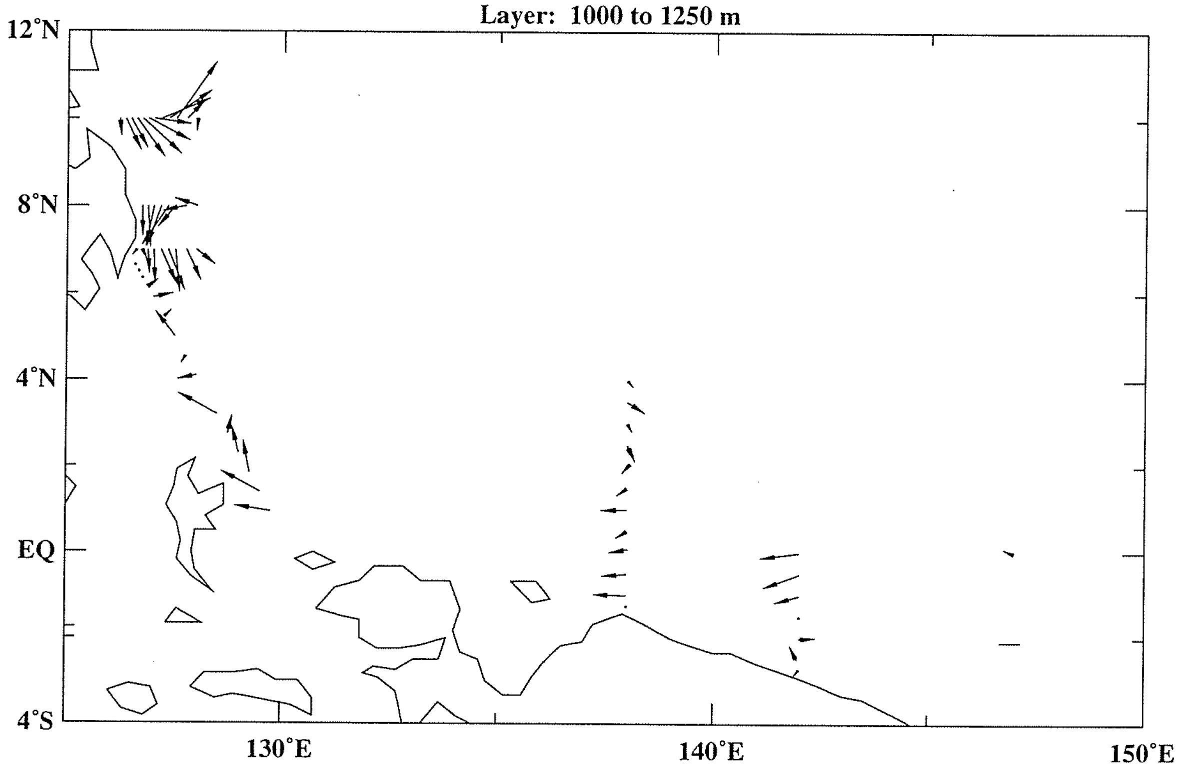
Preliminary LADCP

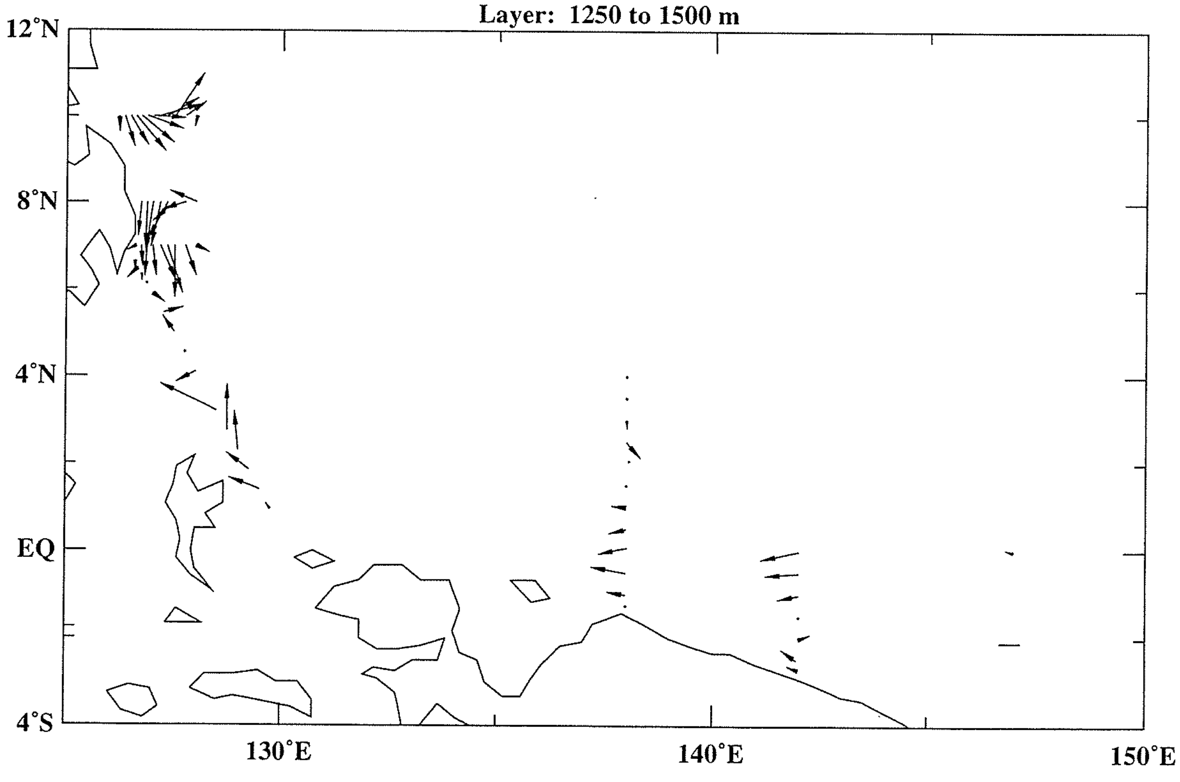


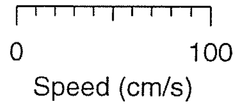


Kaiyo 0006 Leg 3

Preliminary LADCP

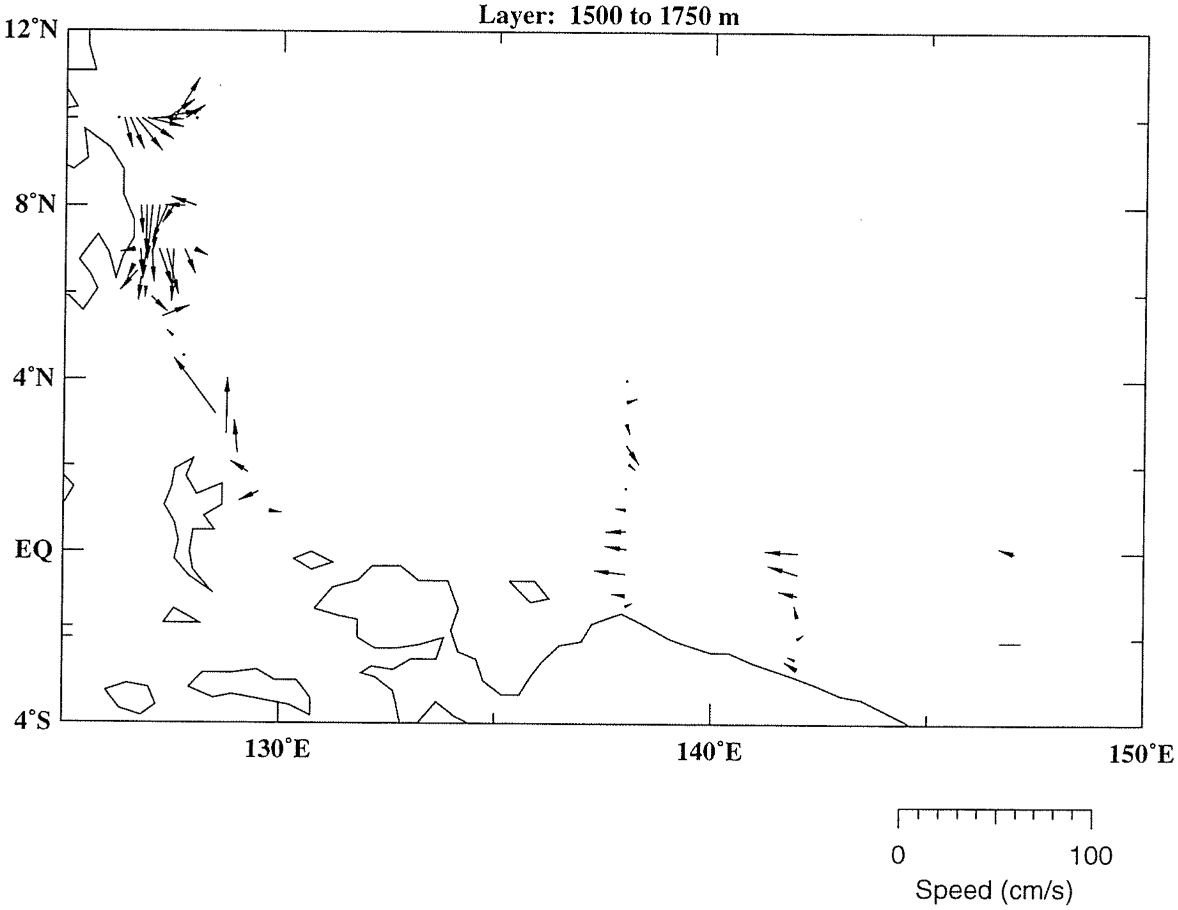


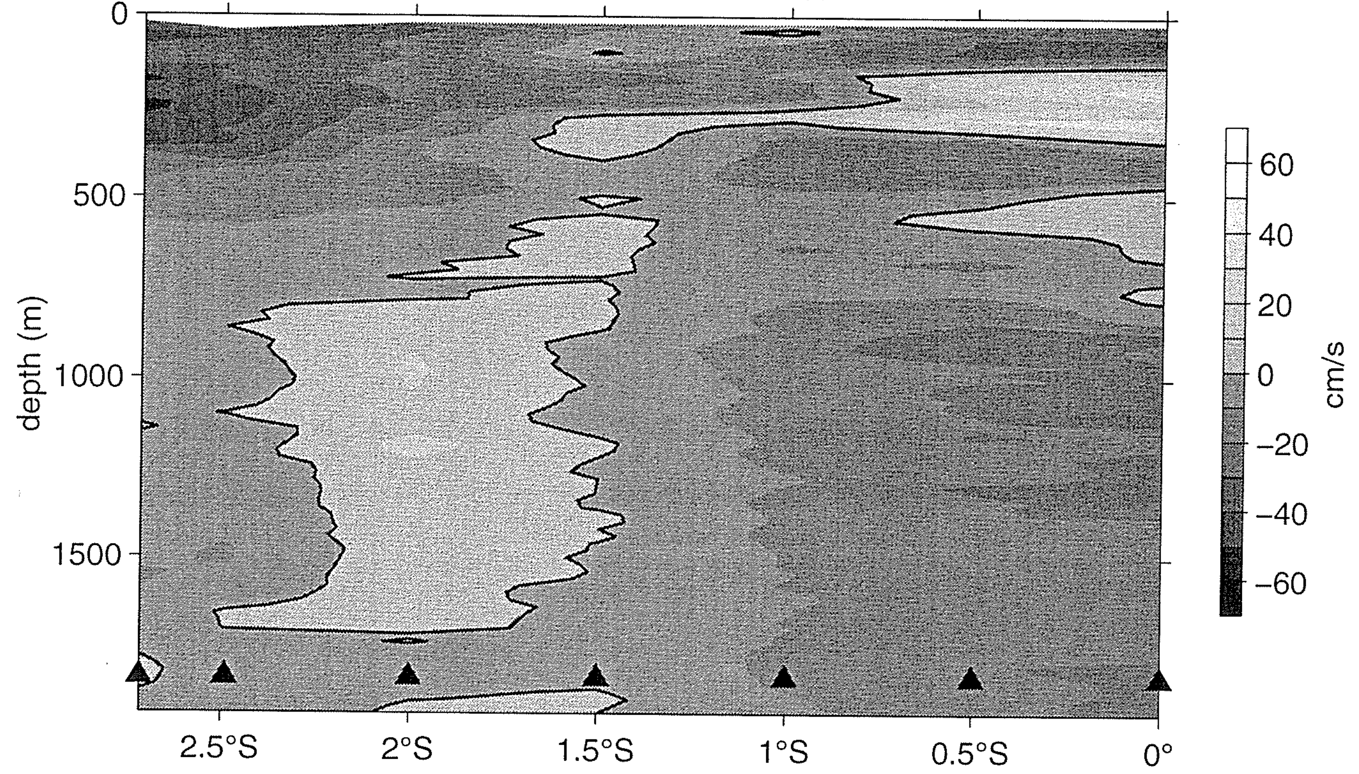




Kaiyo 0006 Leg 3

Preliminary LADCP

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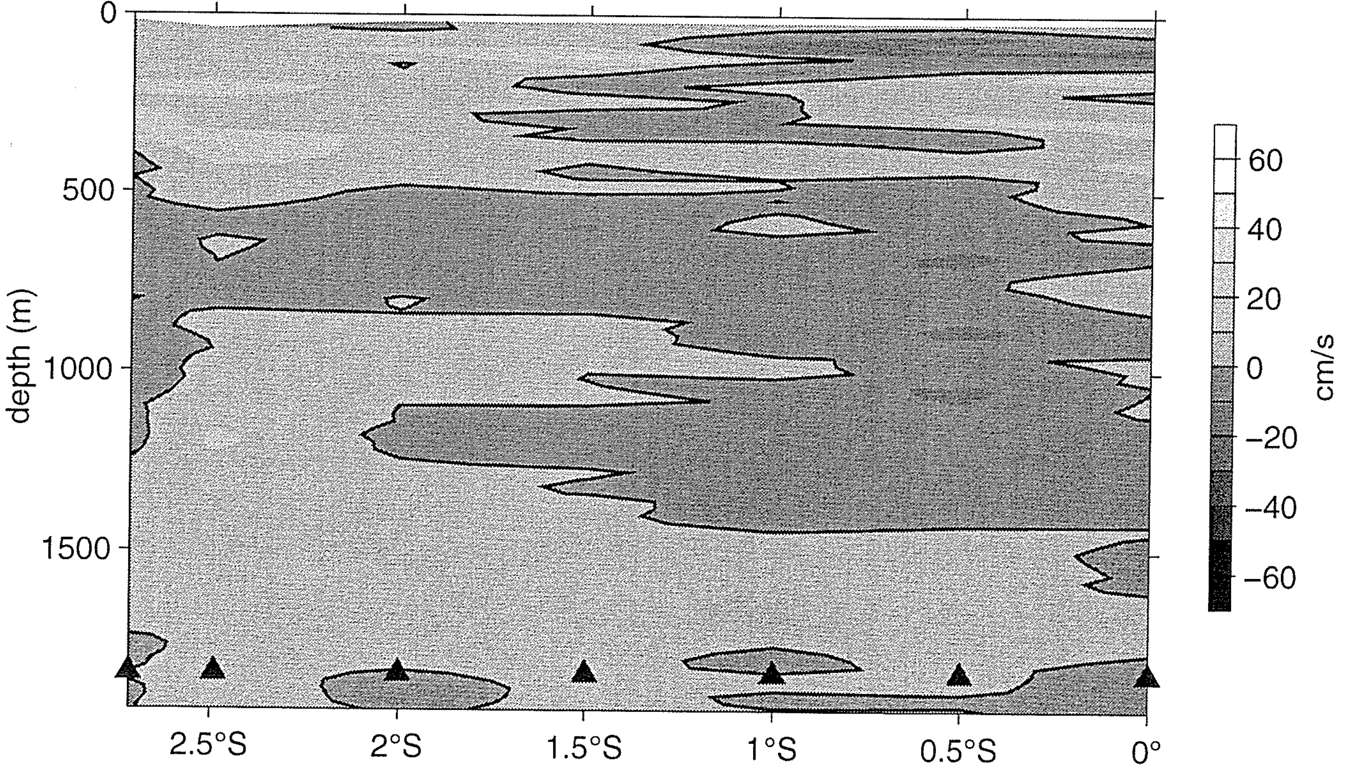
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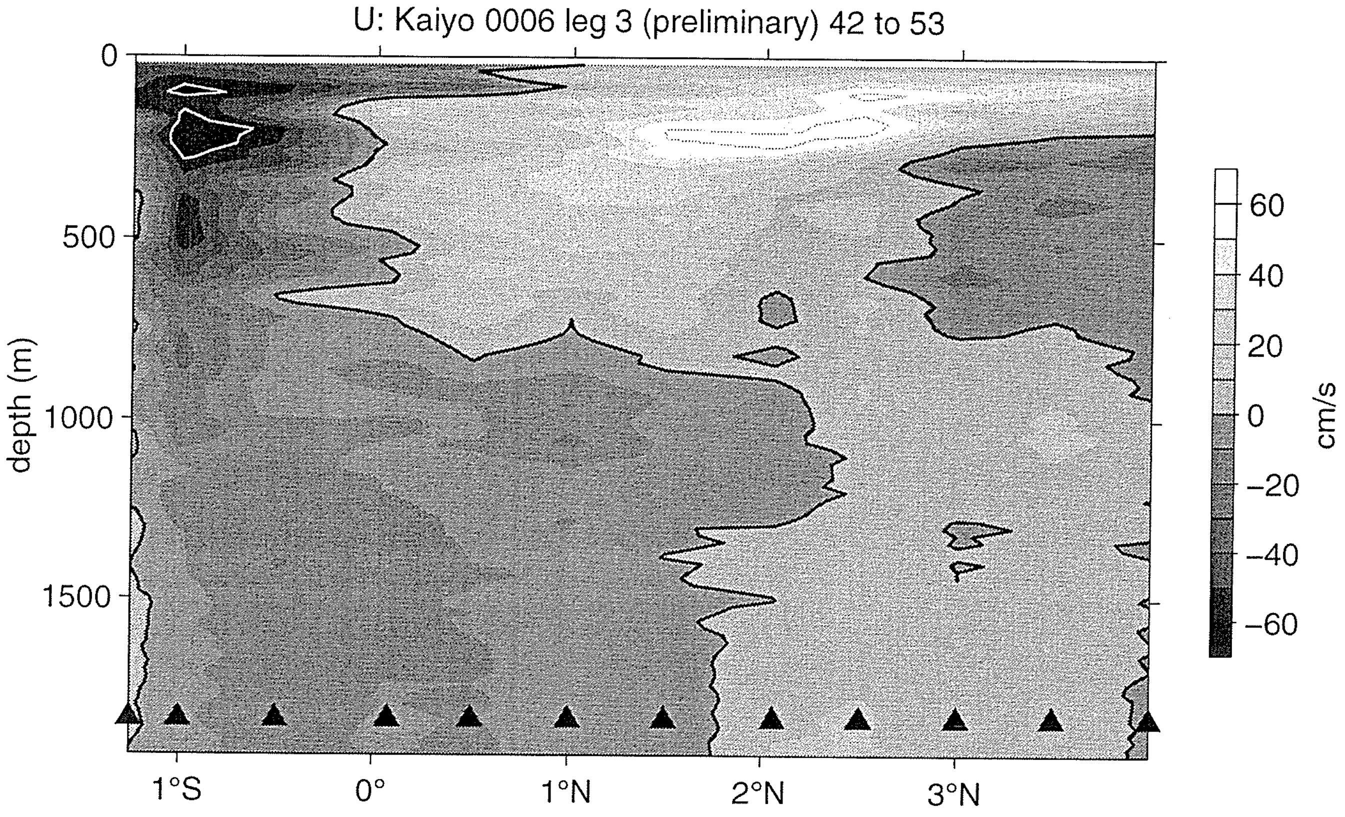

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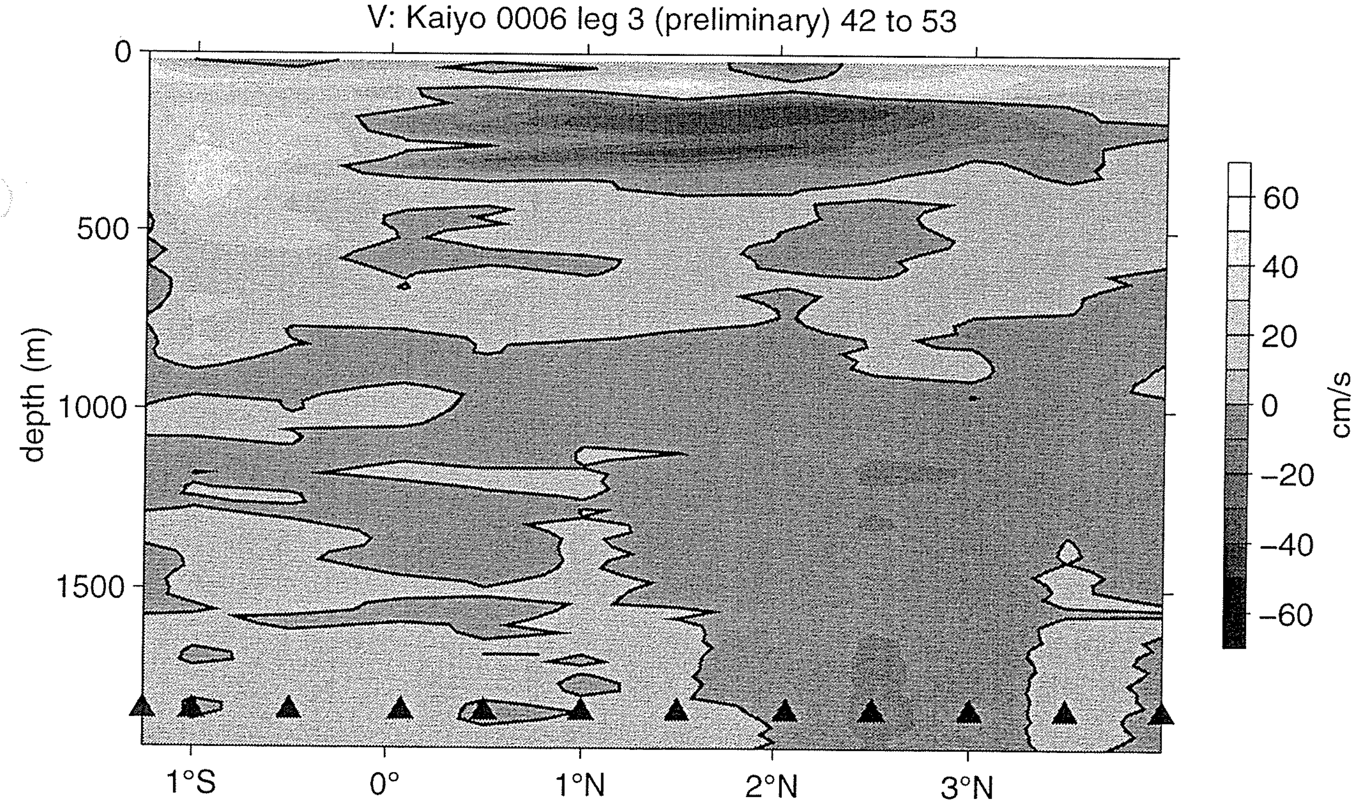

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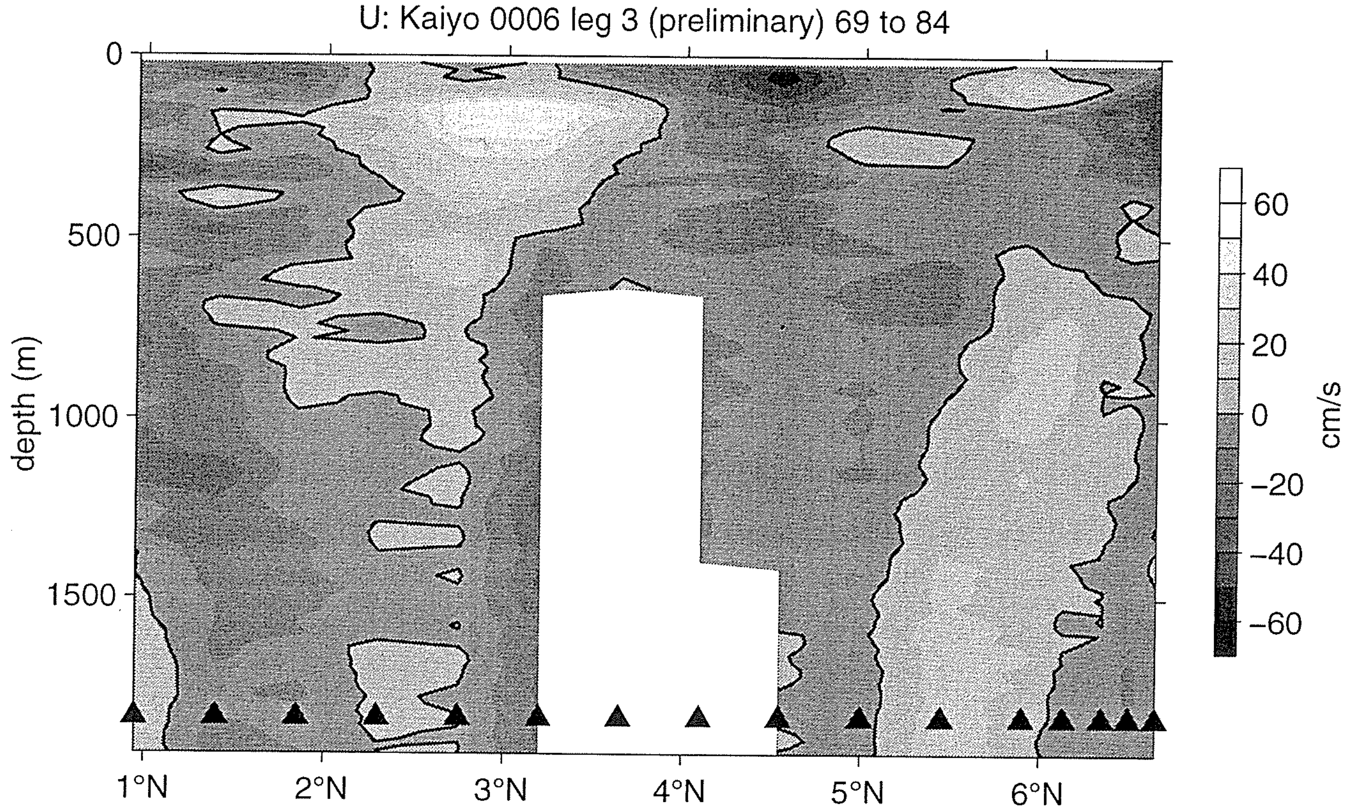

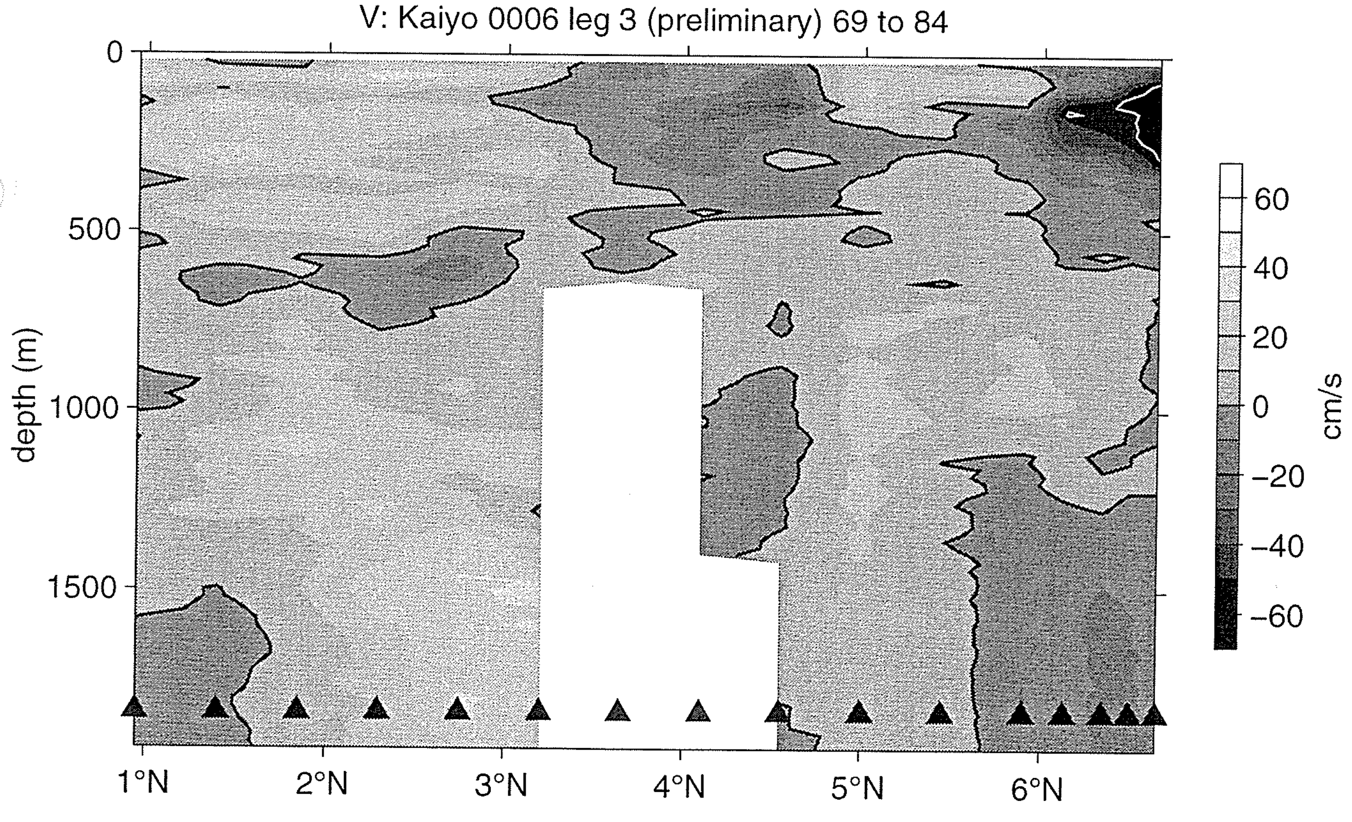

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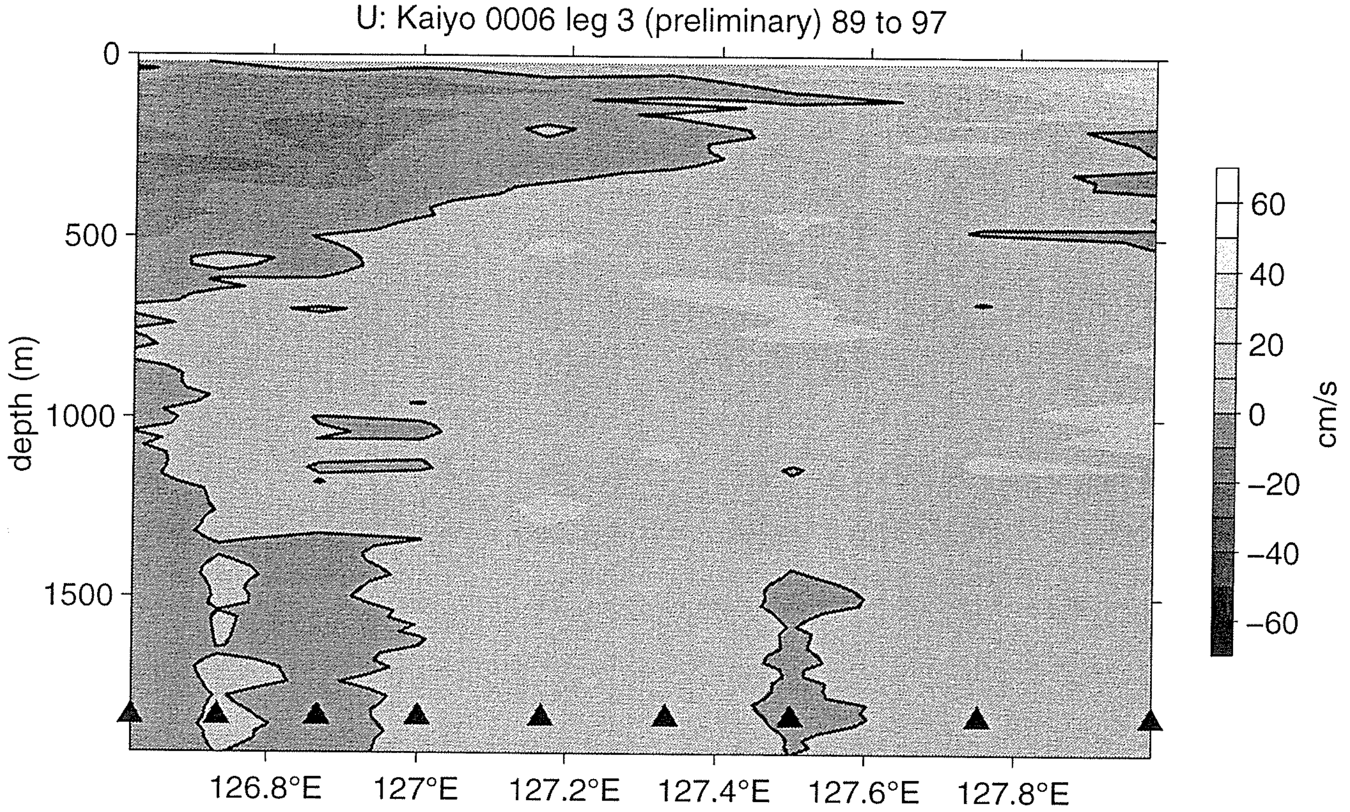

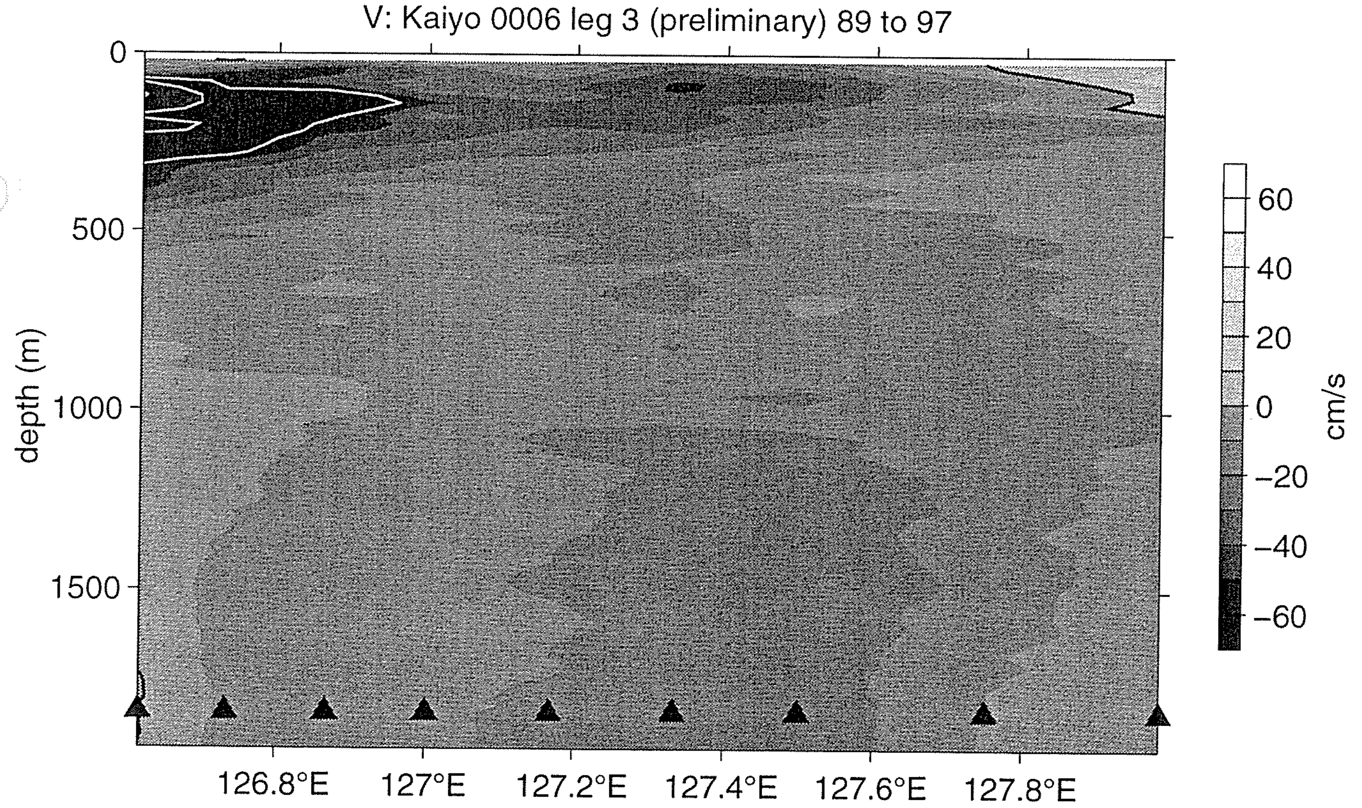

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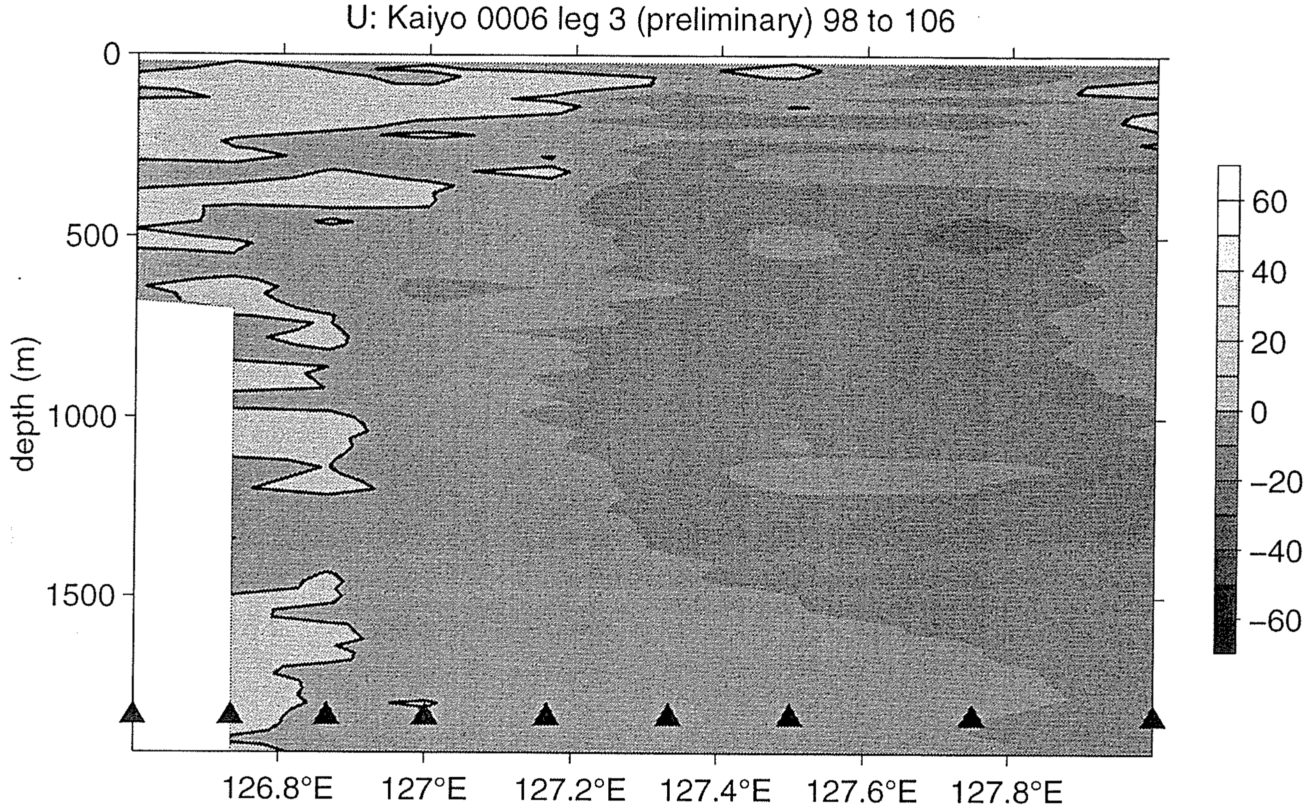

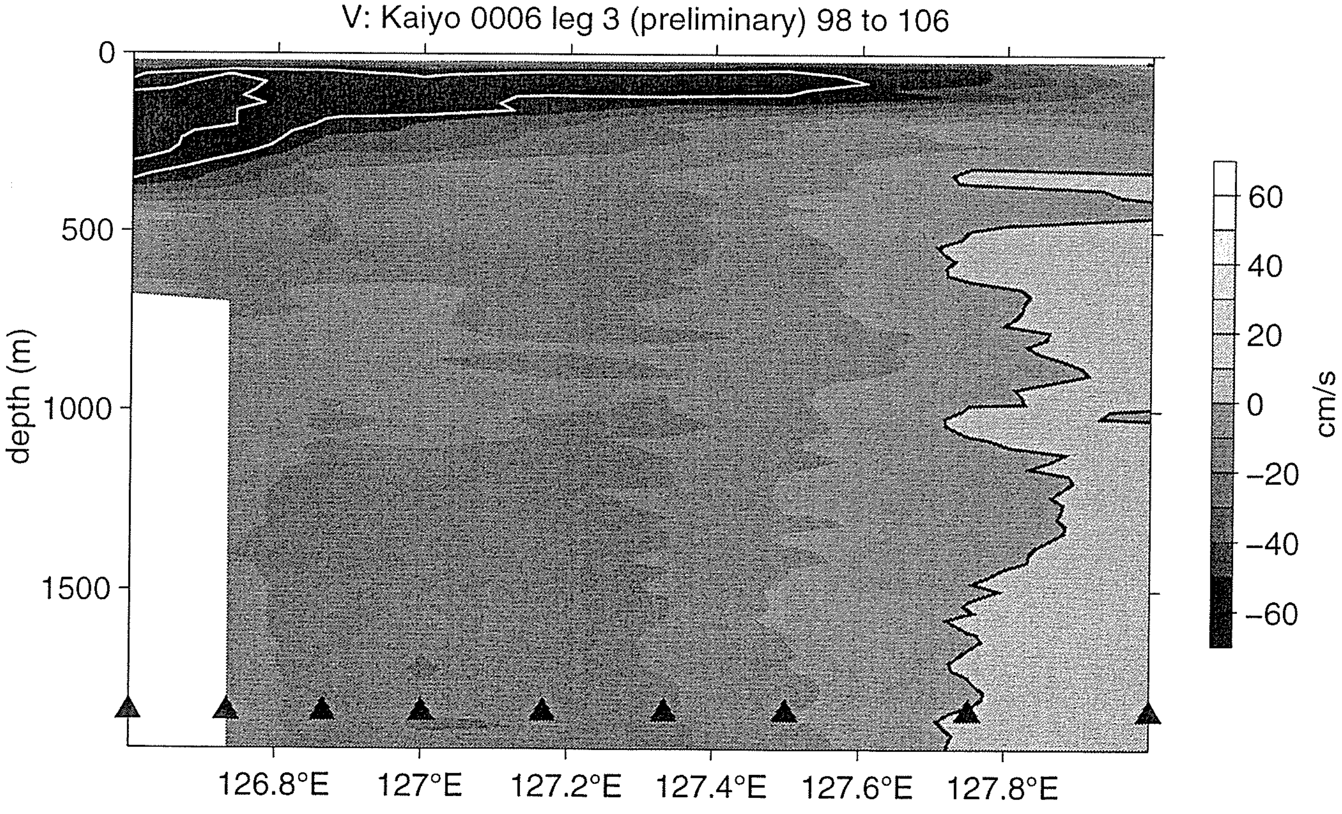

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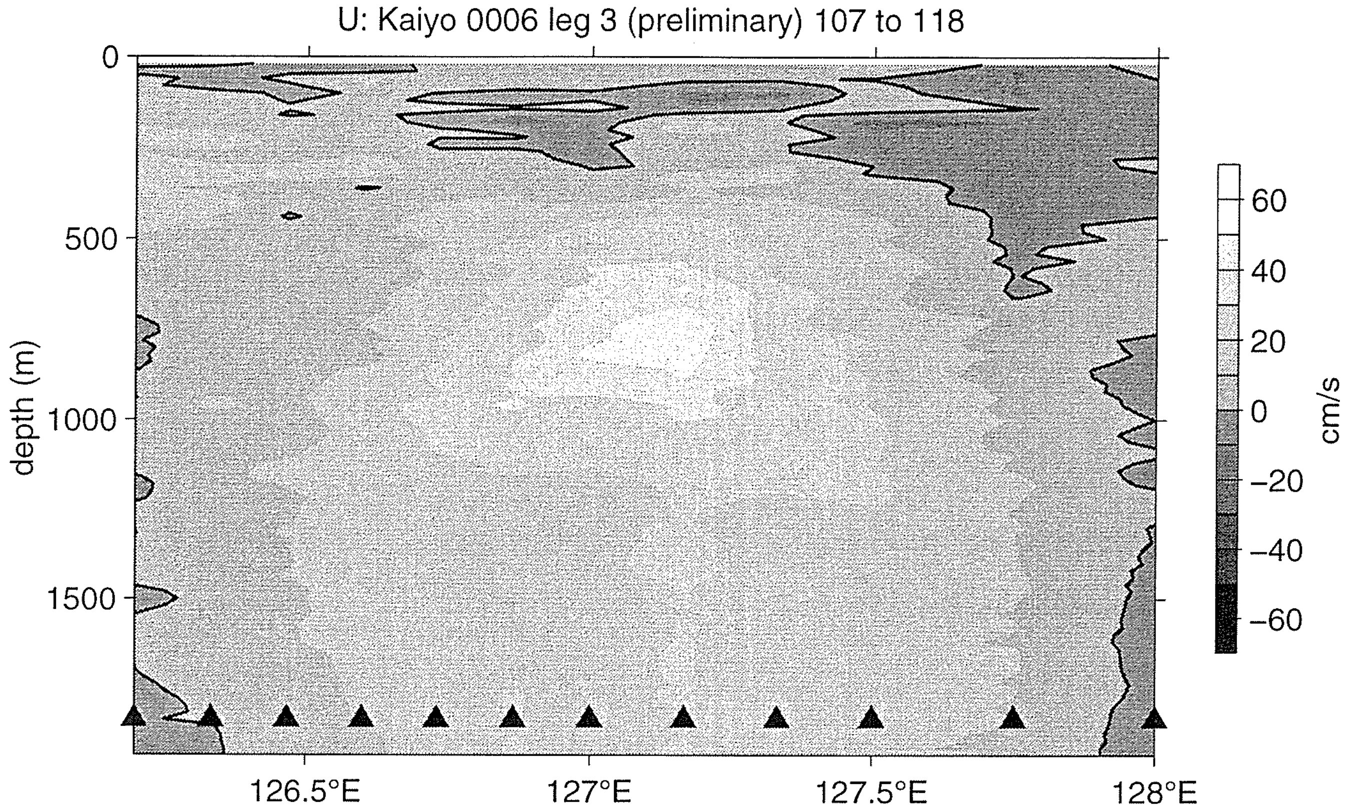

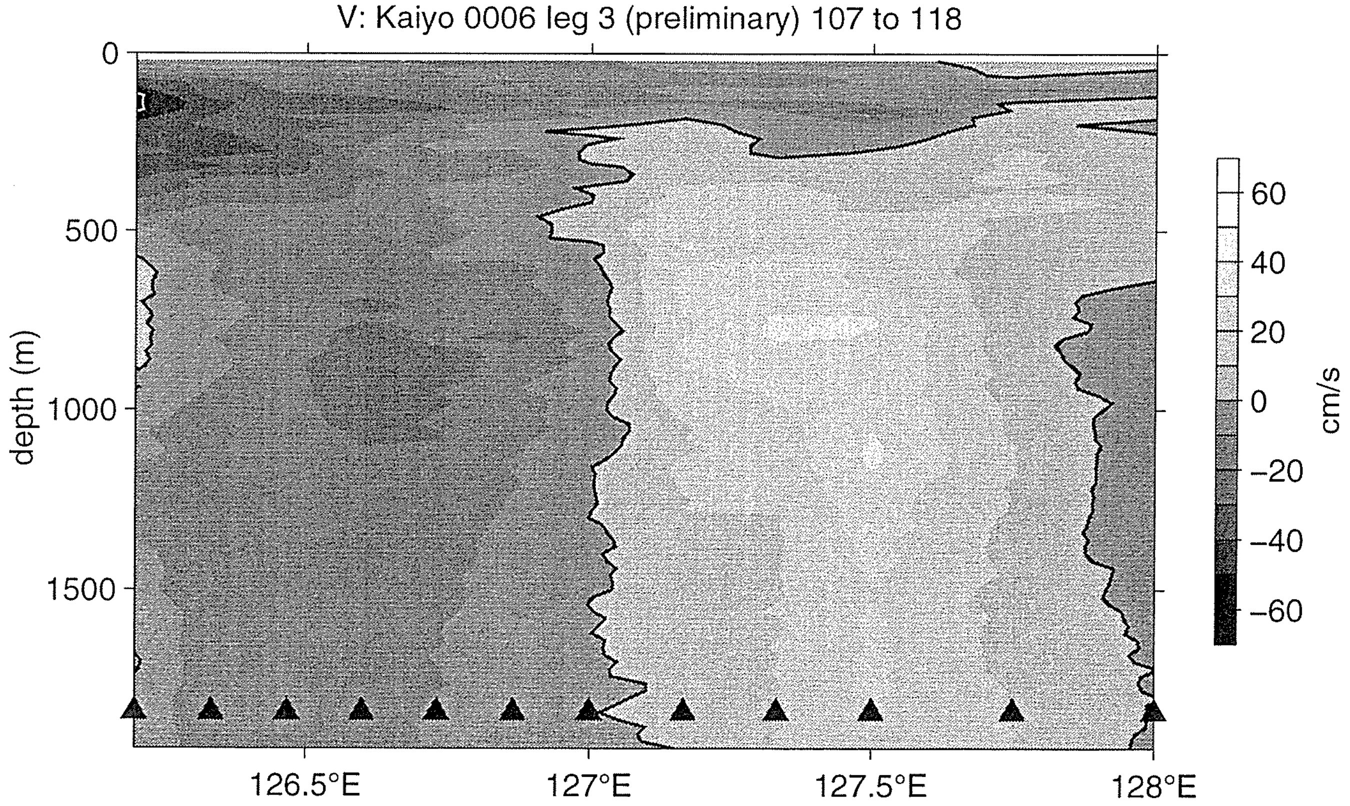

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7. ADCP Moorings

7. ADCP MOORING

(1) Objectives

The purpose is to get the knowledge of physical process in the western equatorial pacific. In this cruise (KY00-06), we recovered four subsurface moorings at (00-147E), (2.5S-142E) and (Mindanao 7N-127E), and deployed four ADCP mooring at the same place.

(2) Parameters

- Current profiles
- Echo intensity
- Pressure, Temperature and Conductivity

(3) Methods

The mooring consists of a top float, instruments, ropes which length is about 4000m, some additional floats, two releasers and sinker. Two instruments are mounted in the top float for observation. One is ADCP (Acoustic Doppler Current Profiler) to observe current profiles upward. The another one is CTD to observe P, T, S at top of the mooring and Current Meter (RCM Doppler Current Meter) for Conductivity, Turbidity, Pressure and Oxygen measurements is fasten on each moorings at 700m depth. At Mindanao, there is one more Current Meter at 400m Depth. Details of the instruments are as follows.

1) ADCP

Self-Contained Broadband ADCP 150 kHz (RD Instruments)

Distance to first bin: 8m

Pings per ensemble: 16

Time per ping: 2.00s

Bin length: 8.00m

Sampling Interval: 3600s

Recovered ADCP

- Serial Number : 1152 (Mooring No.991116-00147E)
- Serial Number : 1224 (Mooring No.991115-25S142E)
- Serial Number : 1221 (Mooring No.991024-7N127E)

Deployed ADCP

- Serial Number : 1151 (Mooring No.000908-00147E)
- Serial Number : 1155 (Mooring No.000916-25S142E)
- Serial Number : 1150 (Mooring No.000924-7N127E)

2) CTD

SBE-16 (Sea Bird Electolonics Inc.)

Sampling Interval: 1800s

Recovered CTD

- Serial Number : 1286 (Mooring No.991116-00147E)
- Serial Number : 2611 (Mooring No.991115-25S142E)

- Serial Number : 1281 (Mooring No.991024-7N127E)

Deployed CTD

- Serial Number : 1279 (Mooring No.000908-00147E)
- Serial Number : 1288 (Mooring No.000916-25S142E)

7 Serial Number: 1276 (Mooring No.000924-7N127E)

3) Current Meter

RCM-8 (AANDERAA Instruments: These belong to Tokyo University)

Recovered Current Meter

- Serial Number : SDCM0034 (700m) (Mooring No.991116-00147E)
- Serial Number : SDCM0036 (700m) (Mooring No.991115-25S142E)

Deployed Current Meter

- Serial Number : 7413 (700m) (Mooring No.000908-00147E)
- Serial Number : 4054U (700m) (Mooring No.991116-00147E)

RCM-9 (AANDERAA Instruments)

Temperature range: low

Recording: 60mins

Conductivity range: 0~74mS

Channel: 7ch

Recovered Current Meter

- Serial Number : 355 (400m) (Mooring No.991024-7N127E)
- Serial Number : 357 (700m) (Mooring No.991024-7N127E)

Deployed Current Meter

- Serial Number : 541 (400m) (Mooring No.000924-7N127E)
- Serial Number : 542 (700m) (Mooring No.000924-7N127E)

(4) Deployment:

Four ADCP mooring were deployed at (00-147E), (2.5S- 142E) and (7N-127E). The moorings were planed to make the ADCP buoy placed at about 270m.

After we dropped the anchor, we monitored depth of the acoustic releaser (Fig.7-1～7-3).The descending rate was about 2.6m/sec.

Each position of the mooring was showed below.

Results of calibration

- Mooring No.000908-00147E

  8th Sep. 2000 Lat: 00° 00.0605N Long: 147° 04.1982E Depth: 4480m

- Mooring No.000916-25S142E

  16th Sep. 2000 Lat: 02° 28.8488S Long: 141° 57.8547E Depth: 3448m

- Mooring No.000924-7N127E(Mindanao)

  24th Sep. 2000 Lat: 06° 49.5946N Long: 126° 42.7476E Depth: 3440m

(5) Recovery

We recovered three ADCP moorings that were deployed on Oct.-Nov.1999 (K99-09). We monitored depth of acoustic releaser after we released the anchor (Fig.7-1～7-3).

After the recovery, we uploaded ADCP and CTD data into a computer, and then raw data were converted into ASCII code. Results were shown in the figures on following pages. Fig.7-4～7-6 shows CTD depth, temperature and salinity data. Fig.7-7～7-15 shows the velocity data (eastward and northward component) at 50m(26bins), 100m(20bins) and 150m(14bins) depth and no corrections are done for all plotting data.

(6) Data archive

The velocity data will be reconstructed using CTD depth data. The all data will be Archived by the member of TOCS project at JAMSTEC and will be submitted to TAO project office as a component of TAO current meter array after the quality check.

All data will be submitted to DMO at JAMSTEC within 3 years after each recovery.

(5) Recovery

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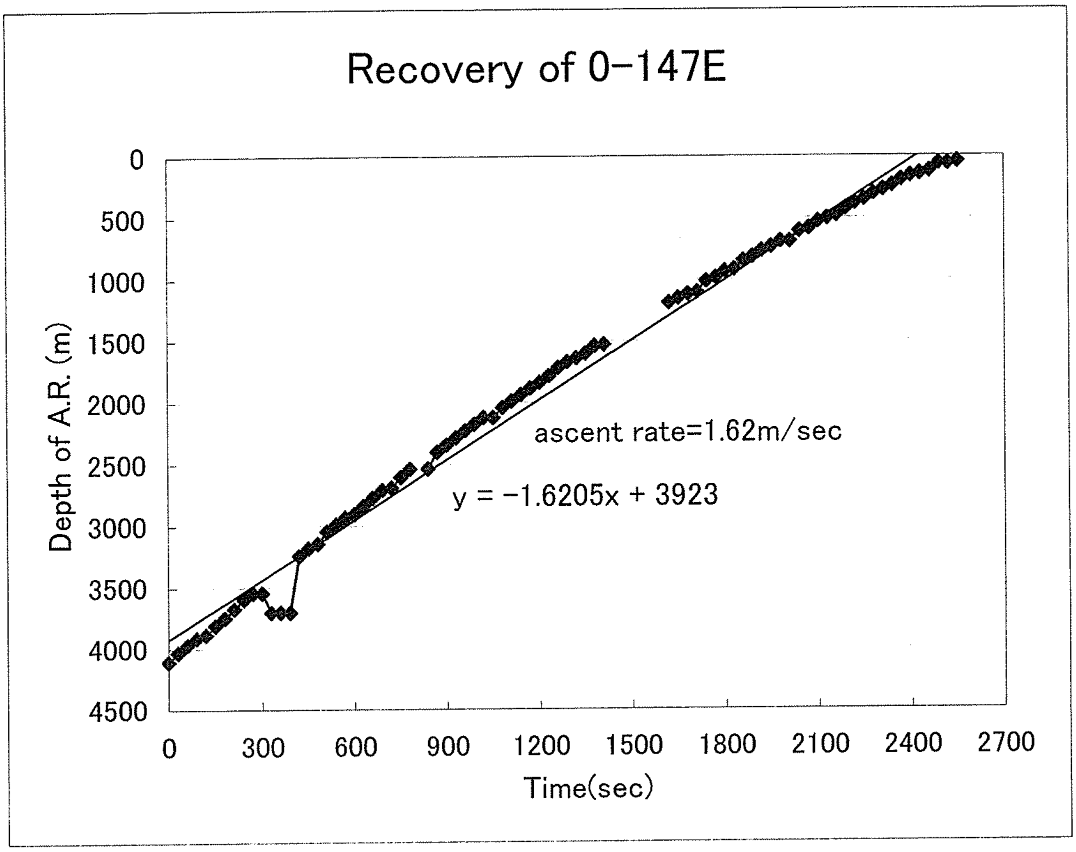
After the recovery, we uploaded ADCP and CTD data into a computer, and then raw data were converted into ASCII code. Results were shown in the figures on following pages. Fig.7-4～7-6 shows CTD depth, temperature and salinity data. Fig.7-7～7-12 shows the velocity data (eastward and northward component) and no corrections are done for all plotting data.

(6) Data archive

The velocity data will be reconstructed using CTD depth data. The all data will be archived by the member of TOCS project at JAMSTEC and will be submitted to TAO project office as a component of TAO current meter array after the quality check.

All data will be submitted to DMO at JAMSTEC within 3 years after each recovery.



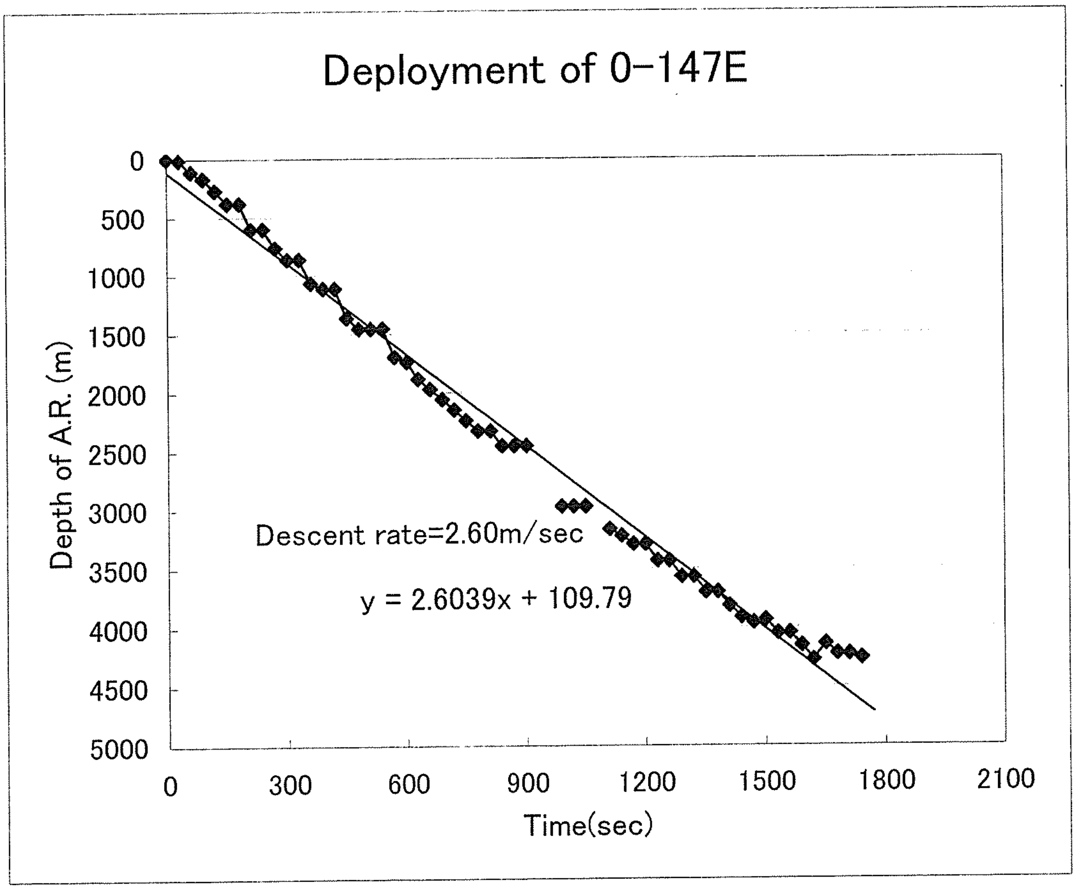
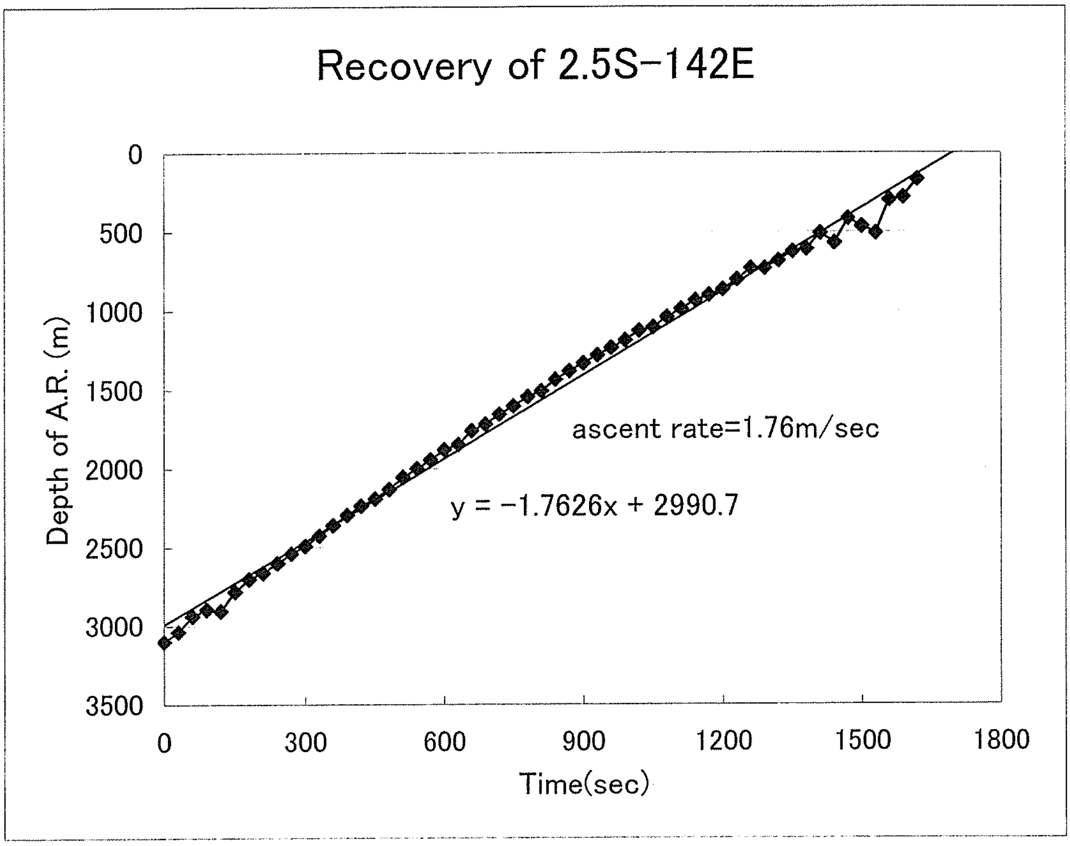


Fig.7-1 Releaser Depth Monitor



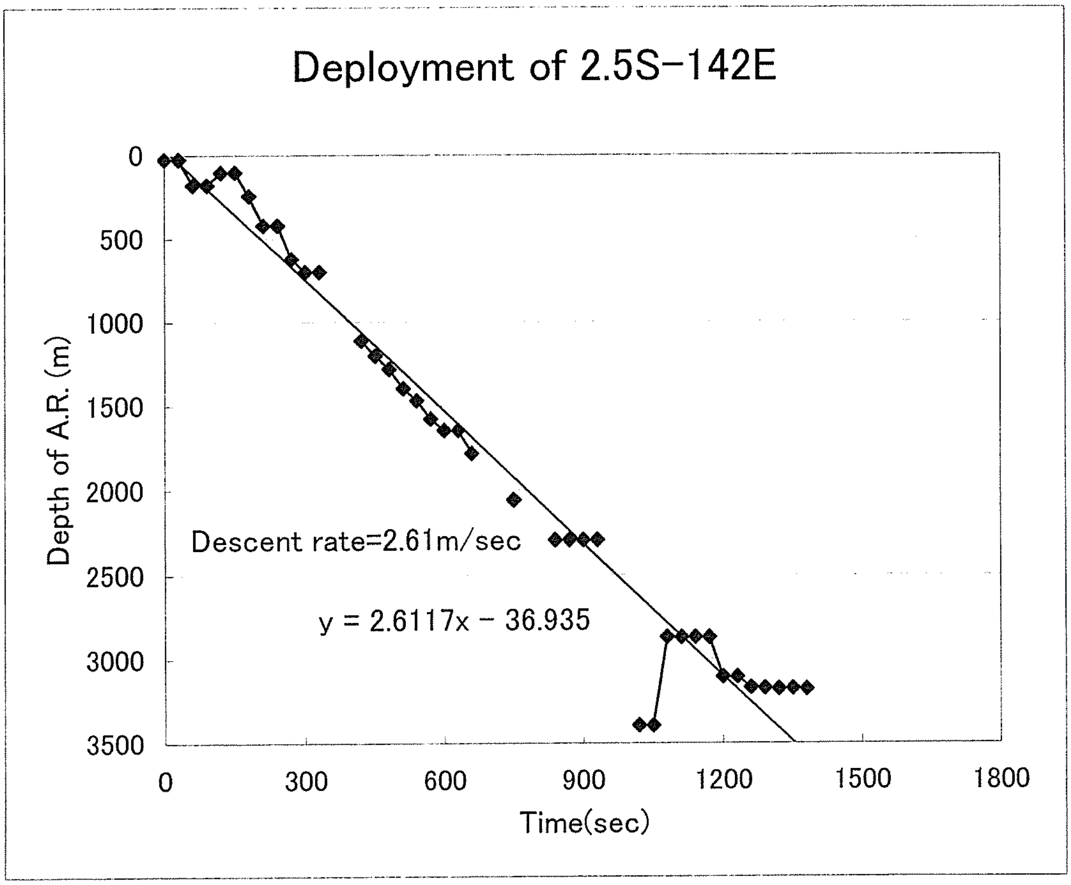


Fig.7-2 Releaser Depth Monitor

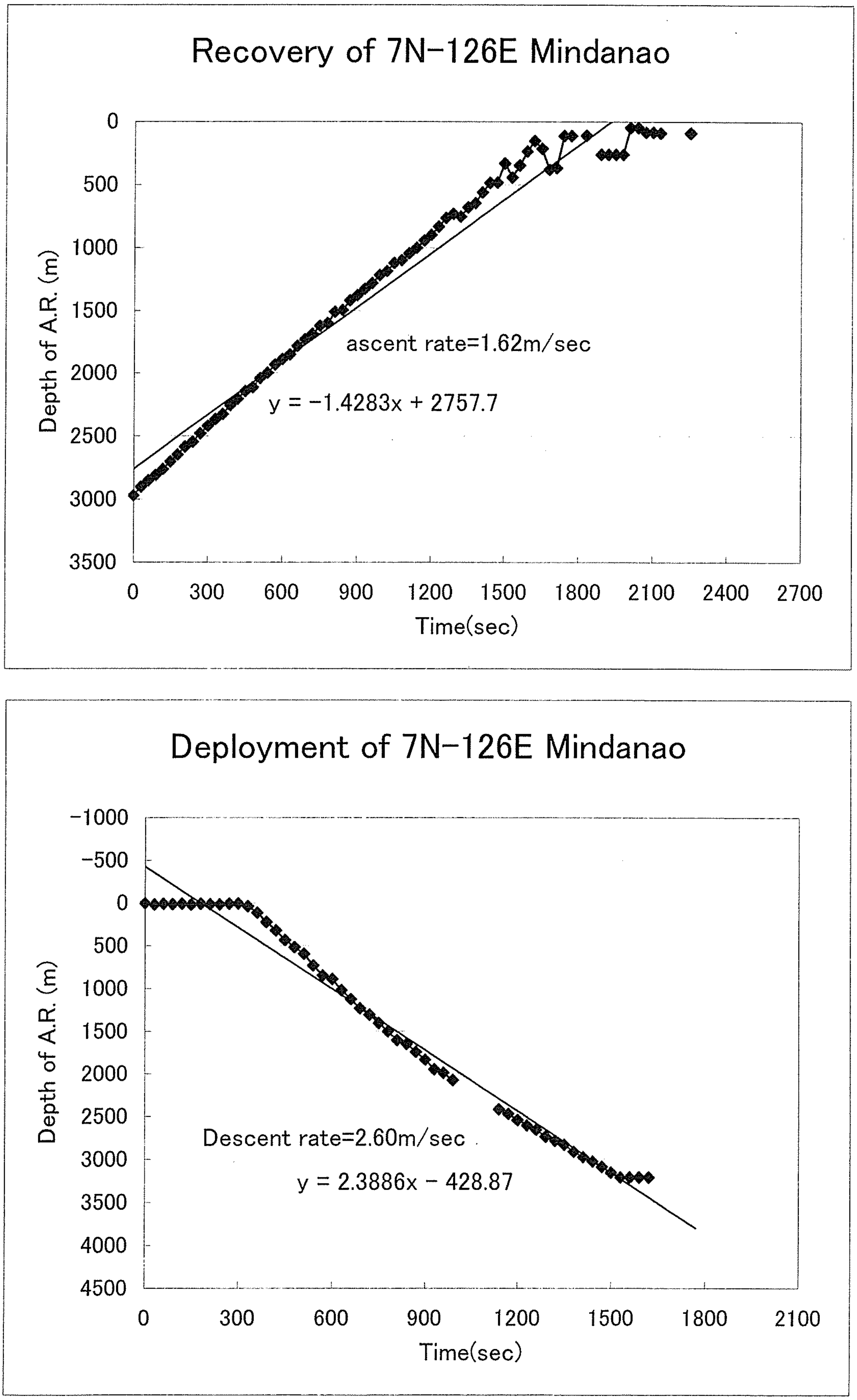


Fig.7-3 Releaser Depth Monitor

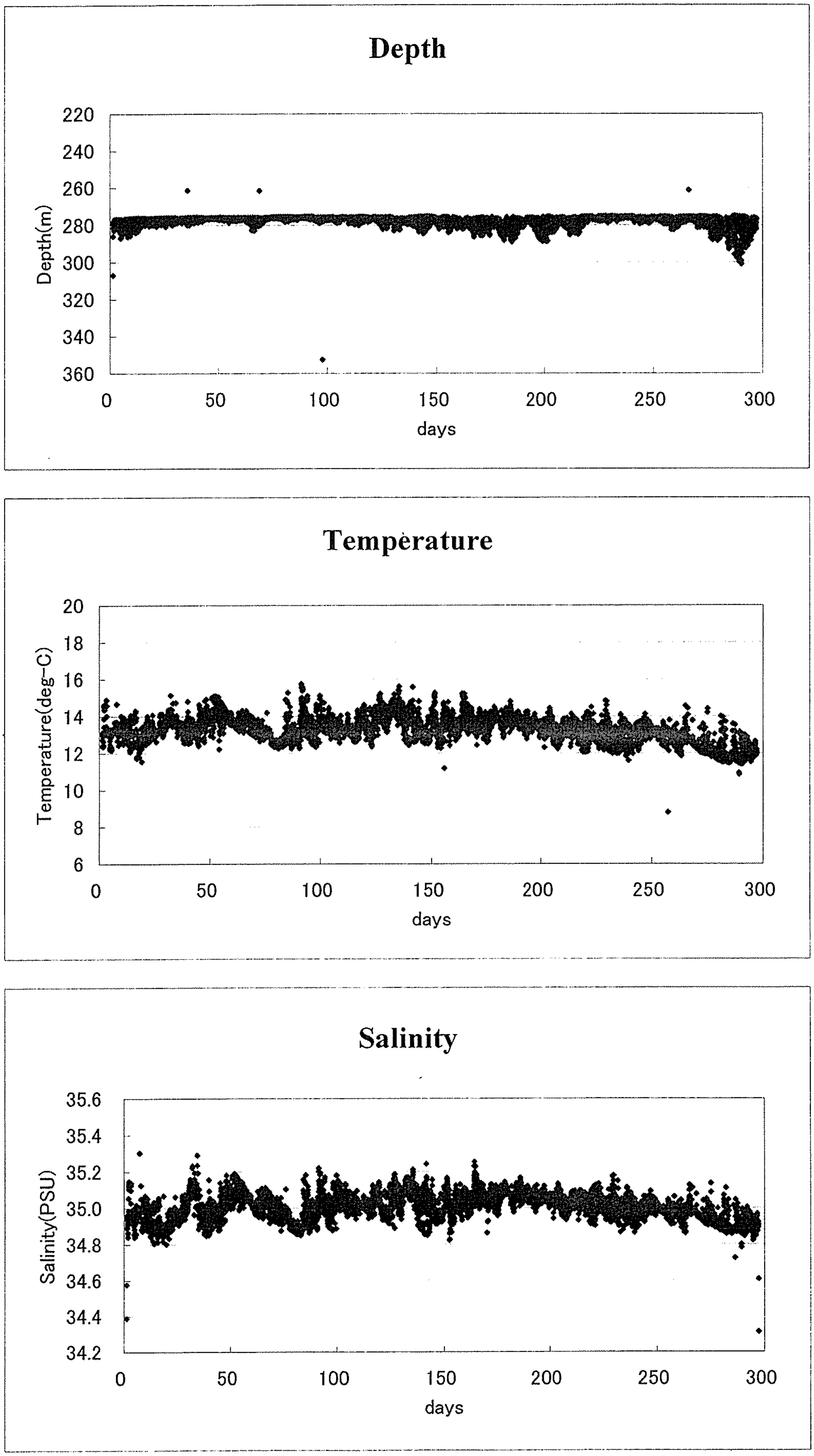


Fig.7-4 Time series of CTD Data (0-147E)

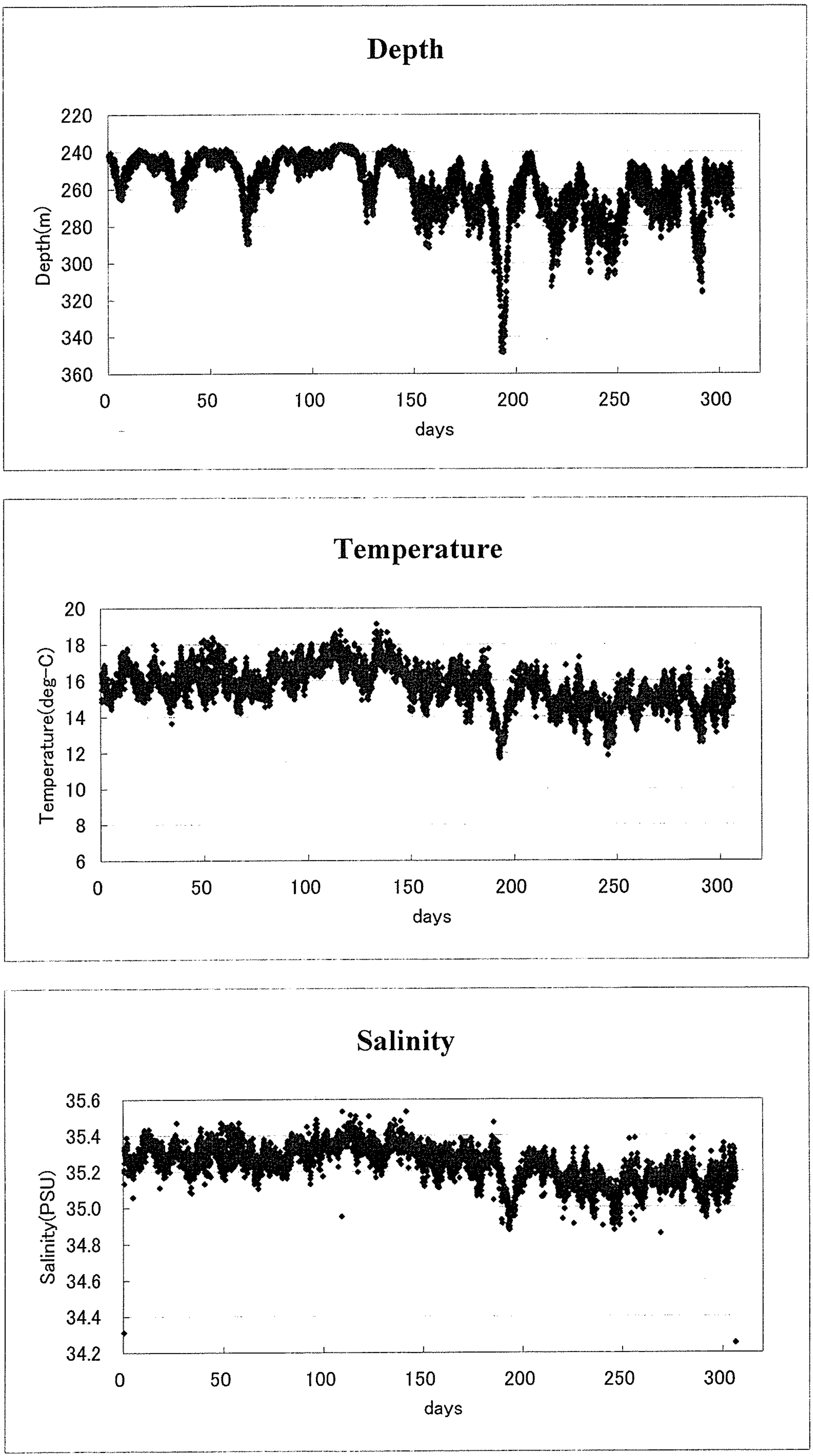
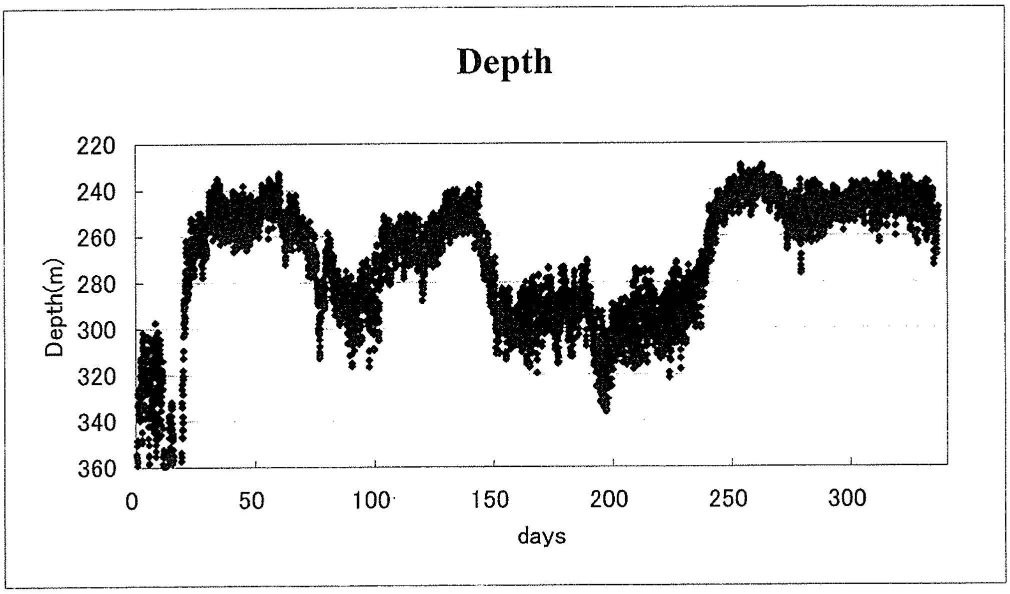
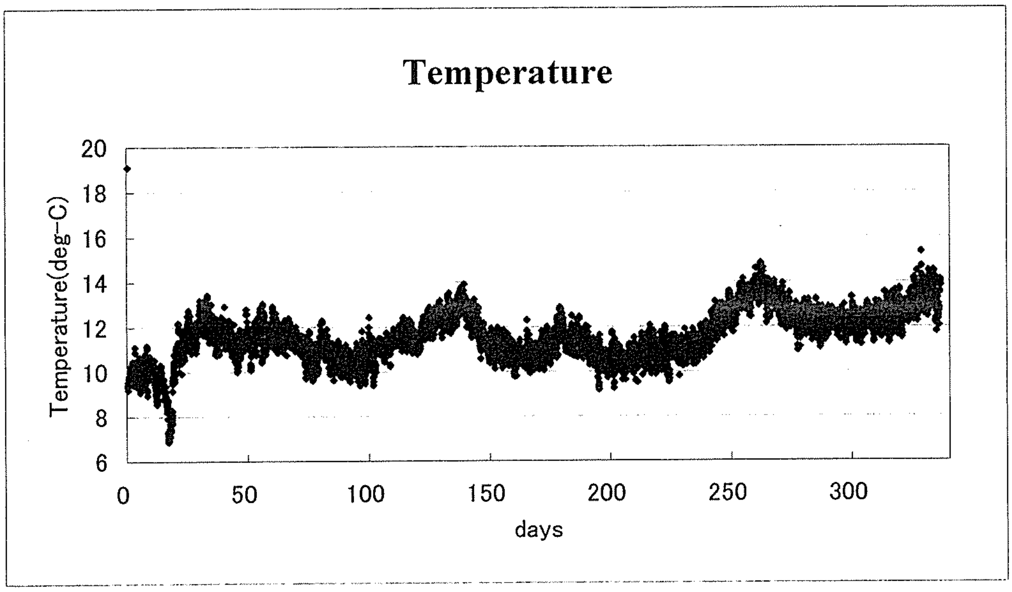


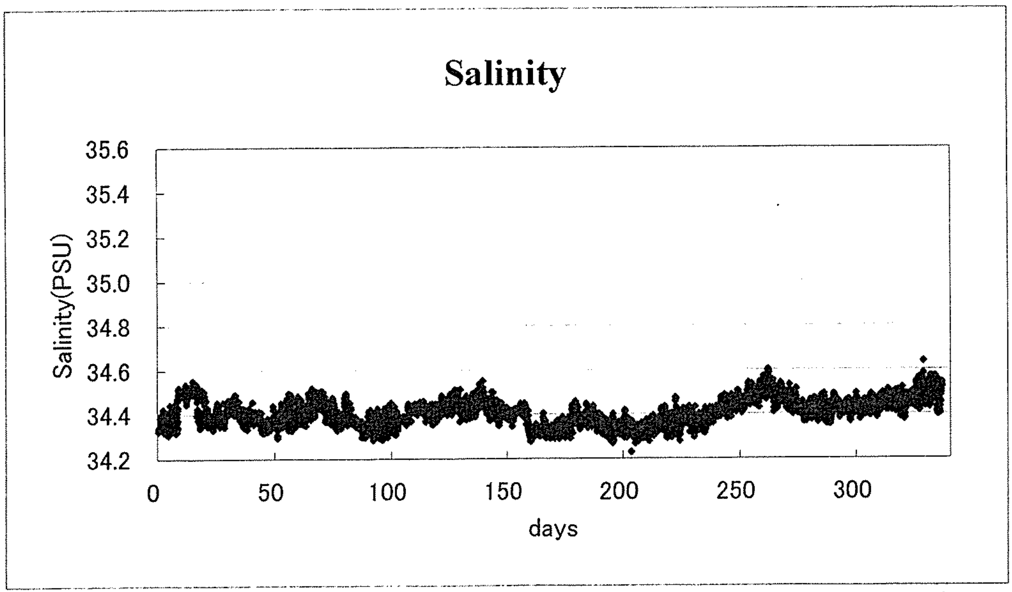
Fig.7-5 Time series of CTD Data (2.5S-142E)



Depth



Temperature



Salinity

Fig.7-6 Time series of CTD Data (7N-126E Mindanao)

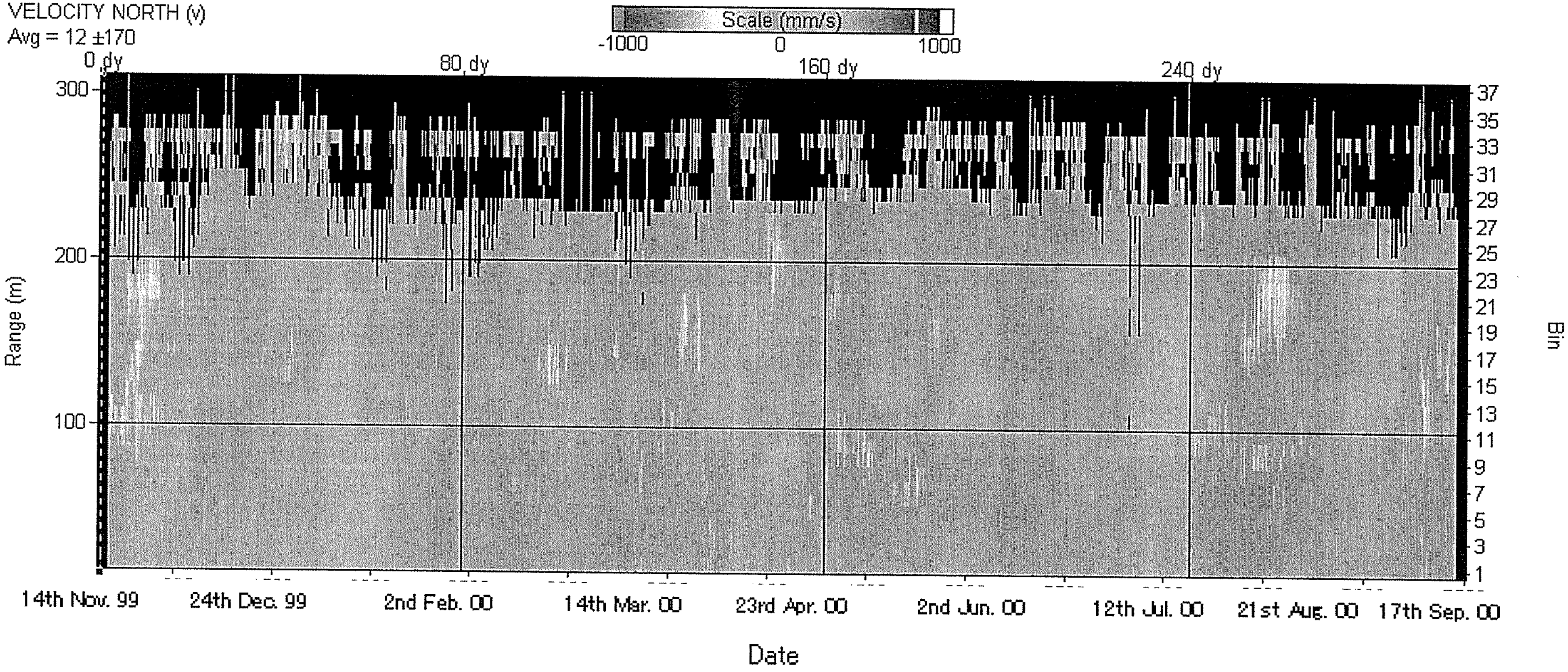


Fig.7-7 ADCP 0-147E Northward Velocity

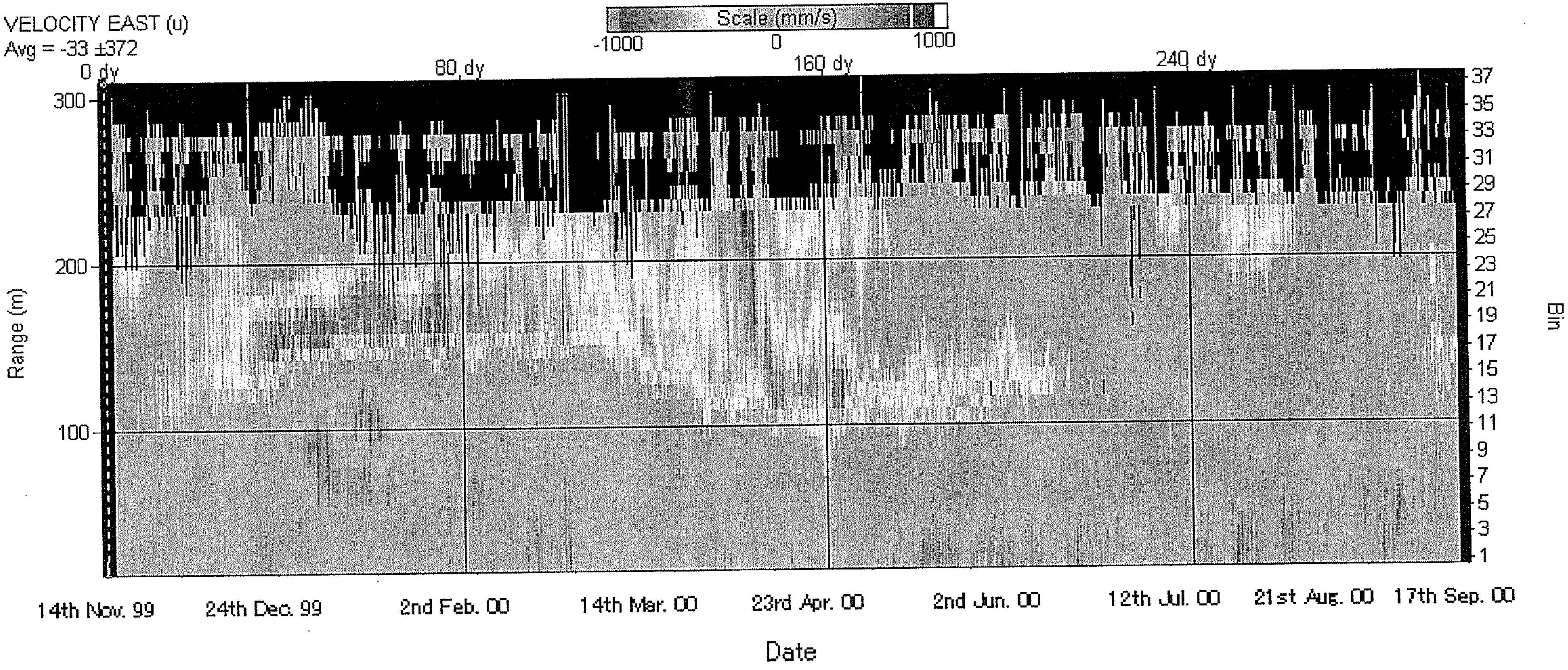


Fig.7-8 ADCP 0-147E Eastward Velocity

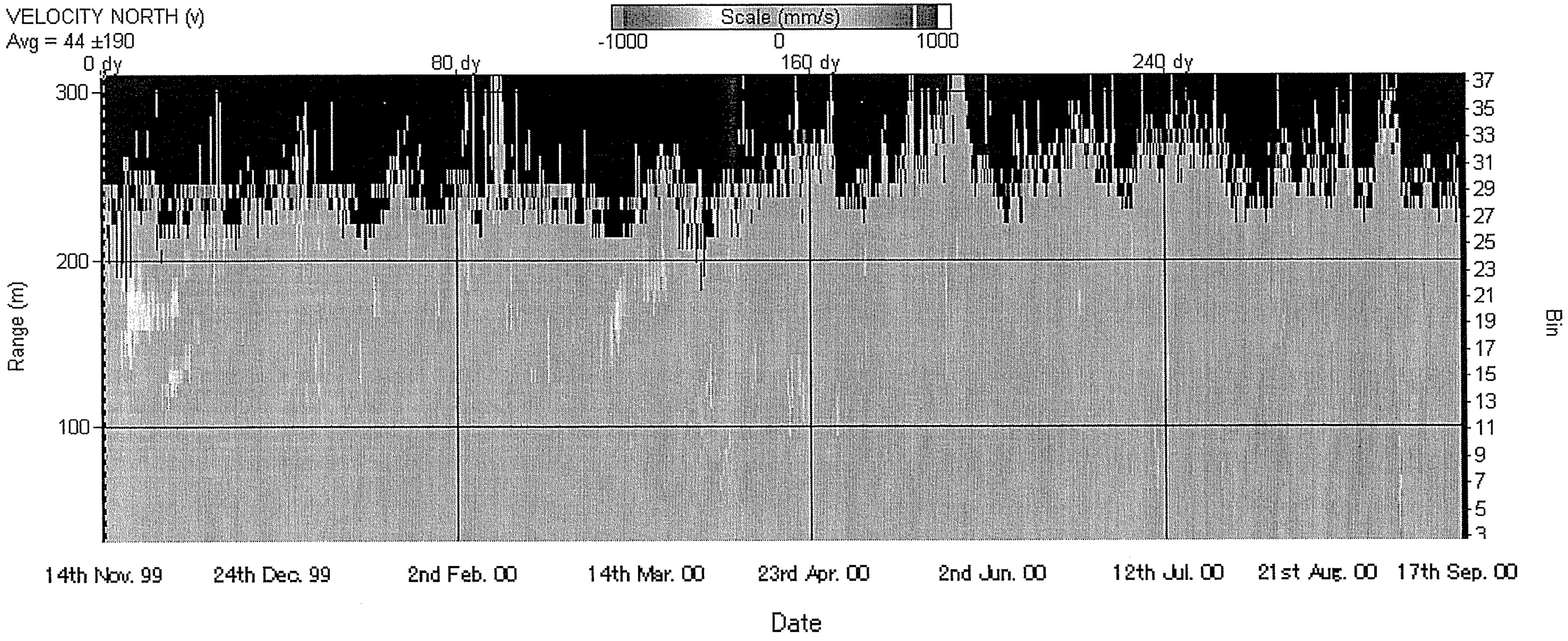


Fig.7-9 ADCP 2.5S-142E Northward Velocity

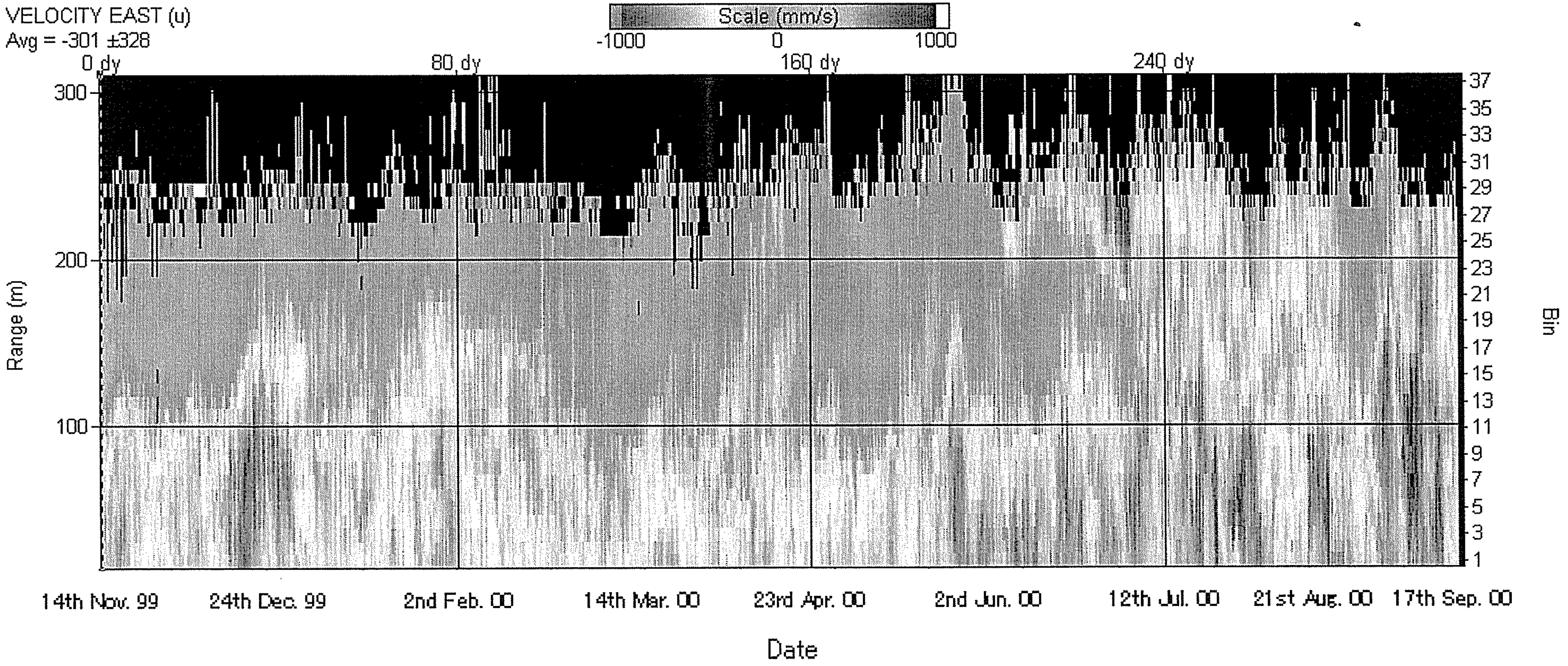


Fig.7-10 ADCP 2.5S-142E Eastward Velocity

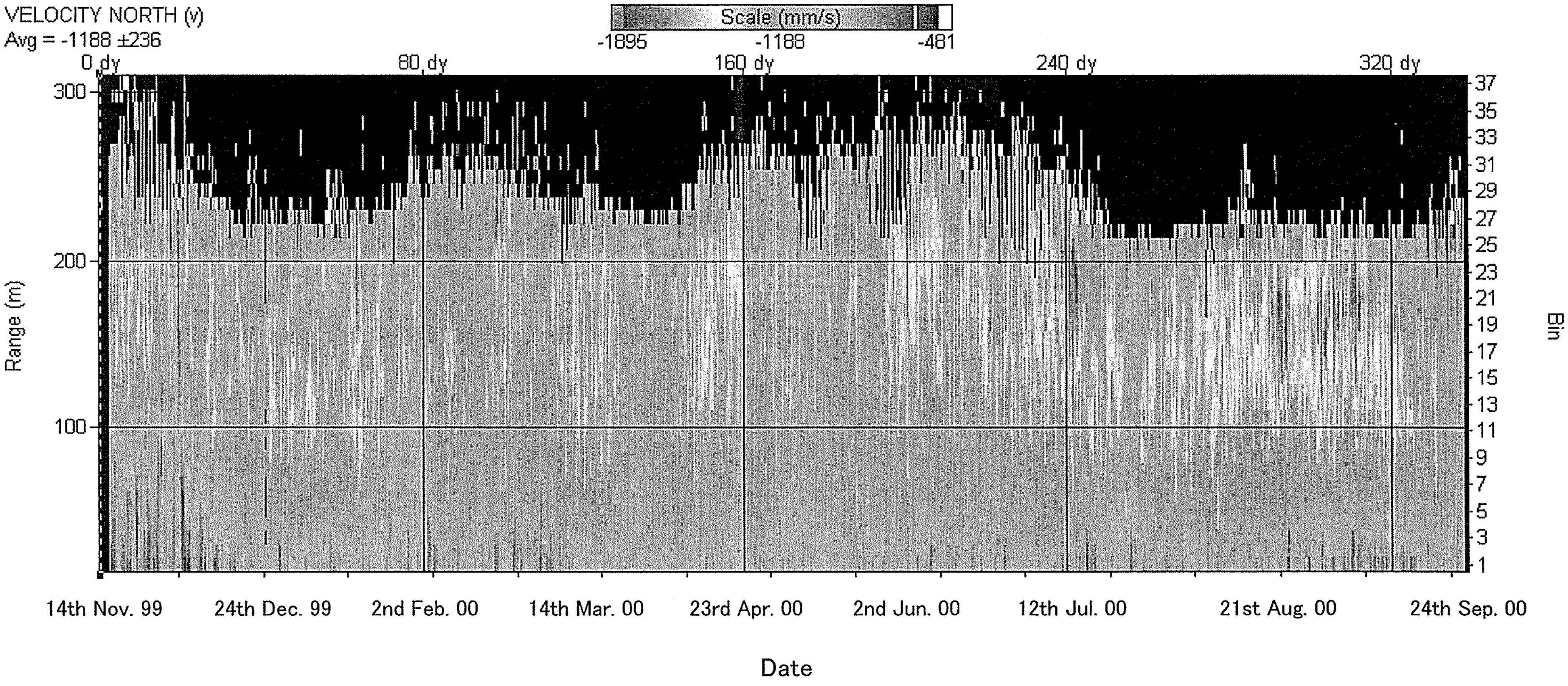


Fig.7-11 ADCP 7N-127E Mindanao Northward Velocity

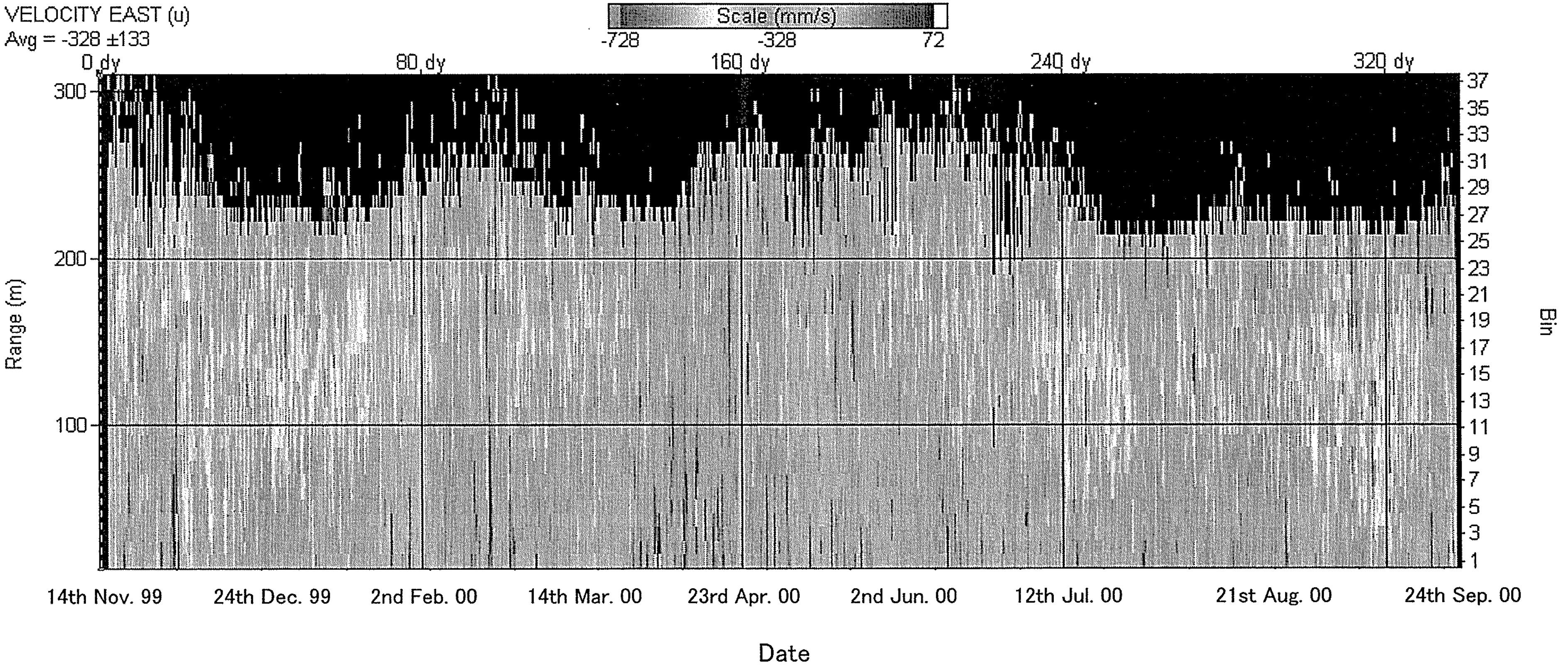
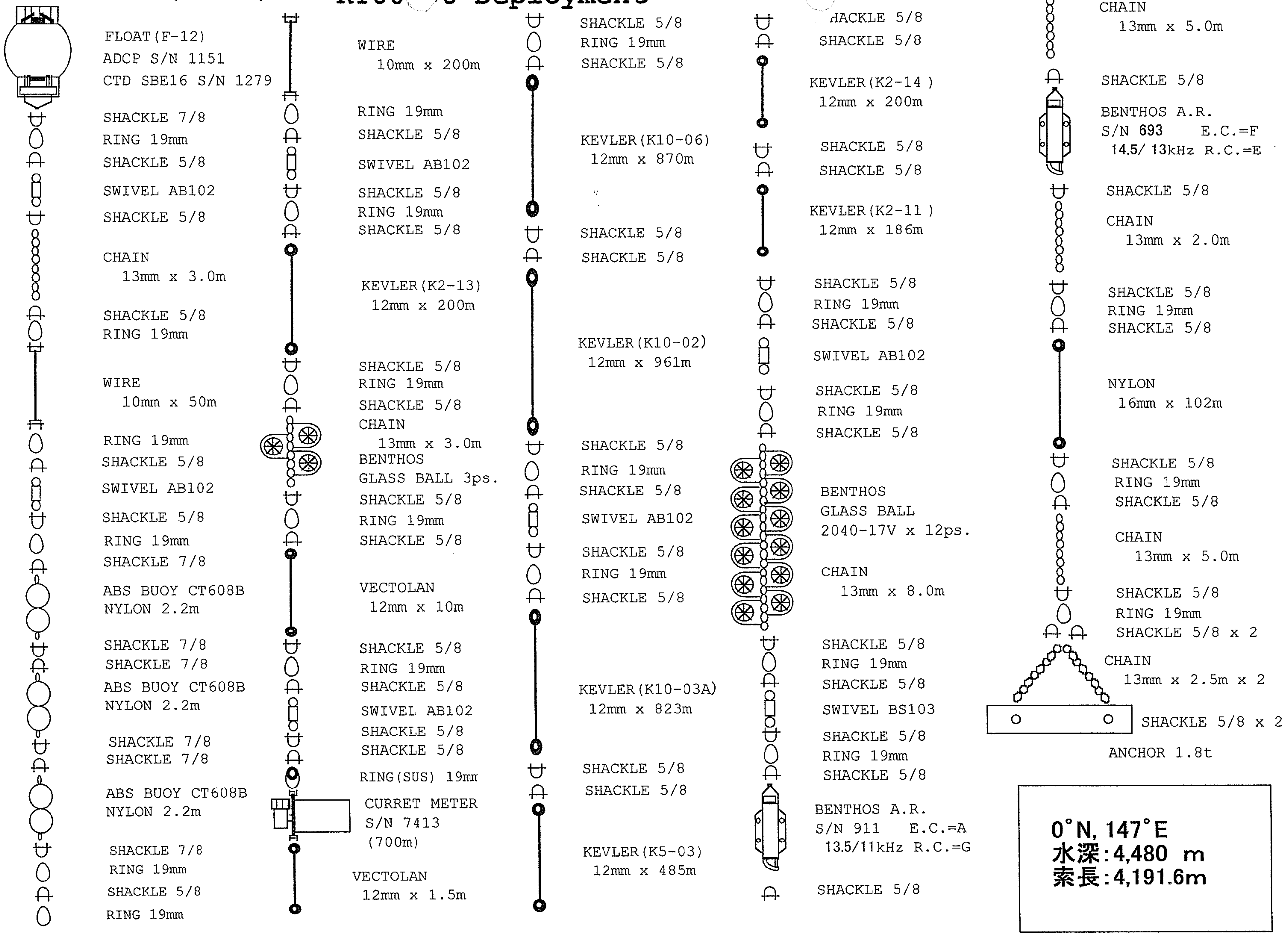


Fig.7-12 ADCP 7N-127E Mindanao Eastward Velocity

00-147(Summer)'00 KY00[illegible]6 Deployment



0°N, 147°E
水深:4,480 m
索長:4,191.6m

DEPLOYMENT & RECOVERY

MOORING No. 000908-00N147E

PROJECT TOCS 「かいよう」		TIME	UTC
AREA 熱帯赤道域		RECORDER (D)	K.AKIZAWA
POSITION 0° - 147° E		(R)	

DEPTH 4505 m

PERIOD NAVIGATION SYSTEM :

No.of DAYS

LENGTH : m DEPTH of BUOY : m BUOYANCY : kg

ACOUSTIC RELEASER

TYPE	BENTHOS (Upper)	TYPE	BENTHOS (Lower)
S/N	911	S/N	693
RECEIVE F.	11.0 kHz	RECEIVE F.	13.0 kHz
TRANSMIT F.	13.5 kHz	TRANSMIT F.	14.5 kHz
ENABLE C.	A	ENABLE C.	F
RELEASE C.	G	RELEASE C.	E
BATTERY		BATTERY	
TEST on DECK		TEST on DECK	

DEPLOYMENT

DATE 08. Sep. 2000 SHIP KAIYO CRUISE No. KY00-06

WEATHER CONDITIONS DIR. of WIND VEL. of WIND

DEPTH 4480 m DEPTH of A.R. 4307 m DESCEND. RATE m/s BUOY :

POS. of STRT 00 °01.9886N 147 °02.8605E HOR.RANGE m

POS. of DEP. 00 ° 00.0426S 147 ° 04.2011E SINKER 05 : 17 DISAPPEAR. :

POS. of MOORING 0 °00.0605 147° 04.1982 LANDING 05:45

NOTE

○設置に際し、深度調整の為、NYLONロープを140mから 102mに変更。

シンカー投入時、すでにトップブイが確認不可能であった。

○ Releaser Depth : 4300m
POS. : 00-00.0531S , 147-04.2070E

SSBL	TIME	S / R	DEPTH
S			
S			
B			
L			

RECOVERY

DATE SHIP CRUISE No.

WEATHER CONDITIONS DIR. of WIND VEL. of WIND

START of RELEASE : FINISH of RELEASE :

POS. of DISCOVERY ° ° ASCENDING RATE m/s

DIRECTION ° DISTANCE m

NOTE

SSBL	TIME	S / R	DEPTH
S			
S			
B			
L			

TIME RECORD

MOORING NO. 000908-00N147E

DEPLOYMENT '00. 09. 08
START : 03 : 45
FINISH : 05 : 17

RECOVERY (Date:)
START :
FINISH :

ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP	ADCP 1151 CTD 1279	03 : 45	着 水		
WIRE	50m	03 : 45 ~			
ABS BUOY	2 × 3	03 : 48			
WIRE	200m	03 : 48 ~ 03 : 53			
KEVLER (K2-13)	200m	03 : 55 ~ 03 : 59			
GLASS BALL	3PS	04 : 04			
AANDERAA	S/N 7413	04 : 04			
KEVLER (K10-06)	870m	04 : 04 ~ 04 : 17			
KEVLER (K10-02)	961m	04 : 17 ~ 04 : 32			
KEVLER (K10-03A)	823m	04 : 32 ~ 04 : 44			
KEVLER (K5-03)	485m	04 : 44 ~ 04 : 51			
KEVLER (K2-14)	200m	04 : 51 ~ 04 : 56			
KEVLER (K2-11)	186m	04 : 56 ~ 05 : 01			
GLASS BALL	12 PS	05 : 05			
BENTHOS A.R.	S/N 911	05 : 06	13.5 / 11 kHz		
BENTHOS A.R.	S/N 693	05 : 10	14.5 / 13.0 kHz		
NYLON	102 ~~140~~m	05 : 10 ~ 05 : 13	NYLON調整 102m		
ANCHOR	1.8t	05 : 17			

Memo of Dep.

シンカー投入位置
00-00.0426S
147-04.2011E

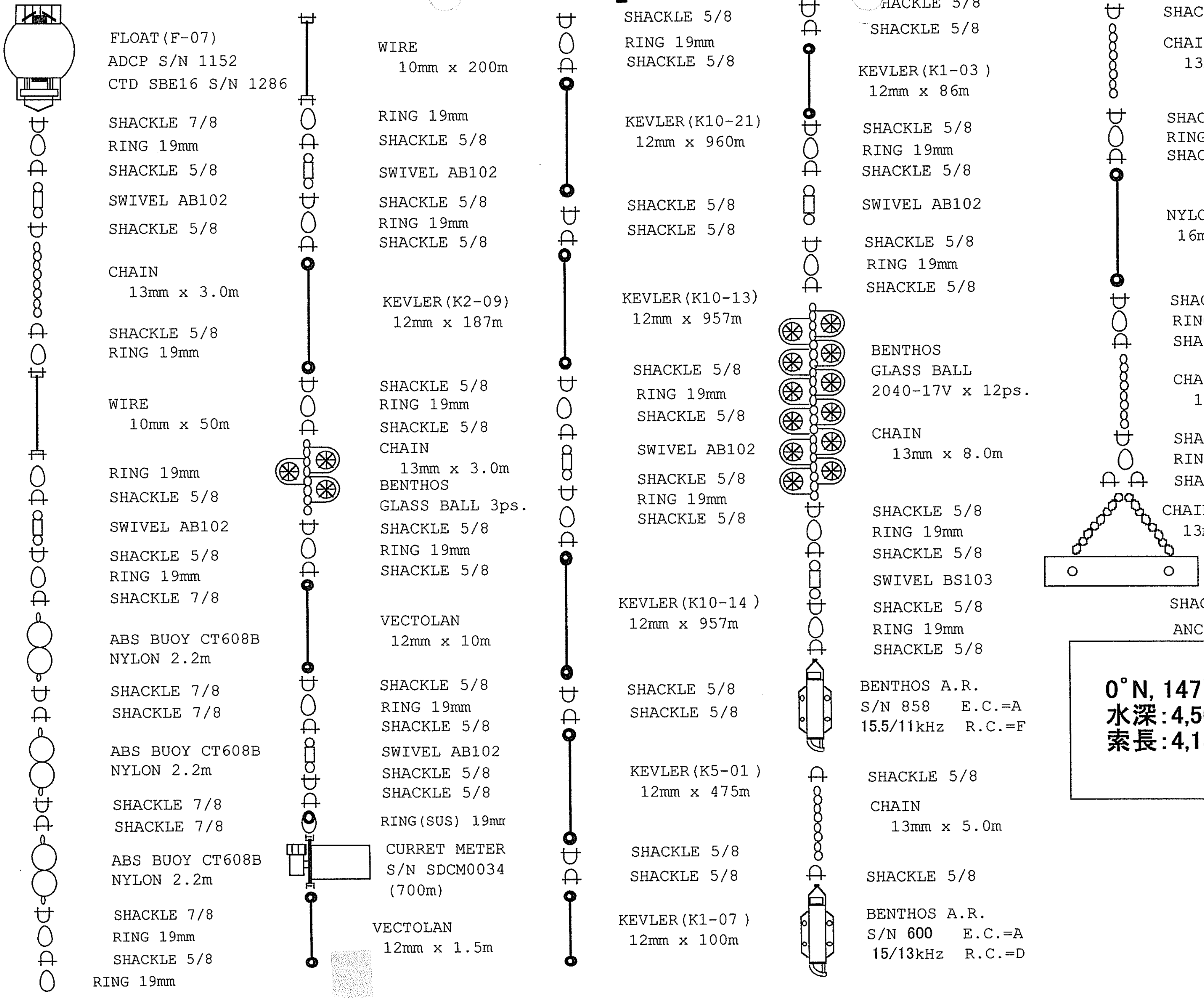
Releaser位置
00-00.0531S
147-04.2070E
Depth: 4300m

・深度調整のため
NYLON ロープを
140m → 102m

・05 : 11 に
Releaserからの
応答確認

00-147(Autumn)'99

KY00-[illegible]6 Recovery



0°N, 147°E
水深:4,505m
索長:4,188.6m

DEPLOYMENT & RECOVERY

MOORING No. 99111 -00N147E

PROJECT	TOCS「かいよう」	TIME	UTC
AREA	熱帯赤道域	RECORDER (D)	TO/A
POSITION	0°-147°E	(R)	
DEPTH	4500m		
PERIOD	360	NAVIGATION SYSTEM :	WGS 84
No.of DAYS			

LENGTH : m DEPTH of BUOY : m BUOYANCY : kg

ACOUSTIC RELEASER

TYPE	BENTHOS (Upper)	TYPE	BENTHOS (Lower)
S/N	858	S/N	600
RECEIVE F.	11.0 kHz	RECEIVE F.	13.0 kHz
TRANSMIT F.	15.5 kHz	TRANSMIT F.	15.0 kHz
ENABLE C.	A	ENABLE C.	A
RELEASE C.	F	RELEASE C.	D
BATTERY	1 year	BATTERY	2 year
TEST on DECK	OK	TEST on DECK	OK

DEPLOYMENT

DATE 16 NOV. 1999 SHIP KAIYO CRUISE No. KY9909

WEATHER bc CONDITIONS DIR. of WIND VEL. of WIND

DEPTH 4471 m DEPTH of A.R. 4287m DESCEND. RATE m/s BUOY 23:44

POS. of STRT 00°00.615S 147°03.679E HOR.RANGE m

POS. of DEP. 00°00.0183N 147°05.4022E SINKER 1:19 DISAPPEAR. 1:37

POS. of MOORING 00°00.05N 147°05.292E LANDING 1:47

NOTE

SSBL	TIME	S / R	DEPTH

RECOVERY

DATE 07, Sep. 2000 SHIP KAIYO CRUISE No. KY00-06

WEATHER CONDITIONS DIR. of WIND 114 deg. VEL. of WIND 11.0 m/s

START of RELEASE 23 : 30 FINISH of RELEASE 22 : 36

POS. of DISCOVERY 00 °00.2875N 147 °04.9496E ASCENDING RATE m/s

DIRECTION 140 ° DISTANCE 860 m Depth : 4270m

NOTE

23:30.トランスデュ-サ-降下開始
23:30 ENABLE信号送信
23:31 〃 確認 (5388.9m)
23:33 トランスデューサー,一度揚収
23:33 〃 再度降下
(Depth : 4270m, 位置 140°, 水平きょり 860m
4356m (スラントレンジ))

23:35 RELEASE信号送信
23:36 〃 確認
23:37 撤収
23:38 トップブイ 浮上確認

GR

SSBL	TIME	S / R	DEPTH

TIME RECORD

MOORING NO. 991116-00N147E

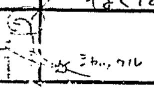
		DEPLOYMENT		RECOVERY (Date: '00.09.08)	
		START : 23:43 FINISH : 01:19		START : 01:06 FINISH : 02:42	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP	ADCP 1152 CTD 1286	23:44		01:06 01:11	水切り ON deck
WIRE	50 m	23:44~23:45		01:13 ~ 01:24	
ABS buoy	2×3	23:46		01:16 01:20	水切り ON deck
WIRE	200 m	23:47~23:50		01:24 ~01:28	
KEVLER (K2-09)	187 m	23:56~23:59		01:28 ~01:42	
GLASS BALL	3 ps	0:02		01:30 01:32	水切り ON deck
AANDERAA	SDCM 0034	0:04		01:32	水切り
KEVLER (K10-21)	960 m	0:04~0:13		01:42 ~01:58	アンデラにからむ
KEVLER (K10-13)	957 m	0:14~0:24		01:58 ~02:15	
KEVLER (K10-14)	957 m	0:26~0:35		02:15 ~ 02:29	
KEVLER (K5-01)	475 m	0:36 ~0:42		02:29 ~ 02:35	
KEVLER (K1-07)	100 m	0:42 ~ 0:44		02:35~02:38	
KEVLER (K1-03)	86 m	0:44 ~ 0:46		02:38 ~ 02:43	
GLASS BALL	12 ps	1:03		02:38 02:41	水切り ON deck
BENTHOS A.R.	~~5865A~~	(S/N858) 1:05		02:38 02:42	水切り ON deck
〃	S/N 600	1:05		02:38 02:42	水切り ON deck
NYLON	~~150~~130m ~~170m~~	1:05~1:09			
ANCHOR	1.8t	1:19			

《Recovery Notes》
ENABLE 送信 23:30
〃 確認 23:30
Release 送信 23:35
〃 確認 23:36

作業艇準備完了 00:29
〃 着水 00:30
作業艇引寄せ索受取り 00:46
〃 ブイ到着 00:47
〃 引寄せ索取付け 00:48
引寄せ索巻取り開始 00:49
(一度停止。作業艇揚収)
00:50
作業艇水切・揚収 00:54
引寄せ索再び巻き取り 00:58

・K10-21 がアンデラの上部にからんでいた。
・木製ドラム用の巻取杆が動かなくなる。
(K10-21は、手巻き)

プロペラがなくなっていた。



アンデラ着水 0:04

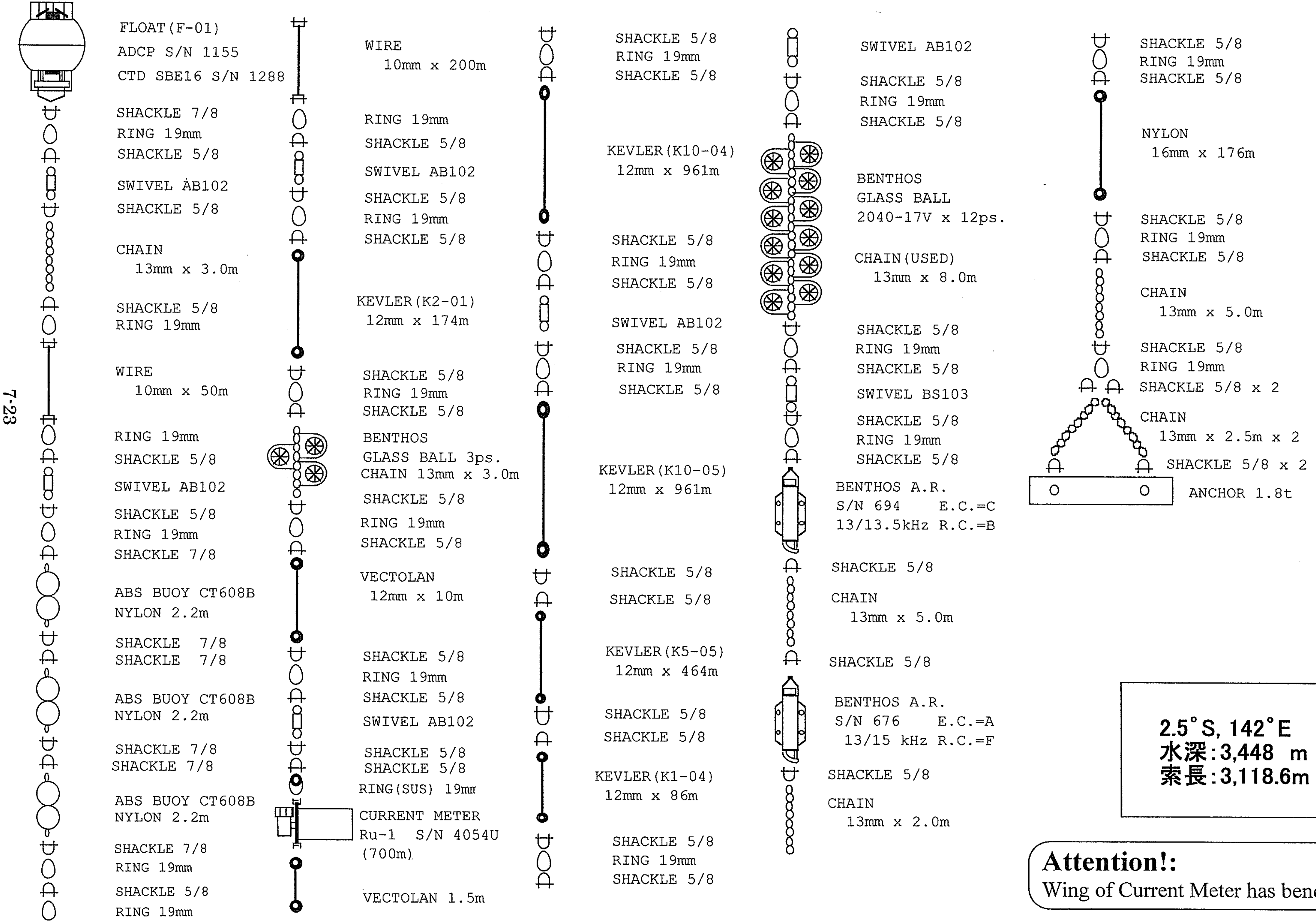
0:49～0:58 水深が「あさい」と分ったため ナイロンロープをさらに 20m 切った。予定 4505m → 4470m

01:12～01:16 航走

☆ アンデラ
- K10-21 の KEVLER ロープが上部にからんでいた。
- プロペラがなくなっていた。

2.5S-142(Summer)'00

KY00 6 Deployment


FLOAT(F-01)
ADCP S/N 1155
CTD SBE16 S/N 1288
SHACKLE 7/8
RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8
CHAIN
13mm x 3.0m
SHACKLE 5/8
RING 19mm
WIRE
10mm x 50m
RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8
RING 19mm
SHACKLE 7/8
ABS BUOY CT608B
NYLON 2.2m
SHACKLE 7/8
SHACKLE 7/8
ABS BUOY CT608B
NYLON 2.2m
SHACKLE 7/8
SHACKLE 7/8
ABS BUOY CT608B
NYLON 2.2m
SHACKLE 7/8
RING 19mm
SHACKLE 5/8
RING 19mm

WIRE
10mm x 200m
RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
KEVLER(K2-01)
12mm x 174m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
BENTHOS
GLASS BALL 3ps.
CHAIN 13mm x 3.0m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
VECTOLAN
12mm x 10m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8
SHACKLE 5/8
RING(SUS) 19mm
CURRENT METER
Ru-1 S/N 4054U
(700m)
VECTOLAN 1.5m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8
KEVLER(K10-04)
12mm x 961m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
KEVLER(K10-05)
12mm x 961m
SHACKLE 5/8
SHACKLE 5/8
KEVLER(K5-05)
12mm x 464m
SHACKLE 5/8
SHACKLE 5/8
KEVLER(K1-04)
12mm x 86m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8

SWIVEL AB102
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
BENTHOS
GLASS BALL
2040-17V x 12ps.
CHAIN(USED)
13mm x 8.0m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
SWIVEL BS103
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
BENTHOS A.R.
S/N 694 E.C.=C
13/13.5kHz R.C.=B
SHACKLE 5/8
CHAIN
13mm x 5.0m
SHACKLE 5/8
BENTHOS A.R.
S/N 676 E.C.=A
13/15 kHz R.C.=F
SHACKLE 5/8
CHAIN
13mm x 2.0m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8
NYLON
16mm x 176m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
CHAIN
13mm x 5.0m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8 x 2
CHAIN
13mm x 2.5m x 2
SHACKLE 5/8 x 2
ANCHOR 1.8t

2.5°S, 142°E
水深:3,448 m
索長:3,118.6m

Attention!:
Wing of Current Meter has bended

DEPLOYMENT & RECOVERY

MOORING No. 000916・25S142E

PROJECT	TOCS	TIME	UTC
AREA	Western Pacific	RECORDER (D) :	K. AKIZAWA
POSITION	2.5°S 142°E	RECORDER (R) :	

DEPTH 3.440m

PERIOD NAVIGATION SYSTEM :

No. of DAYS

LENGTH : m DEPTH of BUOY : m BUOYANCY : kg

ACOUSTIC RELEASERS

TYPE	BENTHOS (upper)	TYPE	BENTHOS (lower)
S/N	694	S/N	676
RECEIVE F.	13.0 kHz	RECEIVE F.	13.0 kHz
TRANSMIT F.	13.5 kHz	TRANSMIT F.	15.0 kHz
ENABLE C.	C	ENABLE C.	A
RELEASE C.	B	RELEASE C.	F
BATTERY	2 years	BATTERY	2years
TEST on DECK	OK	TEST on DECK	OK

DEPLOYMENT

DATE 16. Sep. 2000 SHIP KAIYO CRUISE No. KY00-06

WATHER O CONDITIONS Smooth DIR. of WIND VEL. of WIND

DEPTH 3448 m DEPTH of A.R. 3179 m DESCEND. RATE m/s BUOY 04 : 10

POS. of START 02 ° 28.7703S 141 ° 55.972/E HOR. RANGE m

POS. of DEP. 02 ° 28.8177S 141 ° 57.9184E ANCHOR 05 : 27 DISAPPEAR 05 : 40

POS. of MOORING 02 ° 28.8488 141° 57.8547 LANDING 05: 47

◦ アンデラ 羽根・片側 下方向にまがったまま投入

アンデラ on 15th Sep. 2000 09:00 (GMT) Ru-1 S/N 4054u.

RECOVERY

DATE SHIP CRUISE No.

WATHER CONDITIONS DIR. of WIND VEL. of WIND

START of RELEASE : SENDING E.C. :

SENDING R.C. :

FINISH of RELEASE :

DISTANCE from A.R. m DISCOVERY ADCP :

TIME RECORD

MOORING NO. 000916・255142E

DEPLOYMENT '00. Sep. 16 (U.T.C)
START : 04:08
FINISH : 05:27

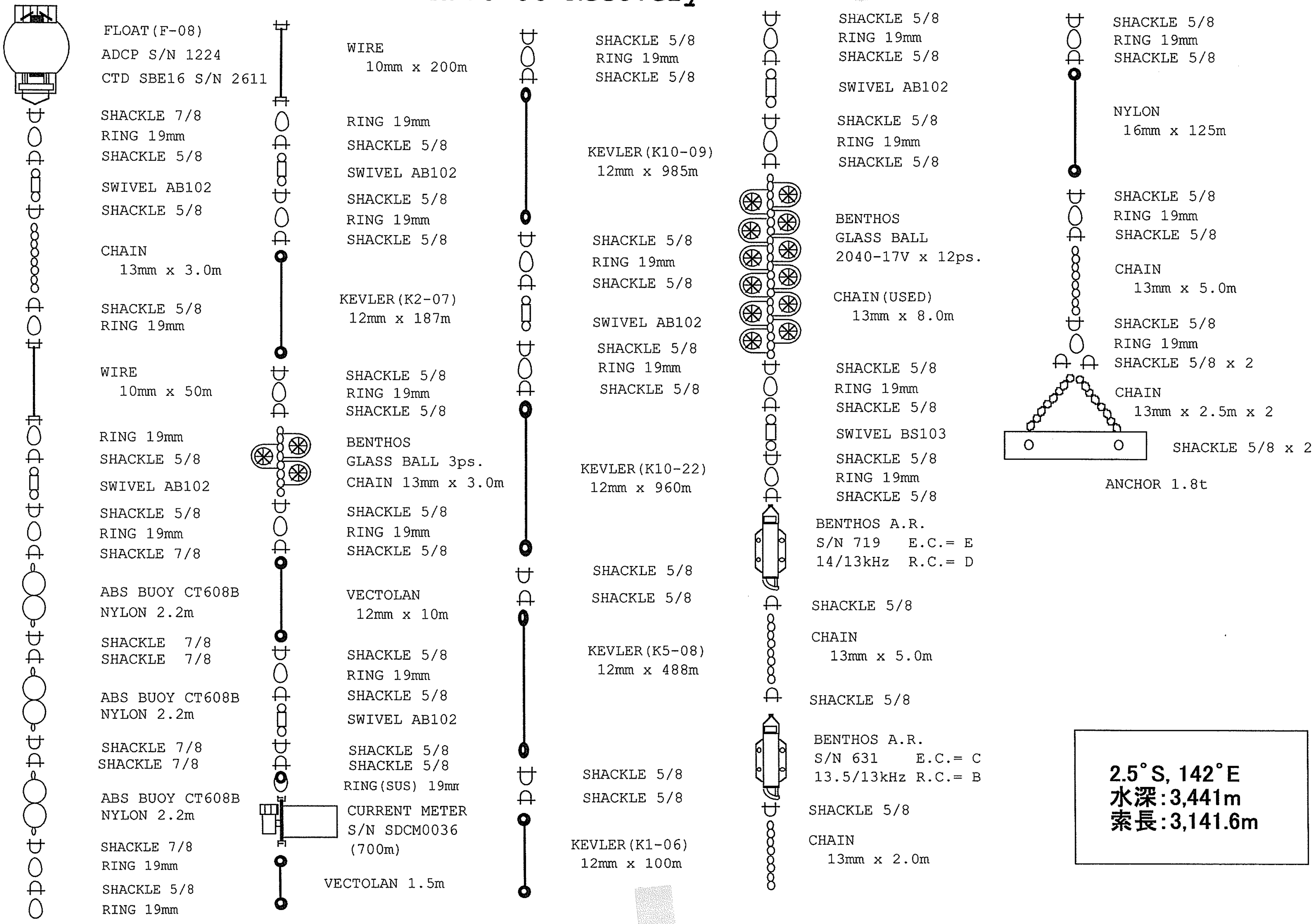
RECOVERY (Date :)
START :
FINISH :

ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP	ADCP1155 CTD 1288	04:10			
WIRE	50 m	04:10 ~ 04:14			
ABS Buoy	2×3	04:14			
WIRE	200m	04:14 ~ 04:22			
KEVLER(K2-01)	174 m	04:25 ~ 04:28			
GLASS BALL	3ps.	04:34			
AANDERAA(Rw-1)	4054U	04:34			
KEVLER (K10-04)	961m	04:35 ~ 04:48			
KEVLER(K10-05)	961m	04:49 ~ 05:01			
KEVLER(K5-05)	464m	05:02 ~ 05:07			
KEVLER(K1-04)	86m	05:08 ~ 05:09			
GLASS BALL	12ps.	05:16			
BENTHOS A.R.	694	05:21			
〃	676	05:21			
NYLON	176m	05:21 ~ 05:23			
ANCHOR	1.8t	05:27			

※AANDERAA 赤い羽根の片側、下方向にまがったまま投入。

2.5S-142(Autumn)'99

KY 0-06 Recovery



2.5°S, 142°E
水深:3,441m
索長:3,141.6m

DEPLOYMENT & RECOVERY

MOORING No. 991115-25S142E

PROJECT	TOCS	TIME	UTC
AREA	Western Pacific	RECORDER (D)	A. ITO
POSITION	02°30S 142°E	(R)	

DEPTH 3440m

PERIOD NAVIGATION SYSTEM : WGS 84

No.of DAYS

LENGTH : m DEPTH of BUOY : m BUOYANCY : kg

ACOUSTIC RELEASER

TYPE	Benthos (upper)	TYPE	Benthos (lower)
S/N	719	S/N	631
RECEIVE F.	13 kHz	RECEIVE F.	13 kHz
TRANSMIT F.	14 kHz	TRANSMIT F.	13.5 kHz
ENABLE C.	E	ENABLE C.	C
RELEASE C.	D	RELEASE C.	B
BATTERY	2 years	BATTERY	2 years
TEST on DECK	OK	TEST on DECK	OK

DEPLOYMENT

DATE 15. Nov. 1999 SHIP KAIYO CRUISE No. KY9909

WEATHER bc CONDITIONS Smooth DIR. of WIND VEL. of WIND

DEPTH 3440 m DEPTH of A.R. 3230 m DESCEND. RATE m/s BUOY 0:30

POS. of STRT 2°28.780S 141°59.820E HOR.RANGE m

POS. of DEP. 2°28.0622S 141°58.4348E SINKER 1:44 DISAPPEAR. 1:56

POS. of MOORING 2°28.110S 141°58.572E LANDING 2:03

NOTE アンデラ ON 13.Nov.1999 05:00 S/N SDCM0036

	TIME	S / R	DEPTH
S			
S			
B			
L			

RECOVERY

DATE 15. Sep. 2000 SHIP KAIYO CRUISE No. KY00-06

WEATHER CONDITIONS DIR. of WIND VEL. of WIND

START of RELEASE 01 : 11 FINISH of RELEASE 01 : 16

POS. of DISCOVERY 02°28.0535S 141°58.0473E ASCENDING RATE m/s

DIRECTION 100° DISTANCE 1000 m

NOTE <Time Record>

00:54 トランスデューサー降下

00:55 Enable 送信・確認

00:56 Release 送信、確認

00:58 トップブイ浮上

(Release Depth 3130m

100°, 水平キョリ 1000m)

01:19 引揚げ索巻取り開始

01:24 トップブイ水切り

01:28 〃 ON deck

02:42 Releaser ON deck

	TIME	S / R	DEPTH
S			
S			
B			
L			

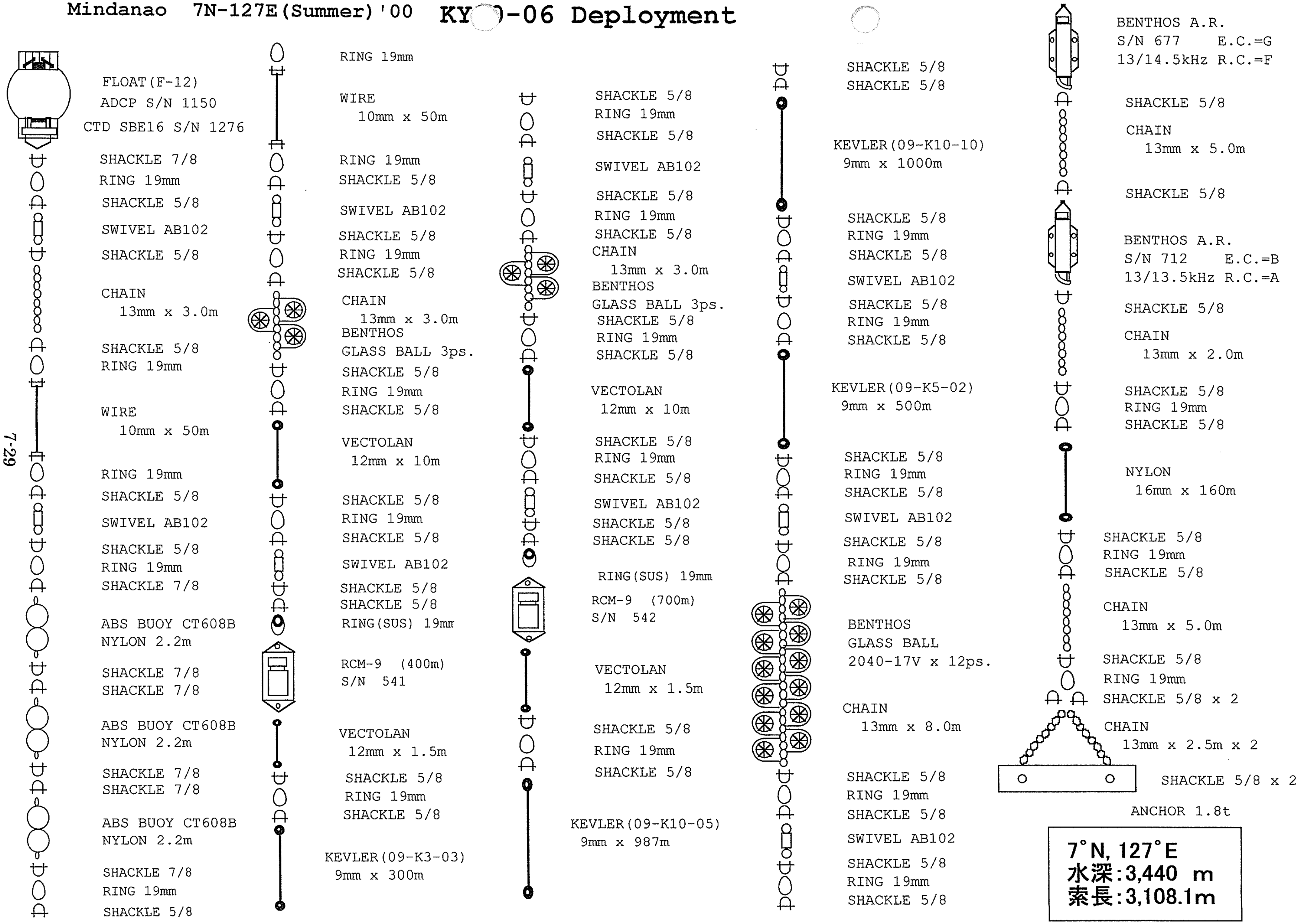
TIME RECORD

MOORING NO. 991115-25S142E

		DEPLOYMENT **START** : 00:28 **FINISH** : 01:44		**RECOVERY** (**Date:** 00.Sep.16) (UTC) **START** : **FINISH** :	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP	ADCP 1224 CTD 2611	0:30		01:24 01:28	水切り ON deck
WIRE	50m	0:30~0:31		01:33~01:40	
ABS buoy	2×3	0:32		01:36	ON deck
WIRE	200m	0:32~0:35		01:37~01:46	
KEVLER(K2-07)	187m	0:38~0:42		01:46~01:58	
GLASS BALL	3ps	0:46		01:49 01:51	水切り ON deck
AANDERAA(RCM)	SDCM0036	0:47		01:53 01:55	水切り ON deck.
KEVLER(K10-09)	985m	0:48~01:04		02:00~02:14	
KEVLER(K10-22)	960m	01:05~01:18		02:15~02:28	
KEVLER(K5-08)	488m	01:19~01:26		02:29~02:37	
KEVLER(K1-06)	100m	01:27~01:29		02:38~02:44	
GLASS BALL	12ps	01:33		02:38 02:42	水切り ON deck
BENTHOS A.R.	719	01:34		02:39 02:42	水切り ON deck
〃	631	01:35		02:40 02:41	水切り ON deck.
NYLON	125m	01:35~01:38			
ANCHOR	1.8t	01:44			
Recovery Memo					
00:54 トランスデューサー降下 00:55 Enable信号送信	01:04 作業艇降下・着水 01:11 引寄せ索取付	01:24 01:28	トップブイ 水切り トップブイ ON deck.		
00:55 〃 確認 00:56 Release信号送信	01:12 引寄せ索、一度巻取り 01:14 〃 巻き取り停止.				
00:56 〃 確認 00:58 トップブイ浮上	01:16 作業艇揚収 01:19 引寄せ索巻取り開始				

アンデラ S.W オン 13th Nov.99 05:00 (U.T.C) S/N SDCM0036
着水 0:48

Mindanao 7N-127E(Summer)'00 KY[illegible]0-06 Deployment



7°N, 127°E
水深:3,440 m
索長:3,108.1m

DEPLOYMENT & RECOVERY

MOORING No. 000924-7N127E

PROJECT	TOCS	TIME	UTC
AREA	ミンダナオ	RECORDER (D) :	K. AKIZAWA
POSITION	7° N 147° E	RECORDER (R) :	

DEPTH 3440 m

PERIOD NAVIGATION SYSTEM : WGS 84

No. of DAYS

LENGTH : m DEPTH of BUOY : m BUOYANCY : kg

ACOUSTIC RELEASERS

TYPE	Benthos (Upper)	TYPE	Benthos (bottom)
S/N	677	S/N	712
RECEIVE F.	13.0 kHz	RECEIVE F.	13.0 kHz
TRANSMIT F.	14.5 kHz	TRANSMIT F.	13.5 kHz
ENABLE C.	G	ENABLE C.	B
RELEASE C.	F	RELEASE C.	A
BATTERY	2 years	BATTERY	2 years
TEST on DECK	OK	TEST on DECK	OK

DEPLOYMENT

DATE 24 Sep. '00 SHIP KAIYO CRUISE No. KY00-06

WATHER bC CONDITIONS DIR. of WIND VEL. of WIND

DEPTH 3440 m DEPTH of A.R. 3211 m DESCEND. RATE m/s BUOY 00 : 47

POS. of START 6 °47.6729N 126 °42.2138E HOR. RANGE m

POS. of DEP. 6 °49.7069N 126 °42.6144E ANCHOR 01 : 59 DISAPPEAR 02:13

POS. of MOORING 6 °49.5660N 126 °42.5884E LANDING 02 : 20

Memo

AANDERAA (RCM-9)

S/N 541 } 9/23/00
S/N 542 } 07:00
Switch ON

RECOVERY

DATE SHIP CRUISE No.

WATHER CONDITIONS DIR. of WIND VEL. of WIND

START of RELEASE : SENDING E.C. :

SENDING R.C. :

FINISH of RELEASE :

DISTANCE from A.R. m DISCOVERY ADCP :

TIME RECORD

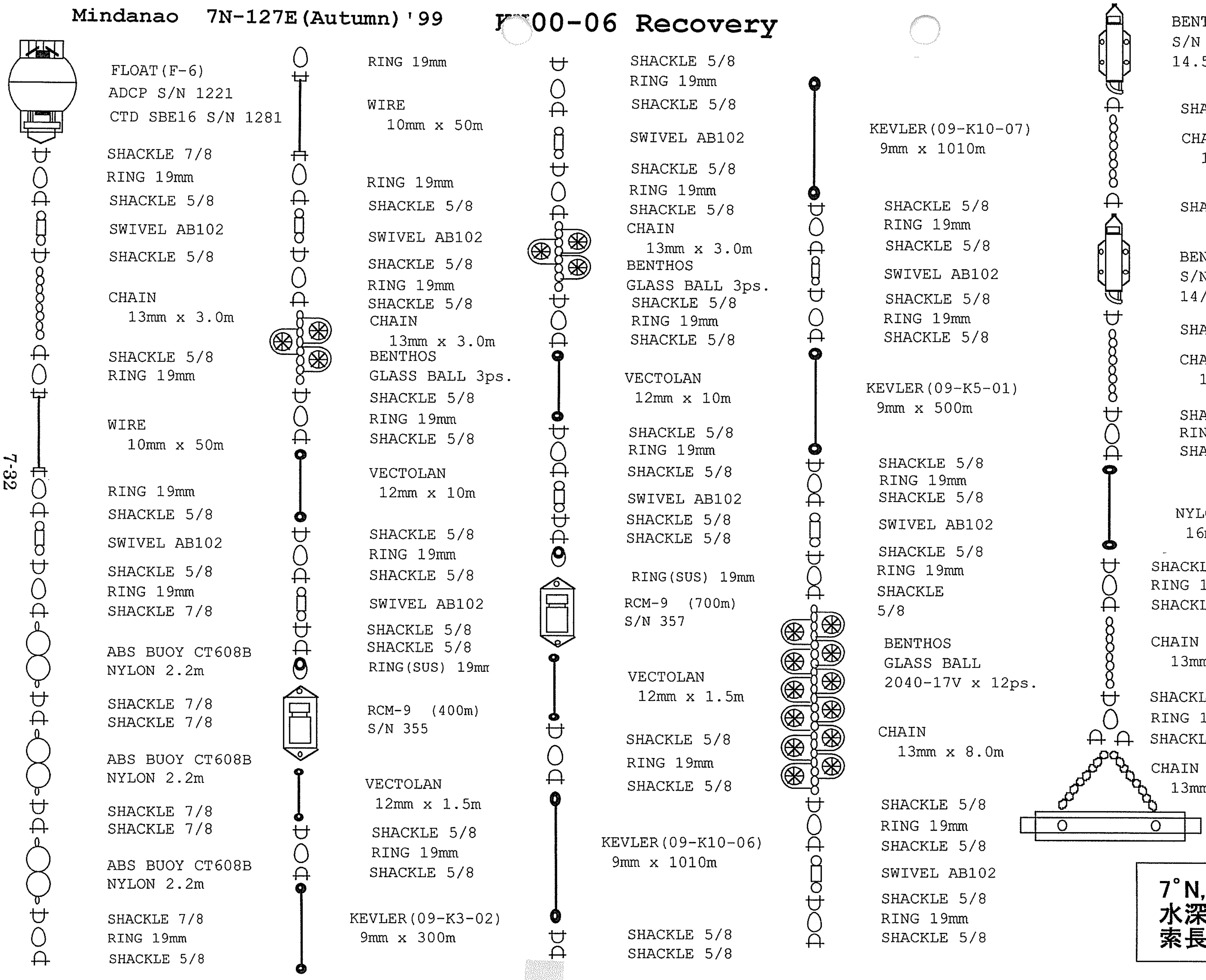
MOORING NO. 000924 - 7N127E (ミンダナオ)

	DEPLOYMENT 24. Sep. '00	RECOVERY (Date :)
	START : 00 : 47 FINISH : 01 : 59	START : FINISH :

ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP CTD	S/N 1150 S/N 1276	00 : 47	Float S/N F-12		
WIRE	10mm × 50m	00 : 47 - 00 : 50			
ABS BUOY	2 × 3	00 : 50			
WIRE	50m	00 : 50 - 00 : 53			
GLASS BALL	3ps	00 : 53			
AANDERAA RCM-9	S/N 541	00 : 55			
KEVLER (09-K3-03)	300m	00 : 55 - 01 : 05			
GLASS BALL	3ps	01 : 05			
AANDERAA RCM-9	S/N 542	01 : 06			
KEVLER (09-K10-05)	987m	01 : 06 - 01 : 21			
KEVLER (09-K10-10)	1000m	01 : 21 - 01 : 37			
KEVLER (09-K5-02)	500m	01 : 37 - 01 :			
GLASS BALL	12ps	01 : 49			
A.R.	S/N 677	01 : 51			
A.R.	S/N 712	01 : 51			
NYLON	160m	01 : 51 - 01 : 59			
ANCHOR	1.8t	01 : 59			

Mindanao 7N-127E(Autumn)'99

KY00-06 Recovery



FLOAT(F-6)
ADCP S/N 1221
CTD SBE16 S/N 1281

SHACKLE 7/8
RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8

CHAIN
13mm x 3.0m

SHACKLE 5/8
RING 19mm

WIRE
10mm x 50m

RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8
RING 19mm
SHACKLE 7/8

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 7/8
SHACKLE 7/8

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 7/8
SHACKLE 7/8

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 7/8
RING 19mm
SHACKLE 5/8

RING 19mm

WIRE
10mm x 50m

RING 19mm
SHACKLE 5/8

SWIVEL AB102

SHACKLE 5/8
RING 19mm
SHACKLE 5/8
CHAIN
13mm x 3.0m
BENTHOS
GLASS BALL 3ps.
SHACKLE 5/8
RING 19mm
SHACKLE 5/8

VECTOLAN
12mm x 10m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

SWIVEL AB102

SHACKLE 5/8
SHACKLE 5/8
RING(SUS) 19mm

RCM-9 (400m)
S/N 355

VECTOLAN
12mm x 1.5m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

KEVLER(09-K3-02)
9mm x 300m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

SWIVEL AB102

SHACKLE 5/8
RING 19mm
SHACKLE 5/8
CHAIN
13mm x 3.0m
BENTHOS
GLASS BALL 3ps.
SHACKLE 5/8
RING 19mm
SHACKLE 5/8

VECTOLAN
12mm x 10m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

SWIVEL AB102
SHACKLE 5/8
SHACKLE 5/8

RING(SUS) 19mm

RCM-9 (700m)
S/N 357

VECTOLAN
12mm x 1.5m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

KEVLER(09-K10-06)
9mm x 1010m

SHACKLE 5/8
SHACKLE 5/8

KEVLER(09-K10-07)
9mm x 1010m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

SWIVEL AB102

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

KEVLER(09-K5-01)
9mm x 500m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

SWIVEL AB102

SHACKLE 5/8
RING 19mm
SHACKLE
5/8

BENTHOS
GLASS BALL
2040-17V x 12ps.

CHAIN
13mm x 8.0m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

SWIVEL AB102

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

BENTHOS A.R.
S/N 634 E.C.=F
14.5/13kHz R.C.=E

SHACKLE 5/8

CHAIN
13mm x 5.0m

SHACKLE 5/8

BENTHOS A.R.
S/N 717 E.C.=D
14/13kHz R.C.=C

SHACKLE 5/8

CHAIN
13mm x 2.0m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

NYLON
16mm x 150m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

CHAIN
13mm x 5.0m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8 x 2

CHAIN
13mm x 2.5m x 2

SHACKLE 5/8 x 2

ANCHOR 1.8t

7°N, 127°E
水深:3,437m
索長:3,131.1m

DEPLOYMENT & RECOVERY

MOORING No. 991024-7N127E

PROJECT	TOCS	TIME	UTC
AREA	ミンダナオ	RECORDER (D)	ITO
POSITION	7°N 127°E	(R)	AKIZAWA

DEPTH 3440m

PERIOD 1999.10.23 ~ NAVIGATION SYSTEM : WGS 84

No.of DAYS 360

LENGTH : m DEPTH of BUOY : m BUOYANCY : kg

ACOUSTIC RELEASER

TYPE	Benthos (Upper)	TYPE	Benthos (bottom)
S/N	634	S/N	717
RECEIVE F.	13.0 kHz	RECEIVE F.	13.0 kHz
TRANSMIT F.	14.5 kHz	TRANSMIT F.	14.0 kHz
ENABLE C.	F	ENABLE C.	D
RELEASE C.	E	RELEASE C.	C
BATTERY	2 years	BATTERY	2 years
TEST on DECK	ok	TEST on DECK	ok

DEPLOYMENT

DATE 1999.10.23 SHIP KAIYO CRUISE No. KY99-09

WEATHER bc CONDITIONS DIR. of WIND N VEL. of WIND

DEPTH 3437 m DEPTH of A.R. 3199 m DESCEND. RATE m/s BUOY 22:36

POS. of STRT 6°4948N 126°42.71E HOR.RANGE m

POS. of DEP. 6°49.792N 126°42.792E SINKER 23:56 DISAPPEAR. 00:10

POS. of MOORING 6°49.596N 126°42.723E LANDING 00:21

NOTE

	TIME	S / R	DEPTH
S			
S			
B			
L			

RECOVERY

DATE 23. Sep. '00 SHIP KAIYO CRUISE No. KY00-06

WEATHER bC CONDITIONS DIR. of WIND VEL. of WIND

START of RELEASE 22 : 17 FINISH of RELEASE 22 : 18

POS. of DISCOVERY 6°49.5946N 126°42.7476E ASCENDING RATE m/s

DIRECTION ° DISTANCE m

NOTE

	TIME	S / R	DEPTH
S			
S			
B			
L			

TIME RECORD

MOORING NO. 991024 - 7N127E (ミンダナオ)

		DEPLOYMENT		RECOVERY (Date: 23. Sep. '00)	
		START : 22:34 (991023) FINISH :		START : 22:45 FINISH : 00:08	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP & CTD	ADCP / 221 CTD / 281	22:36		22:49 22:53	水切り ON deck
WIRE	50m	22:36～22:37		22:57 - 23:03	
ABS BUOY	2コ	22:40		22:58 23:00	水切り ON deck
〃	2コ	22:40		〃	〃
〃	2コ	22:40		〃	〃
WIRE	50m	22:40～22:41		23:03 - 23:11	
GLASSBALL	3コ	22:42		23:03 23:04	水切り ON deck
AANDERAA RCM-9	S/N 355	22:44		23:05 23:08	水切り ON deck
KEVLER ①	09-K3-02 300m	22:44～22:49		23:11 - 23:22	
GLASS BALL	3コ	22:53		23:15 23:17	水切り ON
AANDERAA RCM-9	S/N 357	22:54		23:17 23:20	水切り ON deck
KEVLER ②	09-K10-06 1000m	22:54～23:05		23:24 - 23:43	
〃 ③	09-K10-07 1000m	23:07～23:18		23:43 - 23:59	
〃 ④	09-K5-01 500m	23:20～23:25		23:59 - 00:06	
GLASSBALL	12コ	23:30		00:06 00:08	水切り ON deck
A.R.	S/N 634	23:31		00:06 00:08	水切り ON deck
A.R.	S/N 717	23:31		00:07 00:08	水切り ON deck
NYLON	150m	23:32～23:34			
ANCHOR	1.8ton	23:56			

23:35～23:53 航走

22:38 取り寄せ索取付け
22:39 、取り寄せ索巻取り
22:41 〃 停止
22:42 作業艇水切り揚収
22:45 取り寄せ索巻取り再開
22:49 トップブイ水切り
22:53 トップブイ ON deck

8. TRITON Moorings

8. TRITON moorings

8.1 TRITON Mooring Operation

(1) Personnel

Yoshifumi Kuroda	(JAMSTEC): on board Leg2
Norifumi Ushijima	(JAMSTEC): on board Leg1
Yasushi Takatsuki	(JAMSTEC): on board Leg2
Yuji Kashino	(JAMSTEC): on board Leg2,3
Atsuo Ito	(MWJ): Technical staff
Masayuki Fujisaki	(MWJ): Operation leader
Takeo Matsumoto	(MWJ): Technical staff
Toru Idai	(MWJ): Technical staff
Hiroaki Muraki	(MWJ): Technical staff
Hiroshi Matsunaga	(MWJ): Technical staff
Kaori Akizawa	(MWJ): Technical staff
Takayoshi Seike	(MWJ): Technical staff
Taeko Ohama	(MWJ): Technical staff
Kentaro Shiraishi	(MWJ): Technical staff
Toru Koizumi	(MWJ): Technical staff
Numayama	(MWJ): Diver

(2) Objectives

The air-sea interaction over the warmest sea surface temperature region in the western tropical Pacific Ocean called warm pool affects the global atmosphere and causes El Nino phenomena. The formation mechanism has not been well understood. Long term data sets of temperature, salinity, currents, so on are required at fixed locations. In particular, the oceanic change to the winds in the western tropical Pacific is important in that region of origin of El Nino and rain fall over the ocean is also important parameter to study El Nino and Asia-Australian Monsoon. The TRITON program aims to obtain the basic data to improve the predictions of El Nino and variations of Asia-Australian Monsoon system.

TRITON will be integrated with the existing TAO(Tropical Atmosphere Ocean) array, which is presently operated by the Pacific Marine Environmental Laboratory/National Oceanic and Atmospheric Administration of the United States in cooperation with France, Chinese Taipei and Japan. TRITON is a component of international research program of CLIVAR (Climate Variability and Predictability), which is a major component of World Climate Research Program sponsored by the World Meteorological Organization, the International Council of Scientific Unions, and the Intergovernmental Oceanographic Commission of UNESCO. TRITON will also contribute to the development of GOOS (Global Ocean Observing System) and GCOS (Global Climate Observing System).

The six TRITON buoys have been successfully repaired during this R/V Kiyo cruise (MY00-06),and recovered four TRITON buoys.

(3) Measured parameters

Meteorological parameters: wind speed, direction, atmospheric pressure, air temperature, relative humidity, radiation, precipitation.

Oceanic parameters: water temperature and conductivity at 1.5m, 25m, 50m, 75m, 100m, 125m, 150m, 200m, 300m, 500m 750m, depth at 300m and 750m, currents at 10m.

Six TRITON buoys will be recovered five month after and replaced by newbuoys. There recovered buoys will be maintained at JAMSTEC Mutsu-Branch where is the mother port of R/V Mirai.

(4) Instrument

1) CTD and CT

SBE-37 IM MicroCAT

A/D cycles to average : 4
Sampling Interval : 600sec
Measurement range Temperature : -5～+35
Measurement range Conductivity : 0～+7
Measurement range Pressure : 0～full scale range

2) CRN

SonTek Argonaut ADCM

Sensor frequency : 1500kHz
Sampling Interval : 600sec
Average Interval : 120sec

3) Floating Sensor

SCTI ORG-115DX

Precipitation

PARPSCIENTIFIC. Inc. DIGIQUARTZ FLOATING BAROMETER 6000SERIES

Atmospheric pressure

Woods Hole Institution ASIMET

Relative humidity/air temperature
Shortwave radiation
Wind speed/direction

Sampling Interval : 60sec
Data analysis : 600sec averaged

(5) Locations of TRITON Buoys

Six TRITON buoys have been successfully deployed in the EEZs of Federated States of Micronesia,Indonesia and Papua New Guinea using R/V Mirai.

1) TRITON recovered

Nominal location	2N,138E
ID number at JAMSTEC	12001
Number on surface float	T16
ARGOS PTT number	9771
ARGOS backup PTT number	20719
Deployed date	25 Oct. 1999
Recovered date	
Exact location	2 - 03.95N, 138 - 03.78E
Depth	4265 m
Nominal location	0,138E

ID number at JAMSTEC	13001
Number on surface float	T17
ARGOS PTT number	9772
ARGOS backup PTT number	20715
Deployed date	27 Oct. 1999
Recovered date	
Exact location	0 - 04.32N, 138 - 02.92E
Depth	4216 m

Nominal location	0,147E
ID number at JAMSTEC	09002
Number on surface float	T04
ARGOS PTT number	11826
ARGOS backup PTT number	20713
Deployed date	29 Oct. 1999
Recovered date	9 Sep. 2000
Exact location	0 - 02.19N, 146 - 59.99E
Depth	4550 m

Nominal location	5N,147E
ID number at JAMSTEC	07002
Number on surface float	T03
ARGOS PTT number	11825
ARGOS backup PTT number	3928
Deployed date	03 Nov. 1999
Recovered date	27 Aug. 2000
Exact location	5 - 02.56N, 146 - 57.07E
Depth	4265 m

2) TRITON repaired

Nominal location	8N,156E
ID number at JAMSTEC	01003
Number on surface float	T14
ARGOS PTT number	7962
ARGOS backup PTT number	20299
Deployed date	14 Mar. 2000
Repaired date	31 Aug. 2000
Exact location	8 - 01.10N, 155 - 56.73E
Depth	4834 m

Nominal location	5N,156E
ID number at JAMSTEC	02003
Number on surface float	T15
ARGOS PTT number	9770
ARGOS backup PTT number	20594
Deployed date	12 Mar. 2000

Repaired date	01 Sep. 2000
Exact location	4 - 57.87N, 156 - 04.55E
Depth	3596 m

Nominal location	2N,156E
ID number at JAMSTEC	03004
Number on surface float	T18
ARGOS PTT number	9792
ARGOS backup PTT number	20298
Deployed date	10 Mar. 2000
Repaired date	02 Sep. 2000
Exact location	1 - 57.12N, 155 - 59.28E
Depth	2564 m

Nominal location	EQ,156E
ID number at JAMSTEC	04004
Number on surface float	T19
ARGOS PTT number	20374
ARGOS backup PTT number	20879
Deployed date	07 Mar. 2000
Repaired date	03 Sep. 2000
Exact location	0 - 01.19N, 155 - 56.64E
Depth	1950 m

Nominal location	2S,156E
ID number at JAMSTEC	05002
Number on surface float	T20
ARGOS PTT number	20458
ARGOS backup PTT number	20878
Deployed date	06 Mar. 2000
Repaired date	04 Sep. 2000
Exact location	1 - 59.16S, 156 - 01.46E
Depth	1758 m

Nominal location	5S,156E
ID number at JAMSTEC	06002
Number on surface float	T21
ARGOS PTT number	20384
ARGOS backup PTT number	
Deployed date	03 Mar. 2000
Repaired date	05 Sep. 2000
Exact location	4 - 58.00N, 156 - 00.97E
Depth	1507

(6) Details of repaired

We had repaired six TRITON buoys, described them details under the rist

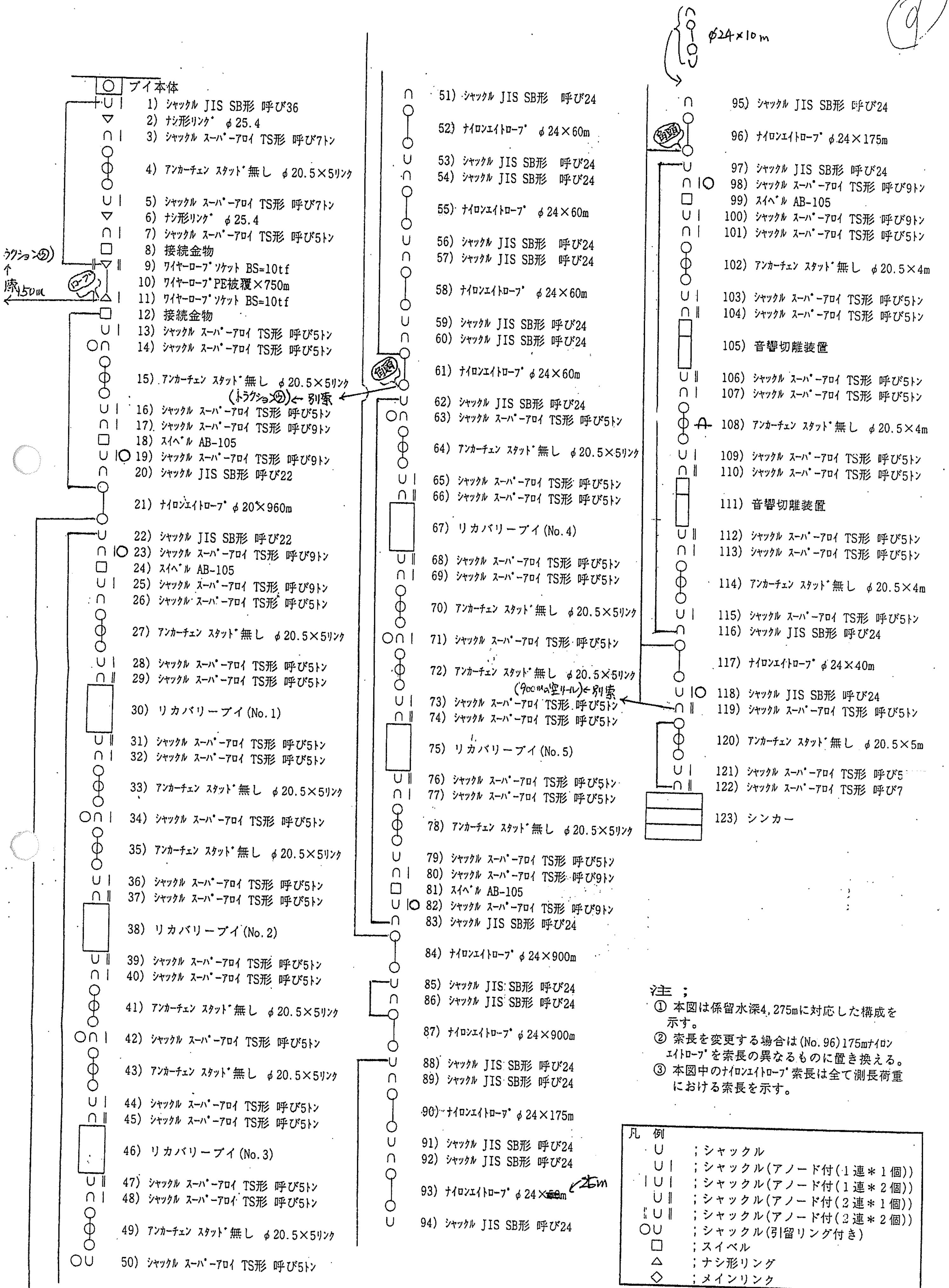
何号機？

Repaired TRITON buoys

Observation No.	Float No.	Details
01003	T14	Changed a sensor for measure atmospheric pressure. S/N 9977946→9871351 Lowered an antenna.
02003	T15	Lowered an antenna.
03004	T18	Changed a sensor for measure rainfall. S/N 9906003→9906011 Changed a sensor for measure air temperature and humidity. S/N 99327→99333 Changed a backup ARGOS ptt. PTT No.20298→20899 Lowered an antenna.
04004	T19	Changed a sensor for measure air temperature and humidity. S/N 99328→98317 Changed system for deal with signals and communication system. S/N T19E→T91E,T19S→T91S Lowered an antenna.
05002	T20	Removed a tower for make fit meteorological sensors. S/N T20 Installed an antenna. S/N TMA99006, PWLA98009
06002	T21	Changed a sensor for measure wind speed and direction. S/N 99336→98319, Vane No.64829→98319 Lowered an antenna.

(7) Data archive

Those hourly averaged data transmitted through ARGOS satellite data transmission system in near real time. The real time data will be provided to meteorological organizations via Global Telecommunication System and utilized for daily weather forecast. The data will be also distributed world wide through Internet from JAMSTEC and PMEL home pages. All data will be archived at JAMSTEC Mutsu Branch.



1) ｼｬｯｸﾙ JIS SB形 呼び36
2) ﾅｼ形ﾘﾝｸﾞ φ25.4
3) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び7ﾄﾝ
4) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
5) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び7ﾄﾝ
6) ﾅｼ形ﾘﾝｸﾞ φ25.4
7) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
8) 接続金物
9) ﾜｲﾔｰﾛｰﾌﾟｿｹｯﾄ BS=10tf
10) ﾜｲﾔｰﾛｰﾌﾟPE被覆×750m
11) ﾜｲﾔｰﾛｰﾌﾟｿｹｯﾄ BS=10tf
12) 接続金物
13) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
14) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
15) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
16) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
17) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
18) ｽｲﾍﾞﾙ AB-105
19) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
20) ｼｬｯｸﾙ JIS SB形 呼び22
21) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ20×960m
22) ｼｬｯｸﾙ JIS SB形 呼び22
23) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
24) ｽｲﾍﾞﾙ AB-105
25) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
26) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
27) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
28) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
29) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
30) リカバリーブイ(No.1)
31) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
32) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
33) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
34) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
35) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
36) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
37) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
38) リカバリーブイ(No.2)
39) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
40) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
41) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
42) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
43) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
44) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
45) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
46) リカバリーブイ(No.3)
47) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
48) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
49) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
50) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
51) ｼｬｯｸﾙ JIS SB形 呼び24
52) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×60m
53) ｼｬｯｸﾙ JIS SB形 呼び24
54) ｼｬｯｸﾙ JIS SB形 呼び24
55) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×60m
56) ｼｬｯｸﾙ JIS SB形 呼び24
57) ｼｬｯｸﾙ JIS SB形 呼び24
58) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×60m
59) ｼｬｯｸﾙ JIS SB形 呼び24
60) ｼｬｯｸﾙ JIS SB形 呼び24
61) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×60m
62) ｼｬｯｸﾙ JIS SB形 呼び24
63) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
64) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
65) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
66) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
67) リカバリーブイ(No.4)
68) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
69) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
70) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
71) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
72) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
73) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
74) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
75) リカバリーブイ(No.5)
76) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
77) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
78) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
79) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
80) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
81) ｽｲﾍﾞﾙ AB-105
82) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
83) ｼｬｯｸﾙ JIS SB形 呼び24
84) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×900m
85) ｼｬｯｸﾙ JIS SB形 呼び24
86) ｼｬｯｸﾙ JIS SB形 呼び24
87) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×900m
88) ｼｬｯｸﾙ JIS SB形 呼び24
89) ｼｬｯｸﾙ JIS SB形 呼び24
90) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×175m
91) ｼｬｯｸﾙ JIS SB形 呼び24
92) ｼｬｯｸﾙ JIS SB形 呼び24
93) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×~~50~~m 25m
94) ｼｬｯｸﾙ JIS SB形 呼び24
95) ｼｬｯｸﾙ JIS SB形 呼び24
96) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×175m
97) ｼｬｯｸﾙ JIS SB形 呼び24
98) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
99) ｽｲﾍﾞﾙ AB-105
100) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
101) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
102) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×4m
103) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
104) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
105) 音響切離装置
106) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
107) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
108) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×4m
109) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
110) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
111) 音響切離装置
112) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
113) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
114) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×4m
115) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
116) ｼｬｯｸﾙ JIS SB形 呼び24
117) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×40m
118) ｼｬｯｸﾙ JIS SB形 呼び24
119) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
120) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5m
121) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5
122) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び7
123) シンカー

注；
① 本図は係留水深4,275mに対応した構成を示す。
② 索長を変更する場合は(No.96)175mﾅｲﾛﾝｴｲﾄﾛｰﾌﾟを索長の異なるものに置き換える。
③ 本図中のﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ索長は全て測長荷重における索長を示す。

凡 例

U	；シャックル
U |	；シャックル(アノード付(1連＊1個))
| U |	；シャックル(アノード付(1連＊2個))
U ‖	；シャックル(アノード付(2連＊1個))
‖ U ‖	；シャックル(アノード付(2連＊2個))
○U	；シャックル(引留リング付き)
□	；スイベル
△	；ナシ形リング
◇	；メインリンク

海洋観測ブイ係留索接続要領 (MR99-K06設置航海用) by MWJ
5N147E : 4,275m

TRITON BUOY Deployment&Recovery

INFORMATION

Project TOCS
Cruise No. MR99-K06
Ship MIRAI
Recorder A.Kato
Area
Buoy No. T 03
PTT 11825
Observation No. 7002
Latitude 5° -02.56N
Longitude 146° -57.07E
Water depth 4265 m
Period ~
Days days

Deployment

Recorder
Date 99.11.2-3
Time : :
Weather bc
Ship Direction °
Wind Direction 180°
Ship speed knot
Wind velocity 5.6 m/s
Acoustic Releaser Depth 4165 m
Sea conditions 1.4 m
Navigation system WGS 84

	Latitude	Longitude	Date	Time	Water depth
Start Depoloyment Pos.	05° -04.3168N	147° -00.2593E	99.11.2	22:51:	4371 m
Sinker throw into the sea Pos.	05° -03.54N	146° -58.59E	99.11.3	01:42:	4254 m
Landing in Bottom Pos.	05° -02.56N	146° -57.07E	99.11.3	02:08:UTC	m

Installed Sensor

Recorder A. Kato

Floating Sensor S/N		Underwater Sensor S/N			
RAN	3473	1.5m CT	182	150m CT	164
WND	309	10m CRN	089	200m CT	529
SWR	308	25m CT	196	250m CT	563
HRH	307	50m CT	204	300m CTD	156
BAR	69920	75m CT	172	500m CT	198
TMA		100m CT	177	750m CTD	157
Option		125m CT	606	Option	

・フラッシャー 97005, 97006
・リフレクター 97003

Acoustic Releaser

Position	Upper	lower
Type	865-A	865-A
S/N	864	817
Receive frequency	13.0 kHz	13.0 kHz
Transmit frequency	15.5 kHz	14.5 kHz
Enable code	A	A
Release code	F	B
Battery		
Test on deck	21:05: (11/2) UTC	21:05: (11/2) UTC

Position Time	Depth	Position Time	Depth
1:45:	800 m	1:59:	3500 m
1:46:	1000 m	2:03:	4000 m
1:48:	1500 m	2:05:	4100 m
1:50	2000 m	2:08:	4165 m 着底確認 (lower)
1:53:	2500 m	: :	m
1:58:	3000 m	: :	m

Recovery

Project TOCS
Cruise No. KY00-06
Ship KAIYO
Recorder K. AKIZAWA
Area
Date 26. Aug. 2000
Time : :
Weather 0
Wind Direction NW °
Sea conditions (波) 1 m (うねり) 2m
Wind velocity 12 m/s
Acoustic Releaser Depth 4128.8 m (SSBLの値)
・Enable code trasmitting :23:51
・Release start :23:52
Navigation system WGS 84

	Latitude	Longitude	Date	Time	Water depth
Discovery Pos.	° - .	° - .	. .	: :	m
Recovery start Pos.	5° -02.60N,	146° -56.95E	27.Aug.'00	:00:43	4264 m
Recovery finish Pos.	5° -04.16N,	146° -56.63E	27.Aug.'00	:04:30	4197 m

Direction
Distance m

Note

・Enable 信号送信 23:51
・Release 信号送信 23:52 →応答なし
23:54 →応答なし
・Enable信号再送信 23:58
23:58 再度かける
・Releaser切り離し確認 00:00 ← この後、切り離しを伝える信号音が確認された

TIME RECORD

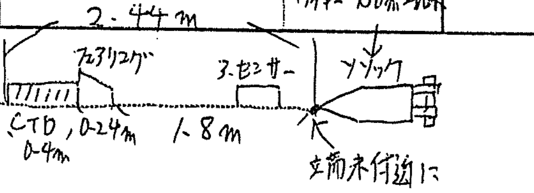
No.

BUOY No.: T03 **PTT:** 11825 **Observation No.:** 07002 **Position:**			**DEPLOYMENT** **DATE** 2-3.Nov.99 **START** 11/2 22:42 **FINISH** 11/3 01:42 **Recorder**		**RECOVERY** **DATE** 27.Aug.'00 (ブイ乗り移り 26.Aug.'00,23:32(UTC)) **START** 00:43 **FINISH** 04:30 **Recorder** 秋沢	
ITEM	**S/N**	**etc**	**TIME**	**MEMO**	**TIME**	**MEMO**
TRITON BUOY	T03		22:51		00:56(水切り)	オンデッキ 01:11
CT-1.5m	182		22:51		01:03	
WIRE	97A003		22:47～0:08		01:55～02:43	
CRN-10m	D89		22:47		01:03 (取りはずし時間 3分48秒)	01:46 取りはずし開始
CT-25m	196		22:42		01:51	53"
CT-50m	204		22:43		01:55	01'29"
CT-75m	172		22:54		02:02	01'07"
CT-100m	177		22:58		02:05	54"
CT-125m	606		23:03		02:06 (クランプ用フェアリング曲損)	01'20"
CT-150m	164		23:07		02:08 センサー取りはずし所要時間	54"
CT-200m	524		23:12		02:11	01'08"
CT-250m	563		23:16		02:15	01'00"
CTD-300m	156		23:19		02:18	01'01"
CT-500m	198		23:27	ア.センサー付 SN 5357	02:25	59"
CTD-750m	157		0:09	ア.センサー付 SN 5359	02:34	01'50"
NYLON φ	A9701	φ20×960	0:08-0:29		02:55～03:11	リカバリーブイ(3つ) 水切り 03:14
	P9858	φ24×60	0:31-0:33		03:23～03:29	
	P9843	〃	0:33-0:35		03:29～03:32	
	P9865	〃	0:35-0:36		03:32～03:36	リカバリーブイ(2つ) 水切り 03:36
	P9868	〃	0:36-0:40		03:36～03:43	
	C9701	φ24×900	0:42-0:54		03:43～03:59	
	C9702	〃	0:54-1:08		04:07～04:18	
	N9804	φ24×175	1:08-1:10		04:18～04:23	
	S9810	φ24×25	1:10-1:10		04:23～04:24	
	U9803	φ24×10	1:10-1:11		04:24～04:25	
	H9702	φ24×~~45~~ 175	1:11-1:17		04:25～04:30	
	R9818	φ24×40	1:21-1:20		流速計 D89 (上部に1cm弱の傷あり)	センサー上部 テープラ この辺り

Memo for Recovery

作業艇降下	23:24(8/26 '00)		ブイへの引寄せ索取付け	00:33	リリーサー(upper)水切り	04:28
TRITON 乗り移り (気象センサー取りはずし)	23:32	ENABLE送信 23:51	作業艇水切り 00:39, 作業艇ON deck 00:43		リリーサー(lower)水切り	04:30
TRITON→作業艇乗り移り	23:36		ブイ引寄せ索巻き取り 00:43～		ブイ揚収時、ON デッキ アンテナ及び風向風速計が船と接触、破損	
Release信号送信	①23:52, ②23:54		ブイ水切り 00:56 , ブイON deck 01:11			
Enable再送信	①23:58, ②23:58		端末水切り 00:57			
Releaser切離確認	00:00(8/27 '00)		流速計水切り 01:03			
リカバリーブイ浮上	00:09			ワイヤー 750m 端末		

シンカーレッコ 1:42
・リリーザー下のシンブルにひきとめロープがからまったため1度巻きこみ、係去
。係留索すべて巻き出した後、シンカーレッコまで約10分要す



端末付近に745のマークあり。

リリーサー 1:21

upper	lower
864	817

ア.センサー

500m	5357
750m	5359

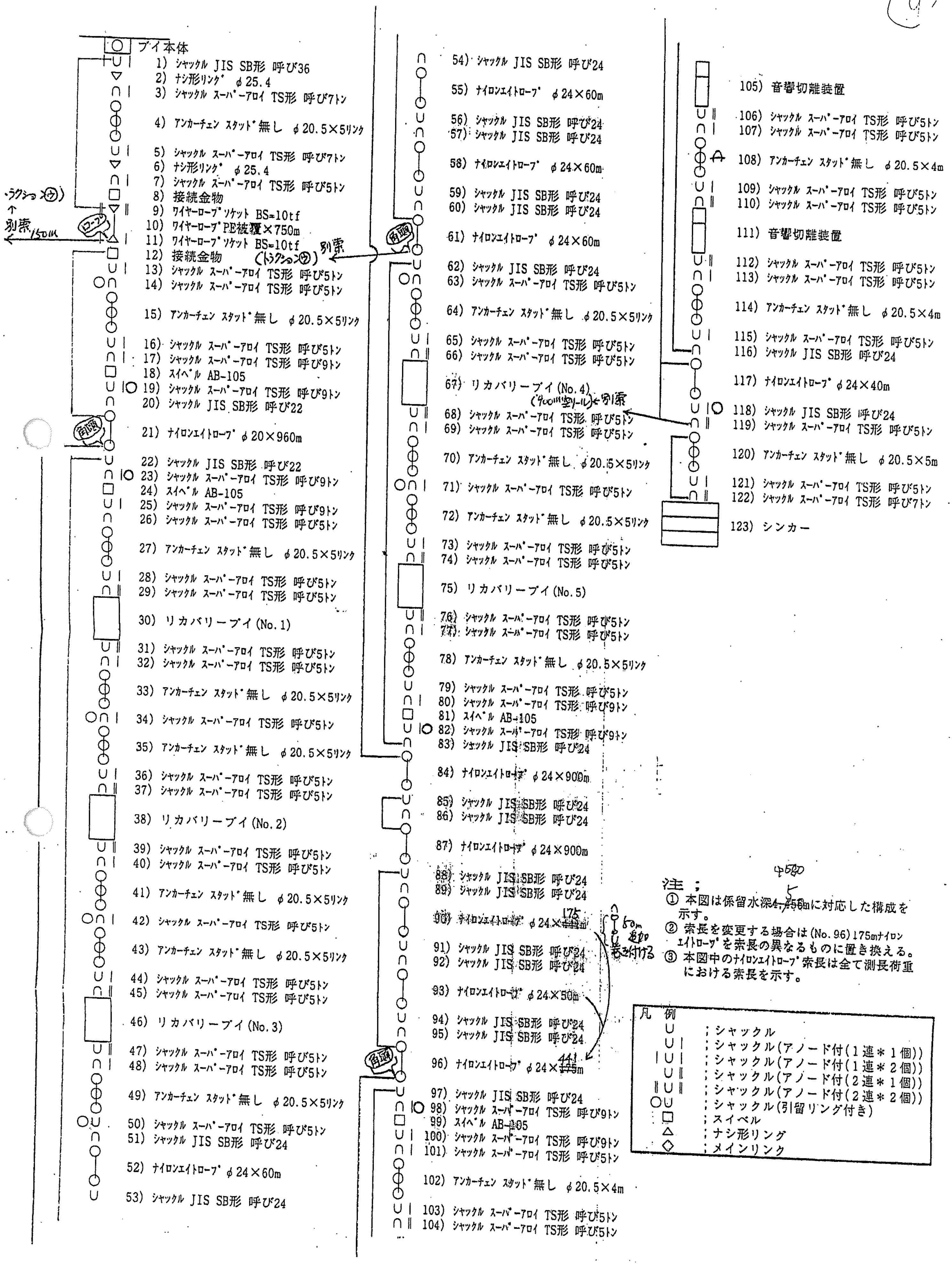
リカバリーブイ
- ・024
- ・001
- ・004

0:31

- ・062
- ・002

0:42

ⓐ



ブイ本体
1) シャックル JIS SB形 呼び36
2) ナシ形リング φ25.4
3) シャックル スーパーアロイ TS形 呼び7トン
4) アンカーチェン スタッド無し φ20.5×5リンク
5) シャックル スーパーアロイ TS形 呼び7トン
6) ナシ形リング φ25.4
7) シャックル スーパーアロイ TS形 呼び5トン
8) 接続金物
9) ワイヤーロープソケット BS=10tf
10) ワイヤーロープPE被覆×750m
11) ワイヤーロープソケット BS=10tf
12) 接続金物 (トラクション㋒)
13) シャックル スーパーアロイ TS形 呼び5トン
14) シャックル スーパーアロイ TS形 呼び5トン
15) アンカーチェン スタッド無し φ20.5×5リンク
16) シャックル スーパーアロイ TS形 呼び5トン
17) シャックル スーパーアロイ TS形 呼び9トン
18) スイベル AB-105
19) シャックル スーパーアロイ TS形 呼び9トン
20) シャックル JIS SB形 呼び22
21) ナイロンエイトロープ φ20×960m
22) シャックル JIS SB形 呼び22
23) シャックル スーパーアロイ TS形 呼び9トン
24) スイベル AB-105
25) シャックル スーパーアロイ TS形 呼び9トン
26) シャックル スーパーアロイ TS形 呼び5トン
27) アンカーチェン スタッド無し φ20.5×5リンク
28) シャックル スーパーアロイ TS形 呼び5トン
29) シャックル スーパーアロイ TS形 呼び5トン
30) リカバリーブイ (No.1)
31) シャックル スーパーアロイ TS形 呼び5トン
32) シャックル スーパーアロイ TS形 呼び5トン
33) アンカーチェン スタッド無し φ20.5×5リンク
34) シャックル スーパーアロイ TS形 呼び5トン
35) アンカーチェン スタッド無し φ20.5×5リンク
36) シャックル スーパーアロイ TS形 呼び5トン
37) シャックル スーパーアロイ TS形 呼び5トン
38) リカバリーブイ (No.2)
39) シャックル スーパーアロイ TS形 呼び5トン
40) シャックル スーパーアロイ TS形 呼び5トン
41) アンカーチェン スタッド無し φ20.5×5リンク
42) シャックル スーパーアロイ TS形 呼び5トン
43) アンカーチェン スタッド無し φ20.5×5リンク
44) シャックル スーパーアロイ TS形 呼び5トン
45) シャックル スーパーアロイ TS形 呼び5トン
46) リカバリーブイ (No.3)
47) シャックル スーパーアロイ TS形 呼び5トン
48) シャックル スーパーアロイ TS形 呼び5トン
49) アンカーチェン スタッド無し φ20.5×5リンク
50) シャックル スーパーアロイ TS形 呼び5トン
51) シャックル JIS SB形 呼び24
52) ナイロンエイトロープ φ24×60m
53) シャックル JIS SB形 呼び24
54) シャックル JIS SB形 呼び24
55) ナイロンエイトロープ φ24×60m
56) シャックル JIS SB形 呼び24
57) シャックル JIS SB形 呼び24
58) ナイロンエイトロープ φ24×60m
59) シャックル JIS SB形 呼び24
60) シャックル JIS SB形 呼び24
61) ナイロンエイトロープ φ24×60m
62) シャックル JIS SB形 呼び24
63) シャックル スーパーアロイ TS形 呼び5トン
64) アンカーチェン スタッド無し φ20.5×5リンク
65) シャックル スーパーアロイ TS形 呼び5トン
66) シャックル スーパーアロイ TS形 呼び5トン
67) リカバリーブイ (No.4)
68) シャックル スーパーアロイ TS形 呼び5トン
69) シャックル スーパーアロイ TS形 呼び5トン
70) アンカーチェン スタッド無し φ20.5×5リンク
71) シャックル スーパーアロイ TS形 呼び5トン
72) アンカーチェン スタッド無し φ20.5×5リンク
73) シャックル スーパーアロイ TS形 呼び5トン
74) シャックル スーパーアロイ TS形 呼び5トン
75) リカバリーブイ (No.5)
76) シャックル スーパーアロイ TS形 呼び5トン
77) シャックル スーパーアロイ TS形 呼び5トン
78) アンカーチェン スタッド無し φ20.5×5リンク
79) シャックル スーパーアロイ TS形 呼び5トン
80) シャックル スーパーアロイ TS形 呼び9トン
81) スイベル AB-105
82) シャックル スーパーアロイ TS形 呼び9トン
83) シャックル JIS SB形 呼び24
84) ナイロンエイトロープ φ24×900m
85) シャックル JIS SB形 呼び24
86) シャックル JIS SB形 呼び24
87) ナイロンエイトロープ φ24×900m
88) シャックル JIS SB形 呼び24
89) シャックル JIS SB形 呼び24
90) ナイロンエイトロープ φ24×~~[illegible]~~175m
91) シャックル JIS SB形 呼び24
92) シャックル JIS SB形 呼び24
93) ナイロンエイトロープ φ24×50m
94) シャックル JIS SB形 呼び24
95) シャックル JIS SB形 呼び24
96) ナイロンエイトロープ φ24×~~175~~441m
97) シャックル JIS SB形 呼び24
98) シャックル スーパーアロイ TS形 呼び9トン
99) スイベル AB-105
100) シャックル スーパーアロイ TS形 呼び9トン
101) シャックル スーパーアロイ TS形 呼び5トン
102) アンカーチェン スタッド無し φ20.5×4m
103) シャックル スーパーアロイ TS形 呼び5トン
104) シャックル スーパーアロイ TS形 呼び5トン
105) 音響切離装置
106) シャックル スーパーアロイ TS形 呼び5トン
107) シャックル スーパーアロイ TS形 呼び5トン
108) アンカーチェン スタッド無し φ20.5×4m
109) シャックル スーパーアロイ TS形 呼び5トン
110) シャックル スーパーアロイ TS形 呼び5トン
111) 音響切離装置
112) シャックル スーパーアロイ TS形 呼び5トン
113) シャックル スーパーアロイ TS形 呼び5トン
114) アンカーチェン スタッド無し φ20.5×4m
115) シャックル スーパーアロイ TS形 呼び5トン
116) シャックル JIS SB形 呼び24
117) ナイロンエイトロープ φ24×40m
118) シャックル JIS SB形 呼び24
119) シャックル スーパーアロイ TS形 呼び5トン
120) アンカーチェン スタッド無し φ20.5×5m
121) シャックル スーパーアロイ TS形 呼び5トン
122) シャックル スーパーアロイ TS形 呼び7トン
123) シンカー

注；
① 本図は係留水深4,~~4~~556m に対応した構成を示す。 φ580
② 索長を変更する場合は(No.96)175mナイロンエイトロープを索長の異なるものに置き換える。
③ 本図中のナイロンエイトロープ索長は全て測長荷重における索長を示す。

凡例

U	；シャックル
U |	；シャックル(アノード付(1連＊1個))
| U |	；シャックル(アノード付(1連＊2個))
U ‖	；シャックル(アノード付(2連＊1個))
‖ U ‖	；シャックル(アノード付(2連＊2個))
○U	；シャックル(引留リング付き)
□	；スイベル
△	；ナシ形リング
◇	；メインリンク

海洋観測ブイ係留索接続要領（MR99-K06設置航海用） by MWJ
0147E：4,~~4~~556m

TRITON BUOY Deployment&Recovery

INFORMATION

Recorder A. Kato
Area
Project TOCS
Cruise No. MR99-K06
Ship MIRAI
Buoy No. T 04
PTT 11826
Observation No. 0003
Latitude 0° -02.19S
Longitude 146° -59.99E
Water depth 4550 m
Period ~
Days days

Deployment

Recorder A. Kato
Date 99. 10. 29
Time 07:20:
Weather bc
Ship Direction °
Wind Direction 112 °
Ship speed knot
Wind velocity 5.8 m/s
Acoustic Releaser Depth m
Sea conditions m
Navigation system WGS 84

	Latitude	Longitude	Date	Time	Water depth
Start Depoloyment Pos.	0° -02.10S	146° -59.06E	99.10.29	07:20:	4414 m
Sinker throw into the sea Pos.	0° -02.02S	146° -38.30E	99.10.29	: :	m
Landing in Bottom Pos.	0° -02.19S	146° -59.99E	99.10.29	07:56:52	4550 m (4セードより)

Installed Sensor

Recorder A. Kato

Floating Sensor S/N		Underwater Sensor S/N			
RAN	3482	1.5m CT	654	150m CT	667
WND	310	10m CRN	D81	200m CT	648
SWR	320	25m CT	637	250m CT	665
HRH	309	50m CT	666	300m CTD	610
BAR	69921	75m CT	630	500m CT	668
TMA	98010	100m CT	655	750m CTD	611
アルゴス位置発信機 Option	20713	125m CT	658	Option	

・フラッシャー 007.008
・レーダリフレクター 004

Acoustic Releaser

			Position		Position	
Position	upper	lower	Time	Depth	Time	Depth
Type	865-A	865-A				
S/N	912	821				
Receive frequency	11.0 kHz	~~14.0~~ kHz 13.0	07:23:	1000 m	07:39:	4000 m
Transmit frequency	~~12.0~~ kHz 14.0	13.5 kHz	:25:	1500 m	:43:	4300 m
Enable code	A	A	:27:	2000 m	:47:	4468 m
Release code	H	G	:30:	2500 m	: :	m
Battery			:33:	3000 m	: :	m
Test on deck	10:45:	10:45:	:36:	3500 m	: :	m

Recovery

Recorder K. AKIZAWA
Area
Project TOCS
Cruise No. KY00-06
Ship KAIYO
Date 08.Sep.'00
Time : :
Weather bc and r
Wind Direction 123.0 °
Sea conditions m
Wind velocity 6.3 m/s
Acoustic Releaser Depth 4404 m (SSBLの値)
Enable code trasmitting : : (すでに起きていた)
Release start 22:05:
Navigation system

	Latitude	Longitude	Date	Time	Water depth
Discovery Pos.	0° -01.56S	146° -56.18E	8.Sep'00	07:27(UTC)	4500 m
Recovery start Pos.	00° -01.41S	146° -55.85E	. .	21:30:	4477.0 m
Recovery finish Pos.	00° -00.699S,	146° -54.59E	. .	01:47:	m

Direction 130°
Distance 840 m

Note

Discovery Pos. : 「かいよう」SSBLのキャリブレーション結果。

TIME RECORD

No.

BUOY No.: T04	DEPLOYMENT	RECOVERY
PTT: 11826	DATE 29/OCT/99	DATE 8.Sep.'00 ~ 9.Sep.'00
Observation No.: 9002	START 04:21 (UTC)	START 21:30 (UTC)
Position:	FINISH 07:19	FINISH 01:47
	Recorder A. Kato	Recorder K. AKIZAWA

ITEM	S/N	etc	TIME	MEMO	TIME	MEMO
TRITON BUOY	T04		04:29		23:00 (水切り)	23:13 (ON deck)
CT-1.5m	654		04:29		23:01	
WIRE	97A001	750m	04:21-05:41		23:45~00:23	
CRN-10m	D81		04:29		23:04	ワイヤーからの回収時下ブタがとれた。
CT-25m	637		04:21		23:46	
CT-50m	666		04:22		23:51	1'00" (センサーカバー曲損)
CT-75m	630		04:36		23:52	43"
CT-100m	655		04:40		23:54	34"
CT-125m	658		04:46		23:55	50"
CT-150m	667		04:47		23:57 センサーをはずすのにかかった時間	35"
CT-200m	648		04:52		23:58	40"
CT-250m	665		04:56		00:01	40"
CTD-300m	610		04:59		00:03	50"
CT-500m	668		05:07	Pセンサー付 SN 5015	00:09	1'43"
CTD-750m	611		05:41	Pセンサー付 SN 5355	00:16	40"
NYLON φ	A9806	φ20×960	05:41-06:01		00:30~00:49	
	P9862	φ24×60	06:03-06:05		00:49~00:52	
	P9863	φ24×60	06:05-06:07		00:52~00:54	
	P9866	φ24×60	06:07-06:08		00:54~00:56	
	P9867	φ24×60	06:08-06:14		00:56~01:02	
	C9816	φ24×900	06:15-06:35		01:04~01:15	
	C9814	φ24×900	06:35-06:49		01:20~01:29	
	G9701	φ24×441	06:49-06:59	ロープに鉄リールのさびが付いている	01:34~01:40	
	K9706	φ24×50	06:59-07:00		01:40~01:43	
	N9815	φ24×175	07:00-07:03		01:43~01:45	
	Q9812	φ24×50	07:03-07:08		01:45~01:46	
	R9817	φ24×40	07:10-07:16			

Recovery Memo

作業艇着水	21:30 (MWJ 伊代・松本)		Release信号再送信	③22:07
ブイ乗り移り	21:35 (気象センサー及びベーンアンテナ取りはずしの為)		〃	④22:08 (スラスターを止める)
作業終了作業艇へ戻る. 22:02			〃	⑤22:09
トランデューサー降下	22:04	Releaserはすでに起きている為, Enableかけず	Release信号確認	22:09
Release信号送信	①22:05		リカバリーブイ浮上	22:18
	②22:06		作業艇引寄せ索受取り	22:36

引寄せ索 ブイ取付け 22:38
作業艇水切・揚収 22:43
引寄せ索巻取り開始 22:46
~~ブイ水切り 23:00~~
ブイ ON deck 23:13
リカバリーブイ水切 00:40
(3コ) ON deck 00:45
リカバリーブイ水切 00:54
(2コ) ON deck 00:57
Releaser 水切(Upper) 01:45
〃 (lower) 01:46
Releaser ON deck 01:47

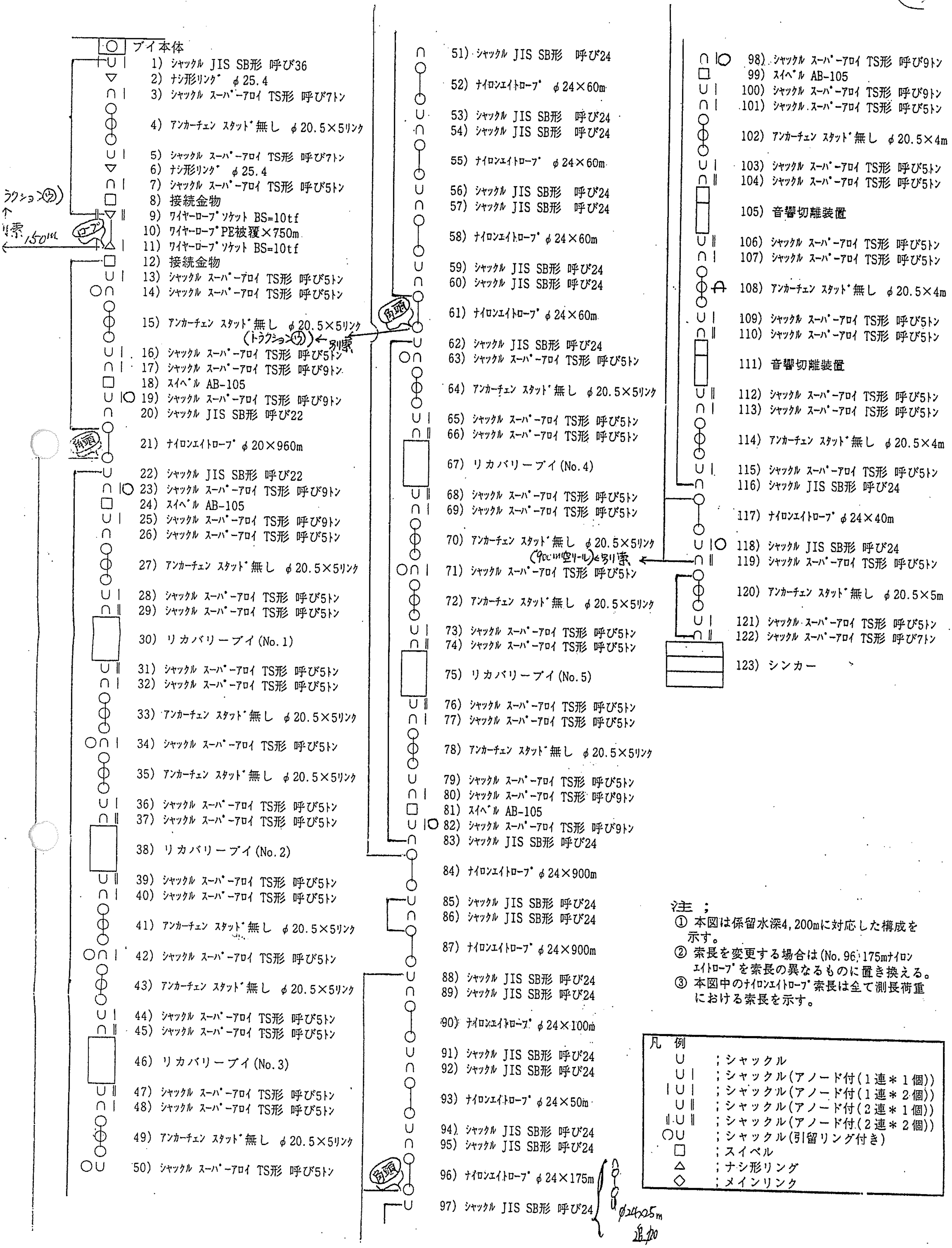
- シンカー レッコ 07:19
- Pセンサー取り付け位置
  SN 5015 → 500m
  SN 5355 → 750m
  SN 5356 → No-1リカバリーブイ

- リカバリーブイ
  No.1 A070
  No.2 A071) 06:03
  No.3 A072
  No.4 A061) 06:15
  No.5 A069

- リリーサー
  upper 912
  lower 821) 07:10

〈気象センサー〉
TMA97005
WND97310
SWR98320
RAN9803482

HRH97309
BAR9769921) デッキにて取りはずし



ブイ本体
1) シャックル JIS SB形 呼び36
2) ナシ形リング φ25.4
3) シャックル スーパーアロイ TS形 呼び7トン
4) アンカーチェン スタッド無し φ20.5×5リンク
5) シャックル スーパーアロイ TS形 呼び7トン
6) ナシ形リング φ25.4
7) シャックル スーパーアロイ TS形 呼び5トン
8) 接続金物
9) ワイヤーロープソケット BS=10tf
10) ワイヤーロープPE被覆×750m
11) ワイヤーロープソケット BS=10tf
12) 接続金物
13) シャックル スーパーアロイ TS形 呼び5トン
14) シャックル スーパーアロイ TS形 呼び5トン
15) アンカーチェン スタッド無し φ20.5×5リンク
16) シャックル スーパーアロイ TS形 呼び5トン
17) シャックル スーパーアロイ TS形 呼び9トン
18) スイベル AB-105
19) シャックル スーパーアロイ TS形 呼び9トン
20) シャックル JIS SB形 呼び22
21) ナイロンエイトロープ φ20×960m
22) シャックル JIS SB形 呼び22
23) シャックル スーパーアロイ TS形 呼び9トン
24) スイベル AB-105
25) シャックル スーパーアロイ TS形 呼び9トン
26) シャックル スーパーアロイ TS形 呼び5トン
27) アンカーチェン スタッド無し φ20.5×5リンク
28) シャックル スーパーアロイ TS形 呼び5トン
29) シャックル スーパーアロイ TS形 呼び5トン
30) リカバリーブイ (No.1)
31) シャックル スーパーアロイ TS形 呼び5トン
32) シャックル スーパーアロイ TS形 呼び5トン
33) アンカーチェン スタッド無し φ20.5×5リンク
34) シャックル スーパーアロイ TS形 呼び5トン
35) アンカーチェン スタッド無し φ20.5×5リンク
36) シャックル スーパーアロイ TS形 呼び5トン
37) シャックル スーパーアロイ TS形 呼び5トン
38) リカバリーブイ (No.2)
39) シャックル スーパーアロイ TS形 呼び5トン
40) シャックル スーパーアロイ TS形 呼び5トン
41) アンカーチェン スタッド無し φ20.5×5リンク
42) シャックル スーパーアロイ TS形 呼び5トン
43) アンカーチェン スタッド無し φ20.5×5リンク
44) シャックル スーパーアロイ TS形 呼び5トン
45) シャックル スーパーアロイ TS形 呼び5トン
46) リカバリーブイ (No.3)
47) シャックル スーパーアロイ TS形 呼び5トン
48) シャックル スーパーアロイ TS形 呼び5トン
49) アンカーチェン スタッド無し φ20.5×5リンク
50) シャックル スーパーアロイ TS形 呼び5トン
51) シャックル JIS SB形 呼び24
52) ナイロンエイトロープ φ24×60m
53) シャックル JIS SB形 呼び24
54) シャックル JIS SB形 呼び24
55) ナイロンエイトロープ φ24×60m
56) シャックル JIS SB形 呼び24
57) シャックル JIS SB形 呼び24
58) ナイロンエイトロープ φ24×60m
59) シャックル JIS SB形 呼び24
60) シャックル JIS SB形 呼び24
61) ナイロンエイトロープ φ24×60m
62) シャックル JIS SB形 呼び24
63) シャックル スーパーアロイ TS形 呼び5トン
64) アンカーチェン スタッド無し φ20.5×5リンク
65) シャックル スーパーアロイ TS形 呼び5トン
66) シャックル スーパーアロイ TS形 呼び5トン
67) リカバリーブイ (No.4)
68) シャックル スーパーアロイ TS形 呼び5トン
69) シャックル スーパーアロイ TS形 呼び5トン
70) アンカーチェン スタッド無し φ20.5×5リンク
71) シャックル スーパーアロイ TS形 呼び5トン
72) アンカーチェン スタッド無し φ20.5×5リンク
73) シャックル スーパーアロイ TS形 呼び5トン
74) シャックル スーパーアロイ TS形 呼び5トン
75) リカバリーブイ (No.5)
76) シャックル スーパーアロイ TS形 呼び5トン
77) シャックル スーパーアロイ TS形 呼び5トン
78) アンカーチェン スタッド無し φ20.5×5リンク
79) シャックル スーパーアロイ TS形 呼び5トン
80) シャックル スーパーアロイ TS形 呼び9トン
81) スイベル AB-105
82) シャックル スーパーアロイ TS形 呼び9トン
83) シャックル JIS SB形 呼び24
84) ナイロンエイトロープ φ24×900m
85) シャックル JIS SB形 呼び24
86) シャックル JIS SB形 呼び24
87) ナイロンエイトロープ φ24×900m
88) シャックル JIS SB形 呼び24
89) シャックル JIS SB形 呼び24
90) ナイロンエイトロープ φ24×100m
91) シャックル JIS SB形 呼び24
92) シャックル JIS SB形 呼び24
93) ナイロンエイトロープ φ24×50m
94) シャックル JIS SB形 呼び24
95) シャックル JIS SB形 呼び24
96) ナイロンエイトロープ φ24×175m
97) シャックル JIS SB形 呼び24
98) シャックル スーパーアロイ TS形 呼び9トン
99) スイベル AB-105
100) シャックル スーパーアロイ TS形 呼び9トン
101) シャックル スーパーアロイ TS形 呼び5トン
102) アンカーチェン スタッド無し φ20.5×4m
103) シャックル スーパーアロイ TS形 呼び5トン
104) シャックル スーパーアロイ TS形 呼び5トン
105) 音響切離装置
106) シャックル スーパーアロイ TS形 呼び5トン
107) シャックル スーパーアロイ TS形 呼び5トン
108) アンカーチェン スタッド無し φ20.5×4m
109) シャックル スーパーアロイ TS形 呼び5トン
110) シャックル スーパーアロイ TS形 呼び5トン
111) 音響切離装置
112) シャックル スーパーアロイ TS形 呼び5トン
113) シャックル スーパーアロイ TS形 呼び5トン
114) アンカーチェン スタッド無し φ20.5×4m
115) シャックル スーパーアロイ TS形 呼び5トン
116) シャックル JIS SB形 呼び24
117) ナイロンエイトロープ φ24×40m
118) シャックル JIS SB形 呼び24
119) シャックル スーパーアロイ TS形 呼び5トン
120) アンカーチェン スタッド無し φ20.5×5m
121) シャックル スーパーアロイ TS形 呼び5トン
122) シャックル スーパーアロイ TS形 呼び7トン
123) シンカー

注；
① 本図は係留水深4,200mに対応した構成を示す。
② 索長を変更する場合は(No.96) 175mナイロンエイトロープを索長の異なるものに置き換える。
③ 本図中のナイロンエイトロープ索長は全て測長荷重における索長を示す。

凡 例
U ；シャックル
U | ；シャックル(アノード付(1連＊1個))
| U | ；シャックル(アノード付(1連＊2個))
U ‖ ；シャックル(アノード付(2連＊1個))
‖ U ‖ ；シャックル(アノード付(2連＊2個))
○U ；シャックル(引留リング付き)
□ ；スイベル
△ ；ナシ形リング
◇ ；メインリンク

海洋観測ブイ係留索接続要領　(MR99-K06設置航海用)　by MWJ
0138E : 4,200m
1999.9.13 変更

TRITON BUOY Deployment&Recovery

INFORMATION

Recorder A. Kato.
Area
Project TOCS
Cruise No. MR99-K06
Ship MIRAI
Buoy No. T 17
PTT ~~9771~~ 9772
Observation No. 13001
Latitude 00° -04.32N
Longitude 138° -02.92E
Water depth 4216 m
Period ~
Days days

Deployment

Recorder A. Kato
Date 99.10.26~27
Time : :
Weather 0
Ship Direction °
Wind Direction 145
Ship speed knot
Wind velocity 0.8 m/s
Acoustic Releaser Depth m
Sea conditions m
Navigation system WGS84

	Latitude	Longitude	Date	Time	Water depth
Start Depoloyment Pos.	08 -03.82N	137° -59.62E	10.26.	22:33 UTC	m
Sinker throw into the sea Pos.	° - .	° - .	10.27.	01:43 UTC	m
Landing in Bottom Pos.	00° -04.32N	138° -02.92	. .	: :	m

Installed Sensor

Recorder A. Kato

Floating Sensor S/N		Underwater Sensor S/N			
RAN	3504	1.5m CT	640	150m CT	647
WND	323	10m CRN	D84	200m CT	653
SWR	315	25m CT	639	250m CT	641
HRH	321	50m CT	635	300m CTD	614
BAR	71353	75m CT	657	500m CT	625
TMA	98012	100m CT	634	750m CTD	615
アルゴス位置発信機 Option	20715	125m CT	645	Option	

・VANE 60700
・レーダーリフレクター 98003
・フラッシャー 023、024

Acoustic Releaser

Position	upper	lower
Type		
S/N	853	874
Receive frequency	11.0 kHz	~~13.5~~ 13.0 kHz
Transmit frequency	13.5 kHz	13.5 kHz
Enable code	A	A
Release code	B	B
Battery		
Test on deck	: :	: :

Position Time	Depth	Position Time	Depth
1:47:	900 m	2:04:	3900 m
1:49:	1500 m	2:06	4000 m
1:52:	2000 m	2:08	4100 m
1:55:	2500 m	2:09:	4124 m
1:58:	3000 m	: :	m
2:01:	3500 m	: :	m

Recovery

Recorder I. OHAMA
Area
Project TOCS
Cruise No. KY00-06
Ship KAIYO
Date 17~18. Sep. 00
Time : :
Weather r and bc
Wind Direction °
Sea conditions m
Wind velocity m/s
Acoustic Releaser Depth 4152 m (SSBL値)
Enable code trasmitting 11:36:
Release start 22:45:
Navigation system

	Latitude	Longitude	Date	Time	Water depth
Discovery Pos.	0° -04.34N	138° -02.93E	17. Sep. 00	12:28:	4214 m
Recovery start Pos.	00° -04.65N	138° -02.42E	17. Sep 00	23:25:	4210 m
Recovery finish Pos.	00° -05.72N	138° -00.85E	18. Sep. 00	02:15:	m

Direction 0°
Distance m

Note

乾舷 0.5m強
ブルーラインが少し見える

Recovery
Discovery Pos. SSBL キャリブレーションの値

TIME RECORD

No.

BUOY No.: T17 **PTT:** 9772 **Observation No.:** 13001 **Position:**	**DEPLOYMENT** **DATE** 26/OCT/99 **START** 22:33 **FINISH** 01:43 **Recorder**	**RECOVERY** **DATE** 17/Sep./00 ～ 18/Sep/00 **START** 23:10 **FINISH** 02:16 **Recorder**

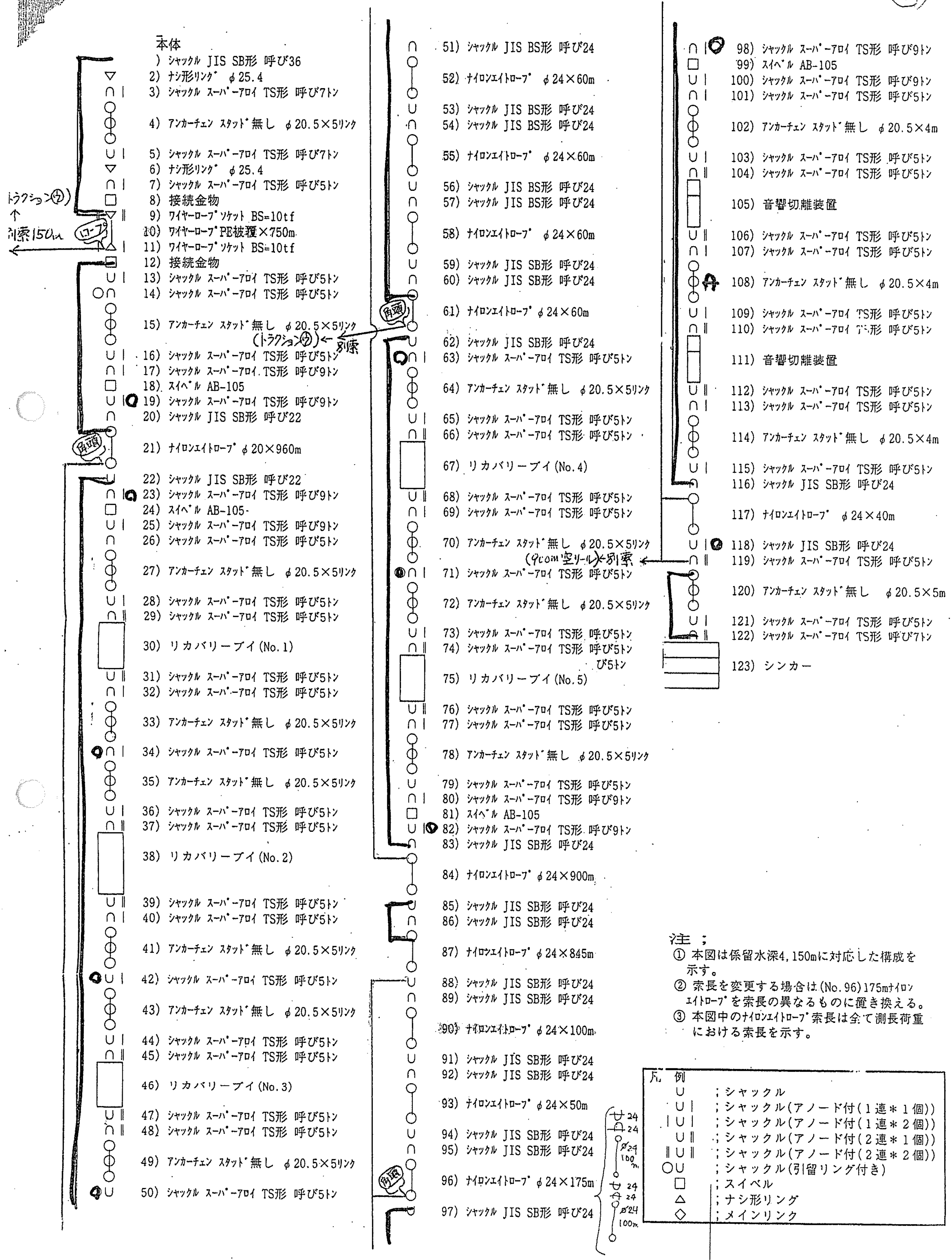
ITEM	S/N	etc	TIME	MEMO	TIME	MEMO
TRITON BUOY	T17		22:44		23:31	水切り 23:25 ON デッキ 23:31
CT-1.5m	640		22:44		Sep.18 00:01	
WIRE	98A011	750m	22:33-0:04		00:05～00:49	
CRN-10m	D84		22:44			
CT-25m	639		22:33		00:05	
CT-50m	635		22:34		00:11	
CT-75m	657		22:50		00:16	
CT-100m	634		22:54		00:18	
CT-125m	645		23:00		00:20	
CT-150m	647		23:01		00:22	
CT-200m	653		23:05		00:25	
CT-250m	641		23:09		00:27	
CTD-300m	614		23:13		00:29	
CT-500m	625		23:22		00:36	
CTD-750m	615		0:04		00:49	
NYLON φ	A9805	φ20×960	0:04-0:26		00:59～01:18	リカバリーブイ No.1～3
	P9870	φ24×60	0:26-0:29		01:18～01:19	
	P9864	φ24×60	0:29-0:30		01:19～01:25	
	P9869	φ24×60	0:30-0:32		01:25～01:27	
	P9859	φ24×60	0:32-0:40		01:27～01:34	リカバリーブイ No4.5
	C9817	φ24×~~60~~900	0:40-0:56		01:34～01:46	
	C9821	φ24×~~60~~900	0:56-1:10		01:46～02:04	
	I9701	φ24×100	1:10-1:12		02:04～02:06	
	K9708	φ24×50	1:12-1:13		02:06～02:09	
	N9811	φ24×125	1:13-1:15		02:09～02:15	
	M9704	φ24×25	1:15-1:20		02:15～02:16	
	R9810	φ24×40	1:~~20~~ 22 - 1:27			
					作業艇着水 22:36	引寄せ索
					ブイにて作業開始 22:38	まき取開始 23:17
					作業終了 22:42	ブイ水切り 23:25 ブイONデッキ 23:31
					トランスデューサー降下 22:43	リカバリーブイ
					トランスデューサー浮上 22:51	~~No1～3~~ 01:18
					切り離し確認 22:52	~~リカバリーブイ~~ No4、5 01:34
					引寄せ索 ブイ取りつけ 23:10	リリーサー 02:15
					作業艇 水切り 23:15	

○アンカーレッコ 1:43 ○リカバリーブイ

No.1 A019 ┐
No.2 A054 ├ 0:26
No.3 A053 ┘
No.4 A014 ┐
No.5 A016 ┘ 0:40

○リリサー
upper 853 ┐
lower 874 ┘ 1:24

リリーサ upper 853 ┐
Lower 874 ┘ 02:15



本体

) ｼｬｯｸﾙ JIS SB形 呼び36
2) ﾅｼ形ﾘﾝｸﾞ φ25.4
3) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び7ﾄﾝ
4) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
5) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び7ﾄﾝ
6) ﾅｼ形ﾘﾝｸﾞ φ25.4
7) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
8) 接続金物
9) ﾜｲﾔｰﾛｰﾌﾟｿｹｯﾄ BS=10tf
10) ﾜｲﾔｰﾛｰﾌﾟPE被覆×750m
11) ﾜｲﾔｰﾛｰﾌﾟｿｹｯﾄ BS=10tf
12) 接続金物
13) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
14) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
15) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
16) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
17) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ.TS形 呼び9ﾄﾝ
18) ｽｲﾍﾞﾙ AB-105
19) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
20) ｼｬｯｸﾙ JIS SB形 呼び22
21) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ20×960m
22) ｼｬｯｸﾙ JIS SB形 呼び22
23) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
24) ｽｲﾍﾞﾙ AB-105-
25) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
26) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
27) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
28) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
29) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
30) リカバリーブイ (No.1)
31) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
32) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
33) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
34) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
35) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
36) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
37) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
38) リカバリーブイ (No.2)
39) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
40) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
41) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
42) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
43) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
44) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
45) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
46) リカバリーブイ (No.3)
47) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
48) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
49) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
50) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ

51) ｼｬｯｸﾙ JIS BS形 呼び24
52) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×60m
53) ｼｬｯｸﾙ JIS BS形 呼び24
54) ｼｬｯｸﾙ JIS BS形 呼び24
55) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×60m
56) ｼｬｯｸﾙ JIS BS形 呼び24
57) ｼｬｯｸﾙ JIS BS形 呼び24
58) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×60m
59) ｼｬｯｸﾙ JIS SB形 呼び24
60) ｼｬｯｸﾙ JIS SB形 呼び24
61) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×60m
62) ｼｬｯｸﾙ JIS SB形 呼び24
63) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
64) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
65) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
66) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
67) リカバリーブイ (No.4)
68) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
69) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
70) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
71) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
72) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
73) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
74) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
び5ﾄﾝ
75) リカバリーブイ (No.5)
76) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
77) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
78) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5ﾘﾝｸ
79) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
80) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
81) ｽｲﾍﾞﾙ AB-105
82) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
83) ｼｬｯｸﾙ JIS SB形 呼び24
84) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×900m
85) ｼｬｯｸﾙ JIS SB形 呼び24
86) ｼｬｯｸﾙ JIS SB形 呼び24
87) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×845m
88) ｼｬｯｸﾙ JIS SB形 呼び24
89) ｼｬｯｸﾙ JIS SB形 呼び24
~~90) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×100m~~
91) ｼｬｯｸﾙ JIS SB形 呼び24
92) ｼｬｯｸﾙ JIS SB形 呼び24
93) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×50m
94) ｼｬｯｸﾙ JIS SB形 呼び24
95) ｼｬｯｸﾙ JIS SB形 呼び24
96) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×175m
97) ｼｬｯｸﾙ JIS SB形 呼び24

98) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
99) ｽｲﾍﾞﾙ AB-105
100) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び9ﾄﾝ
101) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
102) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×4m
103) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
104) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
105) 音響切離装置
106) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
107) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
108) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×4m
109) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
110) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
111) 音響切離装置
112) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
113) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
114) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×4m
115) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
116) ｼｬｯｸﾙ JIS SB形 呼び24
117) ﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ φ24×40m
118) ｼｬｯｸﾙ JIS SB形 呼び24
119) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
120) ｱﾝｶｰﾁｪﾝ ｽﾀｯﾄﾞ無し φ20.5×5m
121) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び5ﾄﾝ
122) ｼｬｯｸﾙ ｽｰﾊﾟｰｱﾛｲ TS形 呼び7ﾄﾝ
123) シンカー

注；
① 本図は係留水深4,150mに対応した構成を示す。
② 索長を変更する場合は(No.96)175mﾅｲﾛﾝｴｲﾄﾛｰﾌﾟを索長の異なるものに置き換える。
③ 本図中のﾅｲﾛﾝｴｲﾄﾛｰﾌﾟ索長は全て測長荷重における索長を示す。

凡例	
U	；シャックル
U |	；シャックル(アノード付(1連＊1個))
| U |	；シャックル(アノード付(1連＊2個))
U ‖	；シャックル(アノード付(2連＊1個))
‖ U ‖	；シャックル(アノード付(2連＊2個))
○U	；シャックル(引留リング付き)
□	；スイベル
△	；ナシ形リング
◇	；メインリンク

海洋観測ブイ係留索接続要領（MR99-K06設置航海用） by MWJ

2N138E：~~4,150m~~

1999.9.13 変更

TRITON BUOY Deployment&Recovery

INFORMATION

Project TOCS
Buoy No. T 16
Latitude 2°-00.09N
Period 1999.10.25 UTC ~
Cruise No. MR99-K06
PTT 09771
Longitude 138°-01.53E
Ship MIRAI
Observation No. 12001
Water depth 4265 m
Days days
Recorder Kato
Area Tropical Ocean

Deployment

Date 99.10.2
Weather bc
Wind Direction 043°
Wind velocity 4.3 m/s
Sea conditions m
Time 10/24 22:46~ 10/25 02:12
Ship Direction °
Ship speed knot
Acoustic Releaser Depth 4209 m (上側)
Recorder Kato

Navigation system WGS 84

	Latitude	Longitude	Date	Time	Water depth
Start Depoloyment Pos.	2°-00.09N	138°-01.53E	99.10.24	23:01:	4265 m
Sinker throw into the sea Pos.	°- .	°- .	. .	: :	m
Landing in Bottom Pos.	2°-03.95	138°-03.78	99.10.25	02:35:	4209 m

(リリーサー upper SSBLより)
シービーム 4344m
設置水深

Installed Sensor

Recorder Kato

Floating Sensor S/N		Underwater Sensor S/N			
RAN	3500	1.5m CT	980662	150m CT	643
WND	314	10m CRN	082	200m CT	651
SWR	311	25m CT	980663	250m CT	646
HRH	312	50m CT	980631	300m CTD	612
BAR	71352	75m CT	980664	500m CT	821
TMA	011	100m CT	649	750m CTD	613
アルゴス位置発信器 Option	20719	125m CT	650	Option	

・フラッシャー 0021 0022
・レーダーリフレクター 002
・アンテナ 011
・ベーン 60694

Acoustic Releaser

Position	upper	lower
Type		
S/N	819	820
Receive frequency	13.0 kHz	13.0 kHz
Transmit frequency	15.5 kHz	14.5 kHz
Enable code	A	A
Release code	D	F
Battery	1 Year	1 Year
Test on deck	: : ok	: : ok

Position Time	Depth	Position Time	Depth
:02:21	2000 m	: :	m
:02:23	2507 m	: :	m
:02:26	3014 m	: :	m
:02:29	3534 m	: :	m
:02:32	4023 m	: :	m
:02:36	4212 m	: :	m

Recovery

Project TOCS
Cruise No. KY00-K06
Ship KAIYO
Recorder T. Ohama
Area
Date 00.Sep.19
Time : :
Weather bc
Wind Direction °
Sea conditions m
Wind velocity m/s
Acoustic Releaser Depth 4215.3 m
Enable code trasmitting :21:27
Release start 00:14:
Navigation system

	Latitude	Longitude	Date	Time	Water depth
Discovery Pos.	2°-04.05N	138°-02.28 E	00.Sep.18	22:31:	m
Recovery start Pos.	02°-03.90N	138°-03.32E	00.Sep.19	00:52:	4326 m
Recovery finish Pos.	02°-05.47N	138°-05.04E	. .	03:45:	m

Direction 270°
Distance 1340 m

Note

下側リリーサー 反応 途切れる
水深計
ワイヤー(750m)端末 SN 5013
リカバリーブイ(1番上) SN 5014
インターバル 1秒
水深調整で
100×2本追加

9/18 21:27 キャリブレーション開始 enable 1回目 (lower)
21:28 enable 2回目 21:29 enable 3回目
21:31 enable (upper) 1回目. 相方感あり.
22:02 lower 通信途絶

TIME RECORD

No. 1

BUOY No.: T16		
PTT: 09771		
Observation No.:		
Position:		
	DEPLOYMENT	**RECOVERY**
DATE	24/OCT/99	19/Sep/00
START	22:46 (UTC)	00:44
FINISH	23:12 (UTC)	03:45
Recorder		

ITEM	S/N	etc	TIME (UTC)	MEMO	TIME	MEMO
TRITON BUOY	T16		23:00		00:52 (水切り)	01:03 ONデッキ
CT-1.5m	980662		23:00		00:52	まきこみ時に折れた
WIRE	98A013	750m	22:47 - 0:27		01:33 - 02:22	
CRN-10m	1082		22:55		01:30	
CT-25m	980663		22:47		01:33	
CT-50m	980631		22:48		01:45	
CT-75m	980664		23:04		01:48	
CT-100m	649		23:08		01:51	
CT-125m	650		23:14		01:53	
CT-150m	643		23:17		01:57	
CT-200m	651		23:21		02:00	
CT-250m	646		23:26		02:03	
CTD-300m	612		23:30		02:04	
CT-500m	821		23:41		02:09	
CTD-750m	613		0:27		02:15	
NYLON φ	A9807	φ20×900	0:27 - 0:56		02:22 - 02:44	
	P9861	φ24×60	0:57 - 0:59		02:44 - 02:49	
	P9860	φ24×60	0:59 - 1:01		02:49 - 02:54	
	J9719	φ24×60	1:01 - 1:03		02:54 - 02:56	
	J9720	φ24×60	1:03 - 1:09		02:56 - 03:02	
	C9815	φ24×900	1:09 - 1:28		03:02 - 03:19	
	D9701	φ24×845	1:28 - 1:45		03:25 - 03:34	
	I9702	φ24×100	1:45 - 1:46		03:34 - 03:36	
	K9707	φ24×50	1:46 - 1:48		03:36 - 03:37	
	N9810	φ24×175	1:48 - 1:52		03:37 - 03:41	
	R9809	φ24×40	2:02 - 2:07			
水深調整用	SN9804				03:41 - 03:42	
	SN9805				03:42 - 03:43	リリーサ・水切り 03:43

Memo

作業艇乗りこみ・着水	00:06
ブイにて作業開始	00:08
作業終了	00:09
トランスデューサー降下	00:11
切り離しかける (反応はなし)	00:14
切り離し確認	00:14
トランスデューサー上げる	00:15
ブイに引寄せ索かける	00:38
作業艇水切り	00:42
揚収	00:43

引き寄せ索
巻き上げ 00:44
ブイ水切り 00:52
ONデッキ 01:03
リカバリーブイ
(上) 水切り 02:41
ONデッキ 02:44
(下) 水切り 02:56
ONデッキ 02:59
リリーサー
水切り 03:43
ONデッキ 03:45

- Fセンサー 0:57
㊤ 5014
- リリーサー
  upper 819 2:02
  lower 820 2:02
- ヨコカー 2:12
- リカバリー
  - A057
  - A052
  - A051
  0:57
  - A017
  - A002
  1:09
- ワイヤー ソケット直上

水深計 750m SN 5013 0:27

水深調整用

	SN	Start	end
・100m	9804	1:52	1:54
・100m	9805	1:54	1:59

9. ARGO Sensor Test

9. CTP sensor test for ARGO Float

9.1. Participant

Yasushi Takatsuki (JAMSTEC)

9.2. Objective

ARGO is an internationally coordinated activity directed at characterizing both the temperature and salinity structure of the mid- and upper-ocean and the advective field at mid-depth through deployment of autonomous profiling floats. The floats are equipped with a conductivity sensor to measure salinity in addition to the temperature and pressure sensor. We expect to acquire both the temperature and salinity profiles with accuracy at 0.01 degC and 0.01 in PSS-78. However, conductivity sensor is not stabled compared to temperature sensor. Therefore, we need to evaluate the accuracy and stability of the conductivity sensor used for profiling floats. During this cruise, we get the data of CTP sensor for profiling floats and usual CTD at the same time to estimate the in-situ accuracy of CTP sensor.

9.3. Methods

The target sensor is EXCELL CTD, which is designed for profiling floats and manufactured by Falmouth Scientific, Inc. (hereafter FSI-CTD). The FSI-CTD is mounted on the plate of multi-bottle sampler in place of the Niskin bottle in the CTD frame as shown in Figure 9-1. The CTD sensor used as references is SBE-911plus, manufactured by Sea-Bird Electronics, Inc (hereafter SBE-CTD). The FSI-CTD is located 1.2 m above the SBE-CTD. The spec and serial number of the sensors are listed in Table 9-1. The data of FSI-CTD are recorded into internal RAM during the cast and downloaded after the cast via serial interface. Due to the slow response time of the temperature sensor on FSI-CTD, pressure and conductivity data are lagged with the time lag of temperature sensor and its value is 1.17 seconds. All the evaluations are done using with RAW data for FSI-CTD and RAW or pressure averaged data processed by SEASOFT ver. 4.226 for SBE-CTD.

Comparisons are done at all CTD stations during the leg 2 of KY00-06 as shown in Table 9-2. The CTD was lowered to 1000 m depth with its descending rate of 1.0 m/s and pulled up with its ascending rate of 1.5 m/s, typically. At station 014C and 028C, eleven Niskin bottles were installed on the sampler and we took the water sample during the pulling up. At other stations, only one to four Niskin bottles were installed and nothing beside the target sensor except station 010C. At station 010C, acoustic releaser were mounted near the target sensor in the CTD frame, to check work well or not. At station 010C, the CTD was lowered with its descending rate of 0.2 m/s between 100 dbar and 170 dbar depth. At station 022C, the CTD was pulled up with its ascending rate of 0.1 m/s between 180 dbar and 120 dbar depth.

9.4. Preliminary Results

Before the data comparison, data-sampling rate of each sensor was verified. As a result, FSI-CTD sampled 2.751 frames per one second, which is slightly smaller than 2.8 frames per one second written in the manual. As each sensor was mounted on the same frame, we compare the pressure data from each sensor at every second. The pressure difference between FSI-CTD and SBE-CTD at station 022C is shown in Figure 9-2 as example. If each sensor outputs exact value, the pressure of FSI-CTD should be 1.2 dbar smaller than that of SBE-CTD. In order to the pressure accuracy of SBE-CTD is within 0.5 dbar, we consider that the pressure data of SBE-CTD is exact value here. The comparisons of pressure at all the stations show that the FSI-CTD is larger than SBE-CTD ranged from 1 to 9 dbar. The difference was increased at the thermocline, due to the rapid temperature change. At station 014C, 022C and 028C, where ascent rate in the thermocline is smaller than 1 m/s, the difference is within 3 dbar at the most. As the decent and ascent rate of profiling float are order of 0.1 m/s, the pressure accuracy of

FSI-CTD would be within 2 dbar on profiling float, which is the same order of the spec.
The accuracy of the temperature and conductivity sensor is estimated as follows. At first, the pressure of FSI-CTD is corrected with that of SBE-CTD considering with the FSI-CTD is located 1.2m above the SBE-CTD. Next, we calculate the average temperature and conductivity for each 1 dbar bin. Then, we compare the FSI-CTD and SBE-CTD at the same pressure bin. Before the comparison, we also corrected the conductivity of SBE-CTD using the bottle salinity values, which measured by "AUTOSAL" salinometer. Vertical profiles of temperature, conductivity and salinity and these differences at station 022C are shown in Figure 9-3 and Figure 9-4, respectively. Except the thermocline depth, temperature and conductivity differences are almost within 0.02 degC and 0.02 mS/cm, respectively. As a result, salinity differences at most of the deeper layer and surface mixing layer are within 0.01 in PSS-78. In the thermocline, the differences of the temperature and conductivity between the FSI-CTD and SBE-CTD exceed 0.1 degC and 0.1 mS/cm, and salinity difference also exceeds 0.03. However, during the reduced ascend rate observation (e.g. 180 – 120 dbar at station 022C), salinity difference is about 0.01. At station 010C, 014C and 028C, salinity of FSI-CTD is smaller than that of SBE-CTD about 0.06, 0.03 and 0.03, respectively. At these stations, the material such as Niskin bottle may affect the inductive sensor to reduce the conductivity. All things considered, the temperature and conductivity sensors are satisfying the target accuracy except the thermocline.

Figure 9-1. Appearance of target sensor and reference sensor.

Table 9-1. The spec and serial number of the sensors

Target Sensor
EXCELL CTD ECTP-202-DH (Falmouth Scientific, Inc.)
S/N 1324
Firmware Rev. 2.1
Pressure: Semi-conductor strain gauge (fully temperature compensated)
Temperature: Platinum thermometer
Conductivity: Inductive conductivity sensor
Data sampling rate: 2.8 frames/second (maximum)

	Range	resolution	precision
Temperature	-2 – 32 degC	0.0001 degC	< +/-0.0015 degC
Conductivity	0 – 70 mS/cm	0.0001 mS/cm	< +/-0.003 mS/cm
Pressure	0 – 2000 dbar	0.1 dbar	< +/- 1 dbar

Reference Sensor
SBE-911plus (Sea-Bird Electronics, Inc.)
Pressure: Paroscientific Digiquartz sensor (S/N 41223)
Temperature:SBE-3 [Thermister] (S/N 1462, calibrated at Feb. 19, 2000)
Conductivity:SBE-4 [Conductivity cell] (S/N 1045, calibrated at Mar. 2, 2000)
Data sampling rate: 24 frames/second

	Range	resolution	precision
Temperature	-2 – 32 degC	< 0.0002 degC	< +/-0.001 degC
Conductivity	0 – 70 mS/cm	< 0.0004 mS/cm	< +/-0.003 mS/cm
Pressure	0 – 10500 dbar	< 0.06 dbar	< +/- 0.5 dbar

Table 9-2. Station list

Station	Date and time (UTC)	Position	Remarks
002C	Aug. 31 23:41 – Sep. 1 00:12	8N, 156E	
008C	Sep. 1 20:34 – 21:18	5N, 156E	
010C	Sep. 2 04:58 – 05:41	4N, 156E	acoustic releaser mounted 0.2 m/s decent (100 – 170 dbar)
014C	Sep. 2 23:35 – Sep. 3 00:12	2N, 156E	11 Sampling bottles mounted
018C	Sep. 3 22:09 – 22:38	Eq., 156E	
022C	Sep. 4 22:52 – 23:32	2S, 156E	0.1 m/s ascent (180 – 120 dbar)
028C	Sep. 5 19:51 – 20:30	5S, 156E	11 Sampling bottles mounted
029C	Sep. 8 06:22 – 06:52	Eq., 147E	

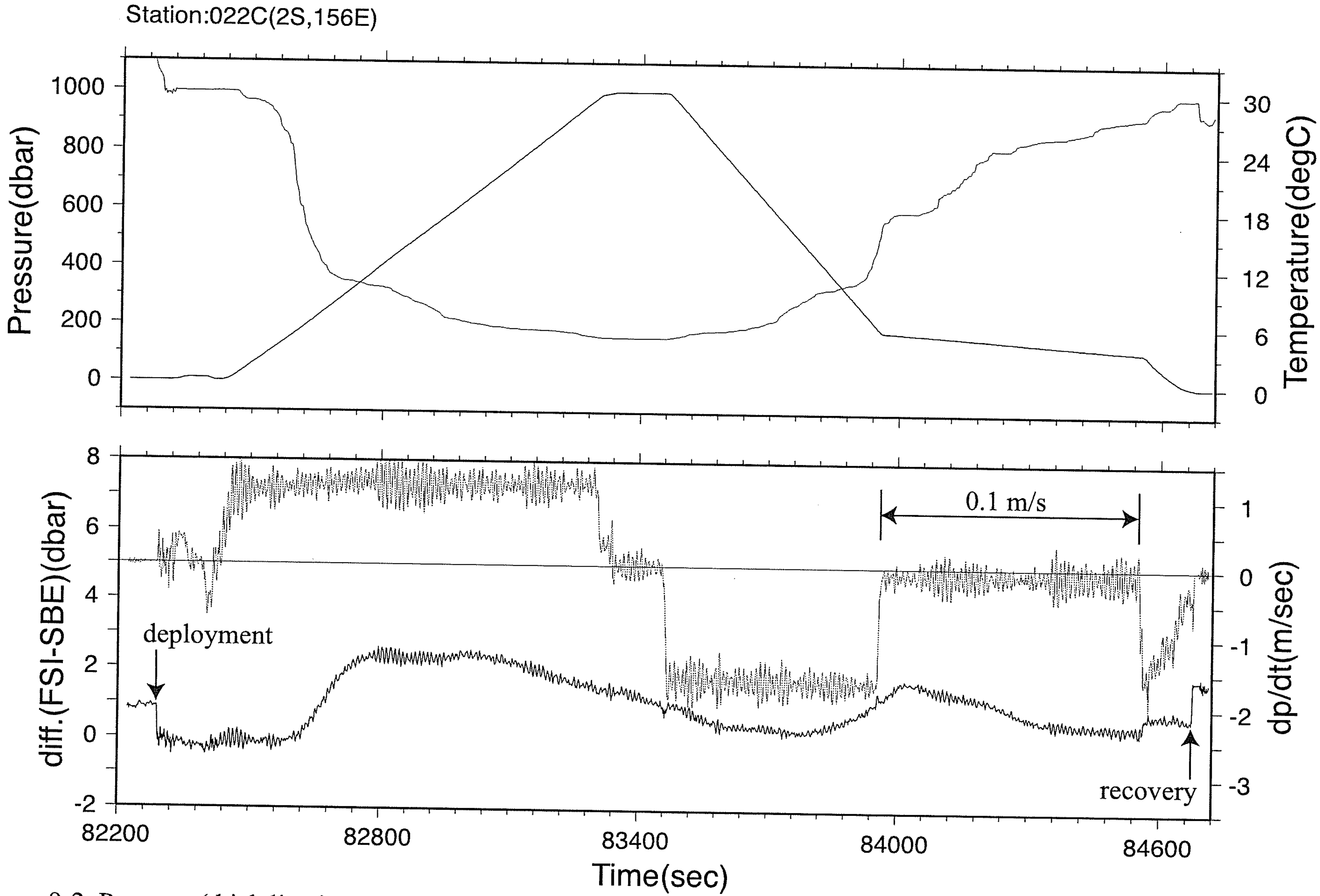


Figure 9-2. Pressure (thick line in upper panel), temperature (thin line in upper panel), pressure difference between FSI-CTD and SBE-CTD (thick line in lower panel) and CTD descent/ascent rate (thin line in lower panel) at every one second.

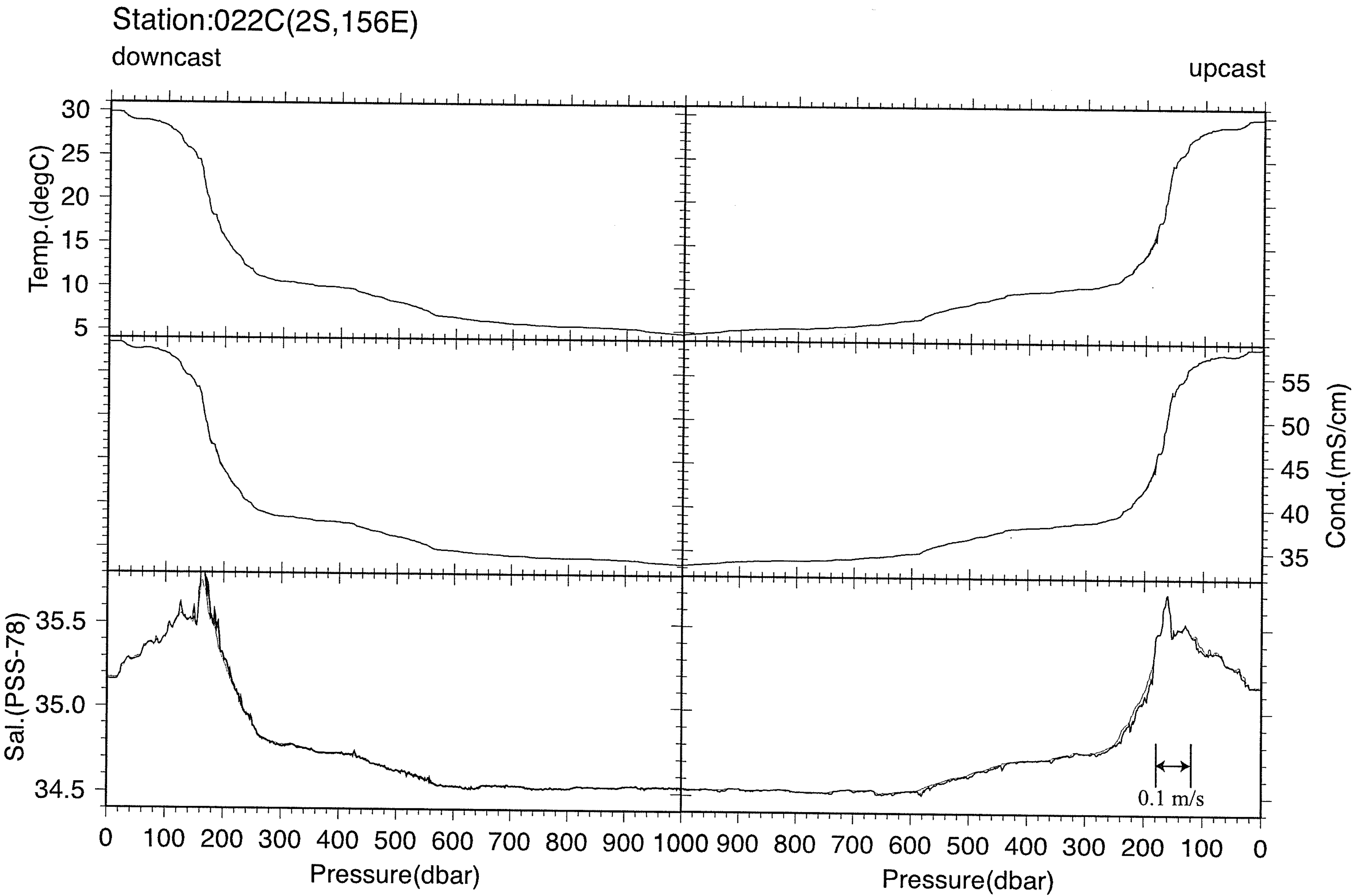


Figure 9-3. Vertical profiles of temperature (upper), conductivity (middle) and salinity (lower) for downcast (left panel) and upcast (right panel) at station 022C. Thick line shows the FSI-CTD data and thin line shows the SBE-CTD.

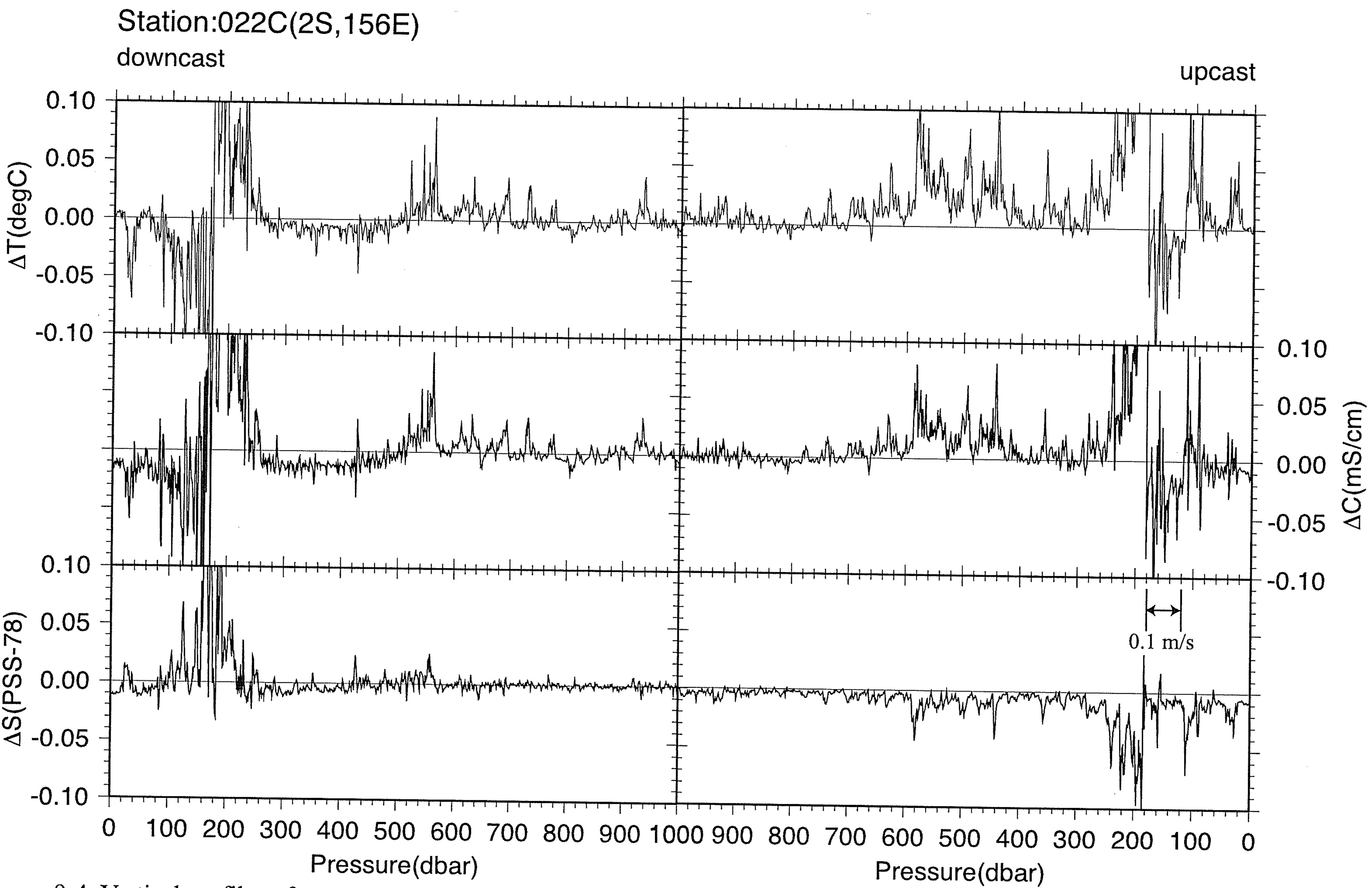


Figure 9-4. Vertical profiles of temperature (upper), conductivity (middle) and salinity difference (lower) between FSI-CTD and SBE-CTD for downcast (left panel) and upcast (right panel) at station 022C.

10. Summary Report

SUMMARY REPORT

Tropical Ocean Climate Study (TOCS) 2000 Autumn Cruise

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The Agency for the Assessment and Application of Technology

PURPOSE

The purpose of this cruise is to observe physical oceanographic characteristic of the ocean : such as currents, temperature, salinity, conductivity, dissolved oxygen, pressure and sound velocity, in the western equatorial Pasific to understand the ENSO (El Nino/Southern Oscillation) phenomena. Because El Nino is occurred with migration of the warm pool in the western equatorial Pasific, variability of the warm water pool is focused in this study. Additionally, a sea water flow from the Pasific to Indian ocean in the Indonesian Seas, i.e., the Indonesian Through flow is also focused because this flow might be related to the warm water pool variability.

TIME DURATION AND FIELD

TOCS00-06 cruise was started out on September 12th, 2000 to October 2th, 2000, from Kavieng (Papua New Guinea) to Koror (Republic of Palau) through Pasific ocean, Indonesian Exclusive Economic Zone (Northern of Irian and Maluku island) and Mindanau ocean by research vessel Kaiyo, Jamstec, Japan.

SURVEY ACTIVITY

In the autumn of 2000, we held a joint survey with Jamstec around the western equatorial Pasific ocean. Cruise number is generally abbreviated as follow : KY00-06, KY is the ship name KAIYO and the number 00-06 means the sixth cruise in the 2000, conducted by Jamstec.

This cruise divided in to 3 legs but we are following only third leg. The observation purpose of this leg are :

1. CTD Observation
   CTD (Conductivity, Temperature, Depth) was used to observe the physical oceanographic characteristic of the ocean to get data salinity, temperature, pressure, conductivity and dissolved oxygen. CTD casts were until 2000 m depth using Sea Bird SBE –911 plus system with several sensors. These sensors measured conductivity, temperature, pressure and dissolved oxygen. In the CTD combination included 7 (seven) Niskin bottles (capacity 5 liter) was used to get water sample at 400 m, 500 m, 600 m, 700 m, 800 m, 900 m and 1000 m depth.

2. XCTD (Expandable Conductivity, Temperature and Depth) observation
   XCTD cast were performed to measure temperature, salinity vertical profile until 1000 m depth. Data from XCTD will be compare with data from CTD. XCTD is new equipment oceanographic and more easier in operate system than CTD.

3. LADCP (Lowered Acoustic Doppler Current Profiler) observation
LADCP equipment was fired in the CTD combination to measure current profiler. Two acoustic doppler profilers were attached to the rosette and used for lowered profiling. Two 250-kHz instruments were mounted at the bottom of the rossette looking down and the top of rossette looking up. The data were dumped from the LADCP to a PC via a serial line (RS-422). Casts of CTD were conducted using the Lowered ADCP by University of Hawaii to measure vertical profile of the current until 2000 m depth.

4. VM ADCP (Vessel Mounted ADCP) observation
Vessel Mounted Acoustic Doppler Current Profiler was used along the ship track in the cruise. R/V Kaiyo was available GPS (Global Positioning System), mounts the Narrow Band ADCP at 75 kHz frequency and 30 degree beam angle manufactured by RD Instrument. ADCP mooring settled below the sea surface was used to obtain the current data of the sea in a certain layer of the depth. This data can be applied to have the knowledge of physical process in the Western Equatorial Pacific.

5. ADCP Buoy Recovery and Deployment
Two ADCP buoy mooring were recovered and deployment in the western equatorial Pacific at 2-30S 142-00E and 6-50N 126-43E to get data physical oceanographic for explain physical process in the ocean. Three instrument, ADCP, CTD and current meter included in the mooring system. ADCP and current meter was measured about current speed and direction with set up to collect 2 seconds per ping, 8 m bin length, 16 pings per ensemble and sampling interval 3600 seconds. The CTD SBE16 was to get data conductivity, temperature and depth in the ocean with set up to collect data with sampling interval 1800 s.

6. TRITON Buoy Recovery
Two TRITON buoy was recovered in the western equatorial Pasific at 0-00N 138-00E and 2-00N 138-00E. The TRITON buoy was to get data oceanographic and data air condition with many sensor i.e. CTD SBE-19 plus, current meter in the under buoy and sensor wind speed, wind direction, short wave radiation, relative humidity, air temperature, precipitation gauge and barometric pressure in the upper buoy. The real time data transmission with satellite Argos system and under water data transmission with inductive coupling data communication method. The minimum sampling rate for all sensors will be every 10 minutes, and hourly averaged data be transmitted in the real time. After finished TRITON buoy recovered that all sensors TRITON is lose and only frame buoy and radar reflector be there at 2-00N 138-00E.

7. Salinity Observation
The purpose of salinity observation is comparison of CTD salinity data with directly measured data. The instrument used Guild Line Autosal Model 84000B/S/N60132. The water sample was collected from the 5-liters Niskin water samplers into 250 ml glass bottles at 1000 db depth. The salinity analyzed to carry out after finished all CTD observation with water samples left more than 24 hours for adapting room temperature in special room (about 24 degC) and standardization have been performed before analysis.

8. Dissolved Oxygen Observation
   The purpose of oxygen observation is comparison of DO meter data corrected by the Winkler titration with CTD DO data. Measurement of dissolved oxygen (below DO) using DO meter corrected by the Winkler titration processed to the WHP operations and methods. The instrument used TOA Portable DO Meter model DO-25A.The water sample was analyzed dissolve oxygen to take at 400, 500, 600, 700, 800, 900 and 1000 meter depth.

ACKNOWLEDGMENTS

Special thanks goes out to Chief Scientist Yuji Kashino who prepare our team for follow Kaiyo Cruise autumn 2000 in the western equatorial Pasific. We would like to extend our gratitude to Captain Fusao Saitoh and the fine officers and crew of the KAIYO along with the JAMSTEC, Marine Works Japan and the Nippon Marine Enterprises scientific personnel. Their team skillful and good efforts were a large part in making this cruise a safe and successful.We would like to thank JAMSTEC which have worked out a closer cooperative program in marine research and our Deputy Chairman of Technology for Natural Resources Development DR. Ir. Bambang Setiadi, MSc. Finally , thanks a lot for all member (scientist, technician, and crew Kaiyo ship) to the kindness and cooperation.

Appendices

A.1 Time Table

Time Table of TOCS KY00-06 Cruise (Time in this table is that used in R/V Kaiyo.)

Aug.20 (Sun.) Fine
10:00 Departure from Yokosuka (Leg 1)
13:00 Boat Drill
13:30 Briefing for safety life on the ship
14:00 Meeting on observations

Aug.21 (Mon.) Fine / Cloudy
Cruise to TRITON Buoy #7 (5N,147E)

Aug.22 (Tue.) Fine / Cloudy
Cruise to TRITON Buoy #7 (5N,147E)

Aug.23 (Wed.) Fine / Cloudy
Cruise to TRITON Buoy #7 (5N,147E)

Aug.24 (Thu.) Cloudy
Cruise to TRITON Buoy #7 (5N,147E)

Aug.25 (Fri.) Fine / Cloudy
10:00 Meeting on recovery of TRITON buoy

Aug.26 (Sat.) Rainy
17:00 Arrive at 5N,147E TRITON buoy deployed point
Check TRITON buoy
17:13 Calibration of TRITON buoy location

Aug.27 (Sun.) Fine / Cloudy
06:00 CTD at St.001 (5-00N, 147-00E)
(cast depth is actually about 815m cause of wire trouble)
08:24 – 10:36 Recover TRITON buoy #7 (5N, 147E)
15:00 Meeting for CTD line treatments

Aug.28 (Mon.) Cloudy / Rainy
00:00 Ship mean time adjustment (SMT=UTC+9h -> +10h)

01:30 ARGOS antenna test (start)

Aug.29 (Tue.) Rainy
10:00 Arrive at Chuuk

Aug.30 (Wed.) Cloudy
Fueling

Aug.31 (Thu.) Fine
10:00 Departure from Chuuk (Leg 2)
13:00 Meeting

Sep. 1 (Fri.) Cloudy
05:08 – 06:02 CTD wire check
08:28 – 09:21 Repair TRITON buoy #1 (8N,156E)
09:41 – 10:12 CTD and water sampling at St.002 (8-00N, 156-00E)
13:54 XCTD at St.003 (7-30N, 156-00E)
16:44 XCTD at St.004 (7-00N, 156-00E)
19:33 XCTD at St.005 (6-30N, 156-00E)
22:25 XCTD at St.006 (6-00N, 156-00E)

Sep. 2 (Sat.) Cloudy
01:18 XCTD at St.007 (5-30N, 156-00E)
06:34 – 07:18 CTD and water sampling at St.008 (5-00N, 156-00E)
08:19 – 08:50 Repair TRITON Buoy #2 (5N, 156E)
12:03 XCTD at St.009 (4-30N, 156-00E)
14:58 – 15:42 CTD, water sampling and acoustic releaser test at St.010 (4-00N, 156-00E)
18:37 XCTD at St.011 (3-30N, 156-00E)
21:29 XCTD at St.012 (3-00N, 156-00E)

Sep. 3 (Sun.) Cloudy
00:19 XCTD at St.013 (2-30N, 156-00E)
06:08 – 09:21 Repair TRITON Buoy #3 (2N, 156E)
09:35 – 10:13 CTD and water sampling at St.014 (2-00N, 156-00E)
13:38 XCTD at St.015 (1-30N, 156-00E)

16:38 XCTD at St.016 (1-00N, 156-00E)
19:35 XCTD at St.017 (0-30N, 156-00E)

Sep. 4 (Mon.) Cloudy
06:02 – 07:56 Repair TRITON Buoy #4 (0N, 156E)
08:09 – 08:38 CTD at St.018 (0-00N, 156-00E)
12:33 XCTD at St.019 (0-30S, 156-00E)
15:05 XCTD at St.020 (1-00S, 156-00E)
17:59 XCTD at St.021 (1-30S, 156-00E)

Sep. 5 (Tue.) Fine
07:35 – 08:37 Repair TRITON Buoy #5 (2S, 156E)
08:52 – 09:32 CTD, water sampling and test of ARGO sensors at St.022 (2-00S, 156-00E)
13:02 XCTD at St.023 (2-30S, 156-00E)
15:50 XCTD at St.024 (3-00S, 156-00E)
18:34 XCTD at St.025 (3-30S, 156-00E)
21:23 XCTD at St.026 (4-00S, 156-00E)

Sep. 6 (Wed.) Fine
00:10 XCTD at St.027 (4-30S, 156-00E)
05:51 – 06:30 CTD and water sampling at St.028 (5-00S, 156-00E)
07:25 – 10:09 Repair TRITON Buoy #6 (5S, 156E)

Sep. 7 (Thu.) Cloudy
Cruise to 0N, 147E

Sep. 8 (Fri.) Cloudy
09:30 – 12:42 Recover ADCP buoy at 0N, 147E
13:40 – 15:45 Deploy ADCP buoy
16:22 – 16:52 CTD and water sampling at St.029 (0-00N, 147-00E)
17:34 – 19:55 Calibration of TRITON buoy location

Sep. 9 (Sat.) Cloudy / Rainy
07:31 – 11:46 Recover TRITON Buoy #9 (0N,147E)

Sep.10 (Sun.) Cloudy
Cruise to Kavieng

Sep.11 (Mon.) Fine
09:20 Arrive at Kavieng

Sep.12 (Tue.) Fine / Cloudy
Fueling

Sep.13 (Wed.) Fine
14:00 Departure from Kavieng (Leg 3)
18:00 Meeting

Sep.14 (Thu.) Fine
00:00 Ship mean time adjustment (SMT=UTC+10h -> +9h)
09:00 Fire drill
11:09 – 12:06 CTD, LADCP and water sampling at St.030 (0-00N, 147-00E)
16:35 XCTD at St.031 (0-00N, 146-00E)
21:01 XCTD at St.032 (0-00N, 145-00E)
Sep.15 (Fri.) Fine
01:36 XCTD at St.033 (0-00N, 144-00E)
06:07 XCTD at St.034 (0-00N, 143-00E)
10:49 – 11:52 CTD, LADCP and water sampling at St.035 (0-00N, 142-00E)
14:30 – 15:37 CTD, LADCP and water sampling at St.036 (0-30S, 142-00E)
18:18 – 19:23 CTD, LADCP and water sampling at St.037 (1-00S, 142-00E)
21:57 – 23:03 CTD, LADCP and water sampling at St.038 (1-30S, 142-00E)

Sep.16 (Sat.) Fine
01:40 – 02:48 CTD, LADCP and water sampling at St.039 (2-00S, 142-00E)
07:41 – 08:32 CTD, LADCP and water sampling at St.041 (2-43S, 142-00E)
09:53 – 11:40 Recover ADCP buoy at 2-30S, 142E
13:10 – 14:47 Deploy ADCP buoy
15:07 – 16:17 CTD, LADCP and water sampling at St.040 (2-30S, 142-00E)

Sep.17 (Sun.) Fine
10:44 – 11:44 CTD, LADCP and water sampling at St.042 (1-15S, 138-00E)

13:09 – 14:11 CTD, LADCP and water sampling at St.043 (1-00S, 138-00E)
16:47 – 17:36 CTD and LADCP at St.44 (0-30S, 138-00E)
20:33 – 21:25 Calibration of TRITON buoy location

Sep.18 (Mon.) Cloudy / Rainy
06:00 – 07:01 CTD, LADCP and water sampling at St.045 (0-00S, 138-00E)
07:36 – 11:15 Recover TRITON Buoy #13 (0N, 138E)
13:17 – 14:07 CTD and LADCP at St.046 (0-30N, 138-00E)
16:34 – 17:33 CTD, LADCP and water sampling at St.047 (1-00N, 138-00E)
20:01 – 20:53 CTD and LADCP at St.048 (1-30N, 138-00E)

Sep.19 (Tue.) Cloudy / Fine
06:58 – 07:31 Calibration of TRITON buoy location
07:40 – 08:41 CTD, LADCP and water sampling at St.049 (2-00N, 138-00E)
09:05 – 12:43 Recover TRITON Buoy #12 (2N, 138E)
14:51 – 15:40 CTD and LADCP at St.050 (2-30N, 138-00E)
18:16 – 19:18 CTD, LADCP and water sampling at St.051 (3-00N, 138-00E)
21:50 – 22:43 CTD and LADCP at St.052 (3-30N, 138-00E)

Sep.20 (Wed.) Fine
01:14 – 02:13 CTD, LADCP and water sampling at St.053 (4-00N, 138-00E)
05:07 XCTD at St.054 (3-48N, 137-28E)
07:48 XCTD at St.055 (3-36N, 136-56E)
10:31 XCTD at St.056 (3-24N, 136-24E)
10:38 XCTD at St.057 (3-12N, 135-52E)
16:02 XCTD at St.058 (3-00N, 135-20E)
18:49 XCTD at St.059 (2-48N, 134-48E)
21:44 XCTD at St.060 (2-36N, 134-16E)

Sep.21 (Thu.) Fine
00:17 XCTD at St.061 (2-24N, 133-44E)
02:55 XCTD at St.062 (2-12N, 133-12E)
05:31 XCTD at St.063 (2-00N, 132-40E)
08:03 XCTD at St.064 (1-48N, 132-08E)
10:39 XCTD at St.065 (1-36N, 131-36E)
13:15 XCTD at St.066 (1-24N, 131-04E)

15:58 XCTD at St.067 (1-12N, 130-32E)
18:40 XCTD at St.068 (1-00N, 130-00E)
20:01 – 20:58 CTD and LADCP at St.069 (0-57N, 129-45E)
23:35 - CTD, LADCP and water sampling at St.070 (1-24N, 129-30E)

Sep.22 (Fri.) Fine
- 00:37 End of observation at St.070
03:13 – 04:04 CTD and LADCP at St.071 (1-51N, 129-15E)
06:47 – 07:44 CTD, LADCP and water sampling at St.072 (2-18N, 129-00E)
10:16 – 11:08 CTD and LADCP at St.073 (2-45N, 128-45E)
13:40 – 12:40 CTD, LADCP and water sampling at St.074 (3-12N, 128-30E)
17:18 – 17:35 CTD and LADCP at St.075 (3-39N, 128-15E)
20:12 – 20:54 CTD, LADCP and water sampling at St.076 (4-06N, 128-00E)
23:28 - CTD and LADCP at St.077 (4-33N, 127-45E)

Sep.23 (Sat.) Fine
- 00:17 End of observation at St.077
02:58 – 03:55 CTD, LADCP and water sampling at St.078 (5-00N, 127-30E)
06:33 – 07:24 CTD and LADCP at St.079 (5-27N, 127-15E)
09:58 – 10:56 CTD, LADCP and water sampling at St.080 (5-54N, 127-00E)
12:22 – 13:13 CTD and LADCP at St.081 (6-08N, 126-52E)
14:35 – 15:34 CTD, LADCP and water sampling at St.082 (6-21N, 126-45E)
16:38 – 17:27 CTD and LADCP at St.083 (6-30N, 126-40E)
18:38 – 19:36 CTD, LADCP and water sampling at St.084 (6-39N, 126-35E)

Sep.24 (Sun.) Fine
05:59 – 06:24 CTD and LADCP at St.087 (6-50N, 126-43E)
07:17 – 09:08 Recover ADCP buoy at 6-47N, 126-42E
09:45 – 11:20 Deploy ADCP buoy
12:42 – 13:34 CTD and LADCP at St.085 (6-45N, 126-31.5E)
14:22 – 15:19 CTD, LADCP and water sampling at St.086 (6-51N, 126-28E)
16:34 – 16:59 CTD at St.088 (7-00N, 126-30E)
23:54 - CTD, LADCP and water sampling at St.097 (7-00N, 128-00E)

Sep.25 (Mon.) Fine
- 01:06 End of observation at St.097

02:28 – 03:28 CTD and LADCP at St.096 (7-00N, 127-45E)
04:58 – 06:04 CTD, LADCP and water sampling at St.095 (7-00N, 127-30E)
07:09 – 08:05 CTD and LADCP at St.094 (7-00N, 127-20E)
09:06 – 10:02 CTD and LADCP at St.093 (7-00N, 127-10E)
11:01 – 12:10 CTD, LADCP and water sampling at St.092 (7-00N, 127-00E)
13:00 – 14:00 CTD and LADCP at St.091 (7-00N, 126-52E)
14:51 – 15:58 CTD, LADCP and water sampling at St.090 (7-00N, 126-44E)
16:45 – 17:45 CTD, LADCP and water sampling at St.089 (7-00N, 126-36E)

Sep.26 (Tue.) Fine
21:04 – 22:14 CTD, LADCP and water sampling at St.106 (8-00N, 128-00E)
23:37 - CTD and LADCP at St.105 (8-00N, 127-45E)

Sep.27 (Wed.) Fine
- 00:32 End of observation at St.105
01:55 – 03:00 CTD, LADCP and water sampling at St.104 (8-00N, 127-30E)
04:02 – 05:00 CTD and LADCP at St.103 (8-00N, 127-20E)
06:02 – 06:59 CTD and LADCP at St.102 (8-00N, 127-10E)
07:56 – 09:04 CTD, LADCP and water sampling at St.101 (8-00N, 127-00E)
09:52 – 10:58 CTD and LADCP at St.100 (8-00N, 126-52E)
11:48 – 13:01 CTD, LADCP and water sampling at St.099 (8-00N, 126-44E)
13:59 – 14:31 CTD, LADCP and water sampling at St.098 (8-00N, 126-36E)

Sep.28 (Thu.) Cloudy
07:55 – 09:04 CTD, LADCP and water sampling at St.107 (10-00N, 126-12E)
09:52 – 10:51 CTD and LADCP at St.108 (10-00N, 126-20E)
11:36 – 12:43 CTD, LADCP and water sampling at St.109 (10-00N, 126-28E)
13:30 – 14:28 CTD and LADCP at St.110 (10-00N, 126-36E)
15:16 – 16:25 CTD, LADCP and water sampling at St.111 (10-00N, 126-44E)
17:14 – 18:13 CTD and LADCP at St.112 (10-00N, 126-52E)
19:09 – 20:18 CTD, LADCP and water sampling at St.113 (10-00N, 127-00E)
21:16 – 22:13 CTD and LADCP at St.114 (10-00N, 127-10E)
23:11 - CTD and LADCP at St.115 (10-00N, 127-20E)

Sep.29 (Fri.) Fine
- 00:10 End of observation at St.115

01:08 – 01:11 CTD, LADCP and water sampling at St.116 (10-00N, 127-30E)
03:32 – 04:27 CTD and LADCP at St.117 (10-00N, 127-45E)
05:52 – 06:56 CTD, LADCP and water sampling at St.116 (10-00N, 127-30E)

Sep.30 (Sat.) Cloudy / Fine
Cruise to Koror

Oct. 1 (Sun.) Fine
10:00 Arrive at Koror