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Tropical Ocean Climate Study (TOCS)

KY9810 Cruise Report

August 15, 1998 - September 14, 1998

Japan Marine Science and Technology Center

1. Cruise Summary

Ship	:	R/V KAIYO
Chief Investigator	:	Kentaro Ando /JAMSTEC (Japan Marine Science and Technology Center)
Cruise Code	:	KY9810
Project Title	:	Tropical Ocean Climate Study
Period	:	August 15, 1998 - September 11, 1998
Ports of call	:	Guam, U.S.A. Truk (Chuuk), Federated States of Micronesia Koror, Republic of Palau
Institutions	:	JAMSTEC MWJ (Marine Works Japan) NME (Nippon Marine Enterprise) PMEL (Pacific Marine Environmental Laboratory), U.S.A. BPPT (Badan Pengkajian dan Penerapan Technologi), Indonesia

Purpose:

The purpose of this cruise is to observe the physical oceanographic and atmospheric conditions in the tropical western Pacific for better understanding of the air-sea interaction and the role of the western Pacific to the ENSO (El Nino/Southern Oscillation) phenomena and global climate change.

Observation Summary:

The TOCS (Tropical Ocean Climate Study) group in Japan Marine Science and Technology Center (JAMSTEC) and Badan Pengkajian dan Penerapan Technologi (BPPT) of Indonesia conducted 36 CTD (Conductivity, Temperature and Depth) casts, current measurement by shipboard ADCP (see session 4 & 5). The three subsurface ADCP mooring systems at 0N156E 2.5S142E and 0N138E were recovered and deployed during this cruise, and one subsurface ADCP mooring at 2S142E were recovered (see session 6). The 6 ADCPs are now being moored in the surveyed area (0N165E, 0N156E, 0N147E, 0N142E, 0N138E, 2.5S142E).

The TAO (Tropical Atmosphere and Ocean) project group in Pacific Marine Environmental Laboratory/National Oceanic and Atmospheric Administration (PMEL/NOAA) and the TOCS group in JAMSTEC conducted 1 visit, 2 repairs, 7 recoveries and 6 deployments of ATLAS (Automated Temperature Acquisition System) buoys along the 156E, 147E and 137E meridional lines. The details are described in session 7 in this report.

Preliminary Results (by Kentaro Ando):

According to the monthly mean TAO data in the end of August 1998, rather large negative SST anomaly (1-2.5C lower than usual) is found in the central-eastern Pacific. This is one of characteristics found during the La Nina phenomena. The wind over the tropical Pacific shows strong easterly wind from 110W to 150E, which will induce strong upwelling near the equator and bring cold water from below. Even in the western Pacific, the westward (easterly) wind anomaly (about 2m/s) is found in the last August. The 20 degree C isothermal depth also shows quite shallow depth (30 meters and more) compared to climatology in the entire tropical Pacific, showing that rather great heat

redistribution occurred in the past several months in the entire Pacific. This cruise is conducted under rather anomalous climatological condition (La Nina). I believe that the data obtained in this cruise will contribute to describe this La Nina phenomena in 1998 and the climatological shift from the 1997-98 strong El Nino in the tropical Pacific.

The preliminary data from this cruise shows that the sea surface temperature (SST) along the ship truck shows 29-30 C (Section 4). The warm water more than 28 C along 156E became thicker than in the former Summer cruise (KY9709). Although the CTD stations along 156E are only 7 (8N, 5N, 2N, 0N, 1S, 2S and 5S), temperature and density sections along 156E suggest that the NECC (North Equatorial Counter Current) and NEC (North Equatorial Current) are seemed to be very weak during the cruise, and warm waters seemed to be accumulated from 5N to 8N than usual. Near the equator of 156E, the equatorial upwelling is found to be stronger than in KY9709, caused by anomalous easterly wind over the survey area. Surface current velocity from the moored ADCP data (raw data) at 0N156E shows that the surface 50 meter current was eastward from day 1 to day 150 (August 1997 to December 1997) and westward from day 150 to 250 (January 1998 to April 1998), and then eastward again from day 250 to 360 (May 1998 to July 1998). During August 1998, the current at 50 meters was westward again. In the summer 1997, eastward current related to the El Nino was dominated, then due to the ending of El Nino, the current at 50 meters changed to westward. During day 100 - 150, the eastward Equatorial Undercurrent became stronger (see Figure 6-5 and 6-6) probably due to the phase shift from El Nino to La Nina, then after day 150, the current at 50 meters was also changed to westward. I could speculate the reason of strong eastward current at 50 meters during day 100-150 that the EUC would come up to 50 meters depth. More detailed analysis will be done in future especially on the surface current variability due to the phase change from El Nino to La Nina.

The density and temperature sections along 142E shows the meridional inclement due to the NGCUC (New Guinea Coastal Under Current), and surface warm water above 28C is found down to 70-100 meters. Surface salinity was higher than in KY9709, suggesting shortness of rainfall. The time series data of surface current (50 meters) at 2.5S142E from the moored ADCP shows that, basically, westward current was dominated from August 1997 to August 1998 except for day 200-300. In the deeper layers (100 meters and 150 meters), the current is rather stable with periodical variation of about 20-40 days, except for the day 170-200 event. Before and after the day 170-200 event at 100 meters and 150 meters, the westward mean current seemed to be changed (weak after day 170-200 event).

Along 138E and 137E, the surface temperature is more than 30 at north of 1N, showing highest temperature in our cruise track. The salinity depth section along 138E shows rather complexed from south of 3N, suggesting water mass mixing between north Pacific origin and south Pacific origin waters. Along equator, same kind of mixing was found west of 146E, and temperature inversions are often found. The time series data of surface current (50m) at 0N138E (Fig.6-13) shows the periodical variability (20-40 days) in both N-S and E-W components. Also, at 150m depth, surface current shows 20-40 days variation. Looking at these two time series, there seems to have no relation each other. More detailed analysis will be needed, however, the role of eddies near the equator will be important to the formation of water masses and variability of current in the western Pacific.

We could observe the ocean structure and current in the western Pacific during the 1998 La Nina. The moored and shipboard ADCP data and the CTD casts during past TOCS cruises may prevail us variability in the western Pacific during the 1997-98 El Nino and the 1998 La Nina.

Acknowledgement :

I would like to express my special thanks to Captain Hasegawa and his crew members of R/V Kaiyo. We could conduct many CTD casts and all mooring works (ADCP and ATLAS) that was scheduled. This cruise will not be success without their help. The instruments (CTD, ADCP, Water Sampler, Releasers) and mooring system (Kevler and Nylon ropes) used during the cruise were all managed, set up, operated, sometimes repaired and maintained by the technical staffs from Marine Works Japan (MWJ) and Nippon Marine Enterprise (NME). Each section in this report were also written by the staffs (see Section 9).

2. List of Instruments

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

· SBE 9-11 plus system, SN 0240, Sea Bird Electronics, Inc., USA
CTD Fish for 6,800m (TOCS Group)

		Data of Calibration
T-sensor	SN 1207	(09-May-1998)
C-sensor	SN 0960	(08-May-1998)
P-sensor	SN 43435	(11-Jul.-1996)
DO-sensor	SN 130257	(09-Jul.-1997)

(2) Water Sampler

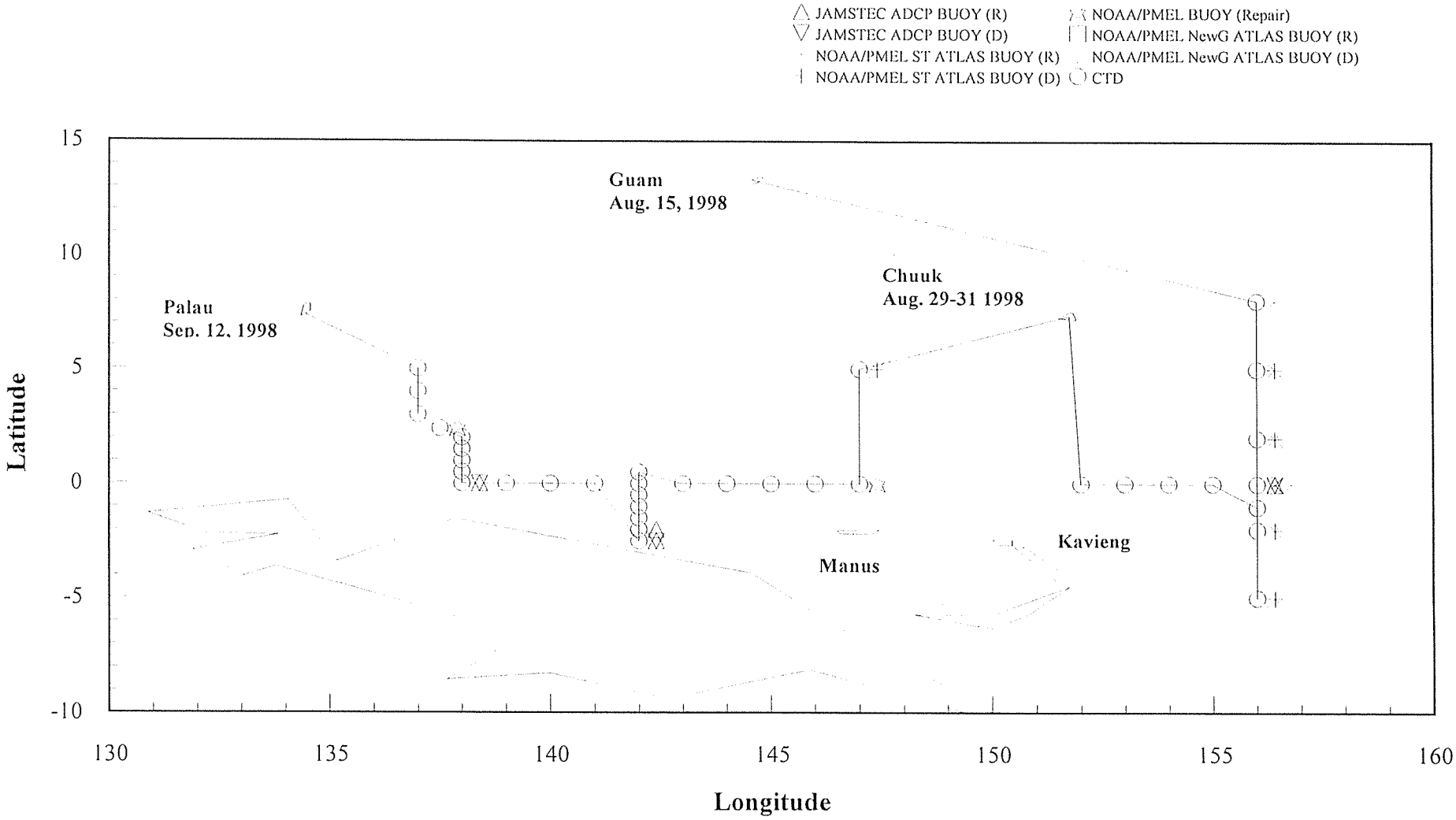
· Carousel S/N 329833, Sea Bird Electronics, Inc., USA

(3) Shipboard ADCP (Acoustic Doppler Current Profiler)
VM-75,RD Instruments, USA
(75kHz,16m bin length, Normal range 560m sterting 30m depth)

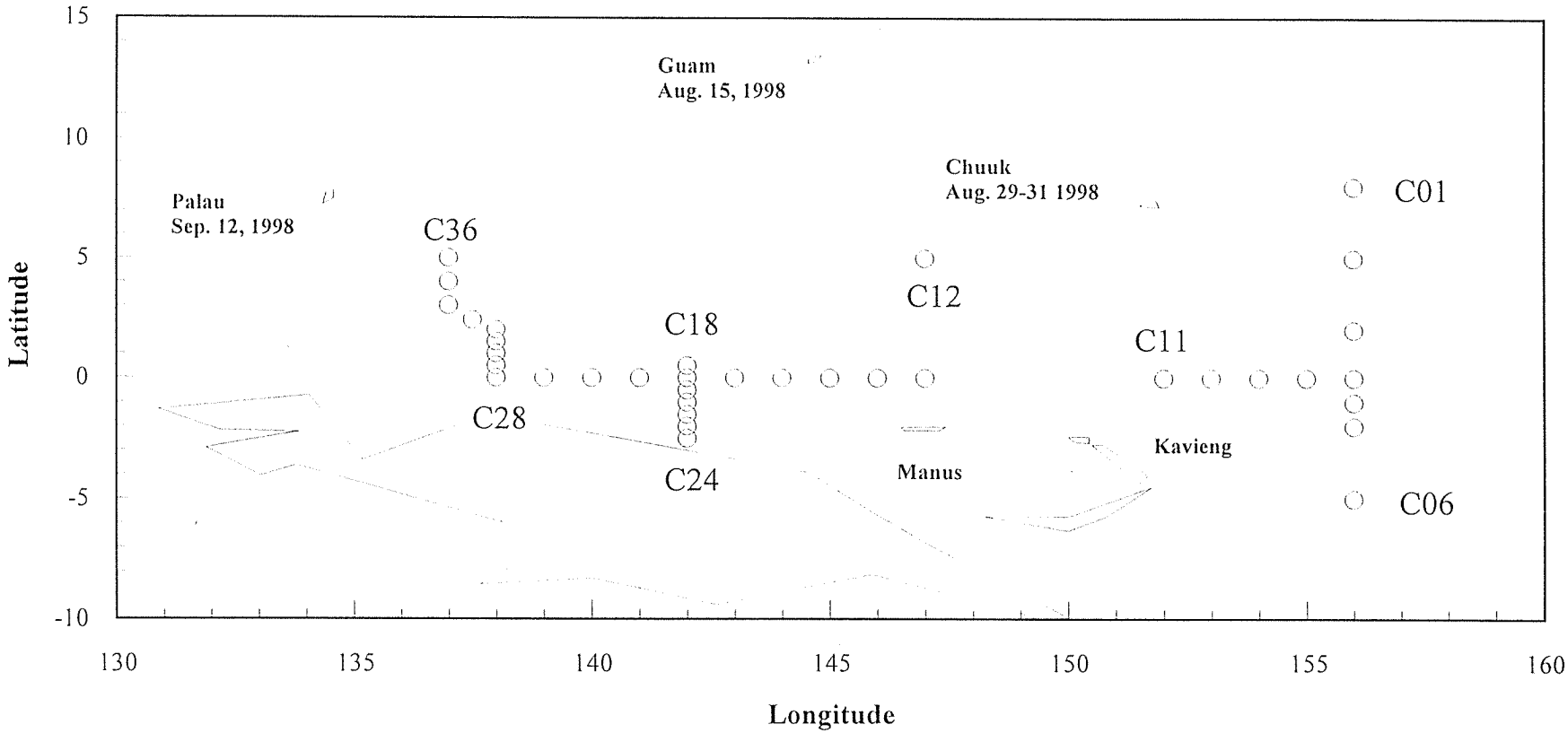
(4) Bottom Salinity

· Guild Line Autosal Model 8400B, S/N60132, GUILDLINE INSTRUMENTS, CANADA.

3. Observation Sites K9810 TOCS Cruise



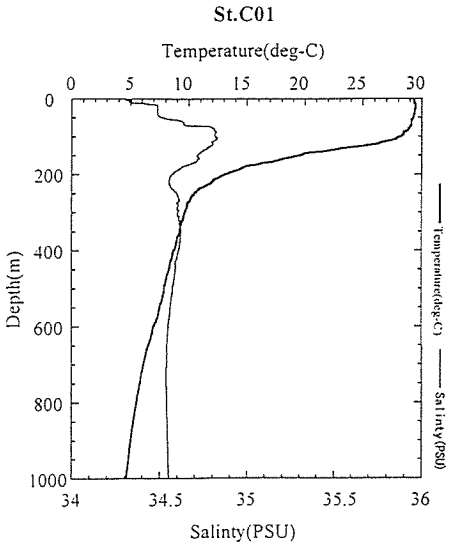
4.1 CTD Sites K9810 TOCS Cruise

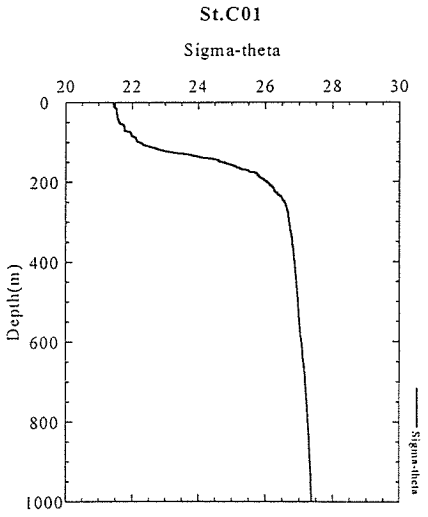


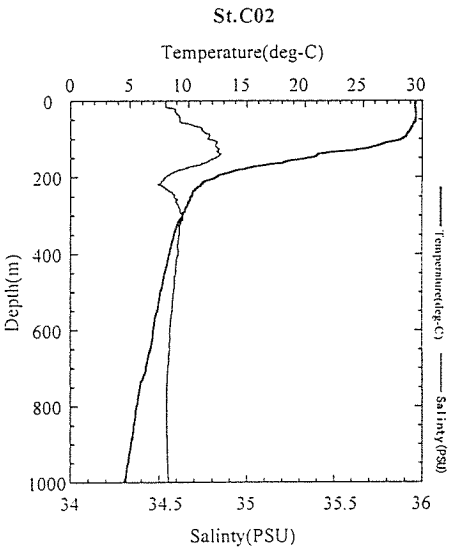
4.2 CTD Casts Table

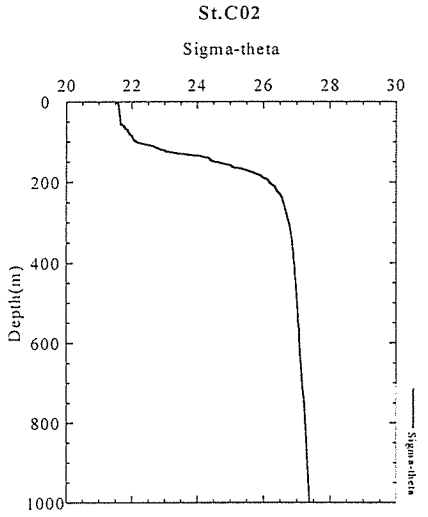
St.	Date	Time(GMT)	Latitude	Longitude
C01	17 Aug.'98	23:38	07° 59.911'N	155° 59.982'E
C02	19 Aug.'98	02:18	04° 58.162'N	156° 03.832'E
C03	20 Aug.'98	01:40	01° 58.604'N	156° 00.411'E
C04	21 Aug.'98	00:58	00° 01.032'S	156° 09.733'E
C05	23 Aug.'98	01:06	02° 00.986'S	156° 00.866'E
C06	24 Aug.'98	01:01	05° 01.149'S	155° 58.500'E
C07	25 Aug.'98	00:21	01° 00.079'S	155° 59.900'E
C08	26 Aug.'98	04:11	00° 00.004'N	155° 00.133'E
C09	26 Aug.'98	09:28	00° 00.000'N	153° 59.910'E
C10	26 Aug.'98	14:37	00° 00.026'S	153° 00.106'E
C11	26 Aug.'98	20:04	00° 00.068'S	151° 59.970'E
C12	02 Sep.'98	02:26	04° 57.063'N	147° 00.238'E
C13	03 Sep.'98	04:48	00° 00.047'N	146° 58.824'E
C14	03 Sep.'98	11:01	00° 00.042'S	146° 00.030'E
C15	03 Sep.'98	16:20	00° 00.023'S	145° 00.026'E
C16	03 Sep.'98	21:40	00° 00.123'N	144° 00.111'E
C17	04 Sep.'98	03:06	00° 00.025'N	143° 00.096'E
C18	04 Sep.'98	08:56	00° 30.010'N	142° 00.126'E
C19	04 Sep.'98	12:05	00° 00.249'N	141° 59.931'E
C20	04 Sep.'98	15:10	00° 29.964'S	141° 59.884'E
C21	04 Sep.'98	18:11	00° 59.908'S	141° 59.833'E
C22	04 Sep.'98	21:16	01° 30.018'S	141° 59.871'E
C23	05 Sep.'98	00:32	02° 00.898'S	141° 59.955'E
C24	05 Sep.'98	03:37	02° 29.906'S	141° 59.940'E
C25	06 Sep.'98	20:55	00° 00.035'S	141° 00.088'E
C26	07 Sep.'98	02:20	00° 00.021'N	140° 00.100'E
C27	07 Sep.'98	07:48	00° 00.005'S	139° 00.106'E
C28	08 Sep.'98	00:56	00° 01.690'S	138° 01.850'E
C29	08 Sep.'98	04:20	00° 29.989'N	137° 59.978'E
C30	08 Sep.'98	07:18	00° 59.848'N	137° 59.963'E
C31	08 Sep.'98	10:14	01° 29.830'N	137° 59.902'E
C32	08 Sep.'98	13:19	01° 59.930'N	138° 00.085'E
C33	08 Sep.'98	22:54	02° 25.900'N	137° 24.757'E
C34	09 Sep.'98	02:50	03° 00.041'N	137° 00.117'E
C35	09 Sep.'98	08:05	03° 59.876'N	137° 00.137'E
C36	09 Sep.'98	21:23	05° 00.032'N	136° 59.928'E

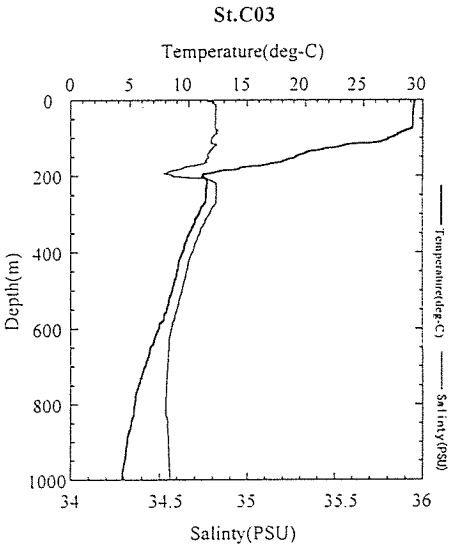
4.3 CTD Profiles

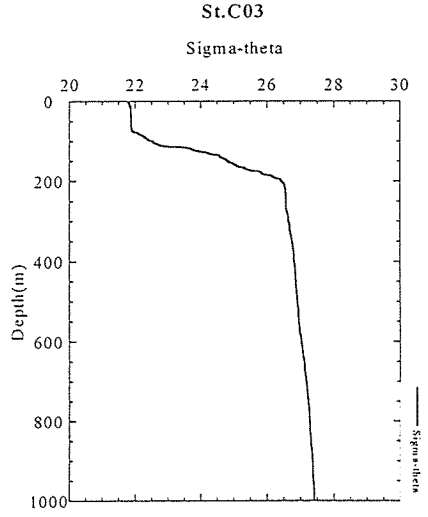












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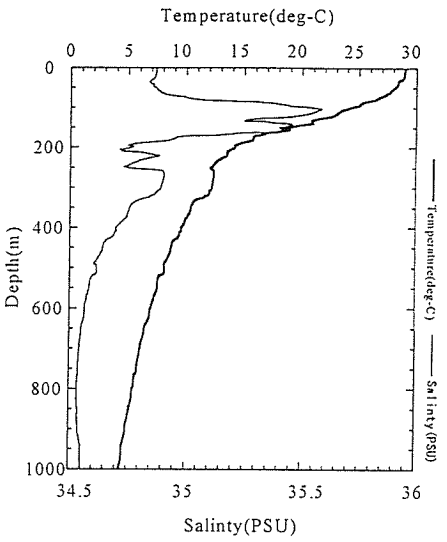

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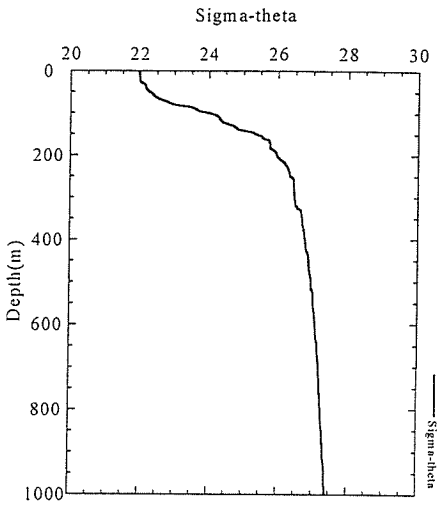

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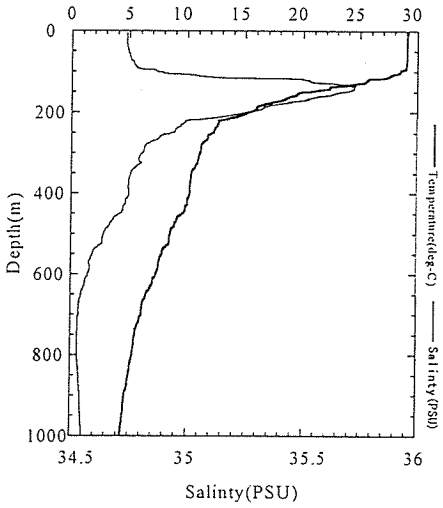

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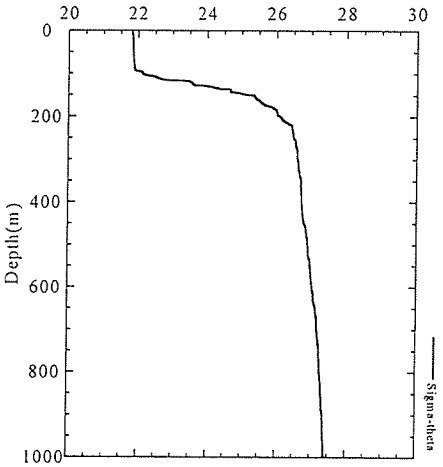

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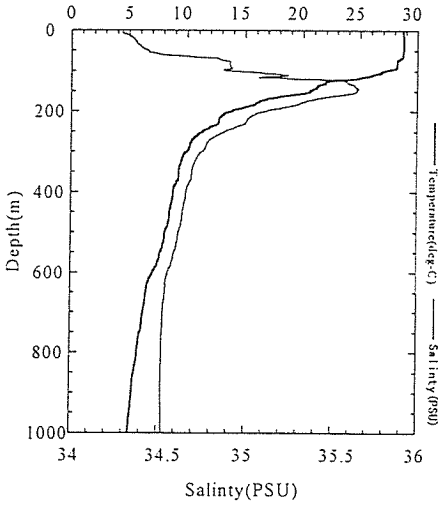

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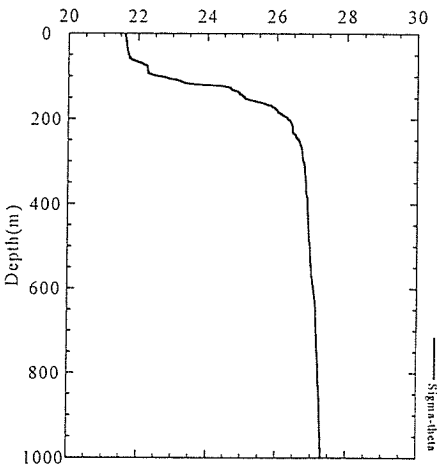

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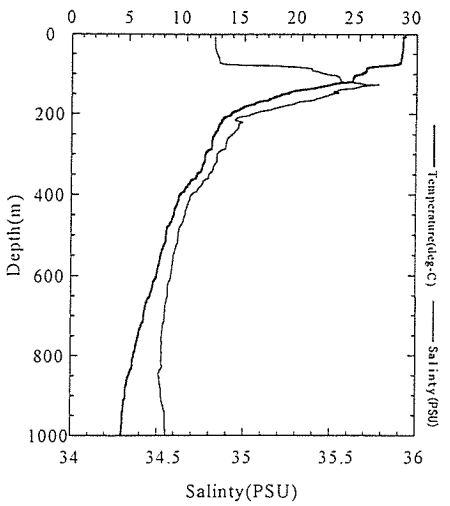

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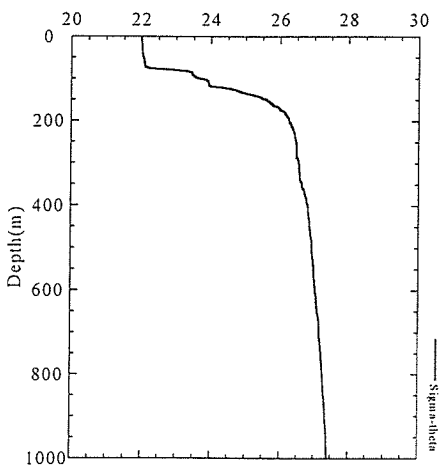

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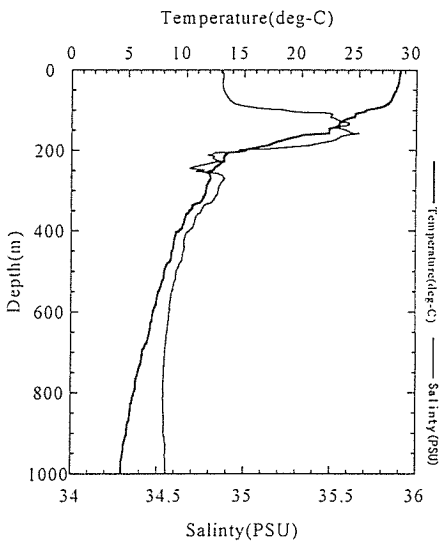

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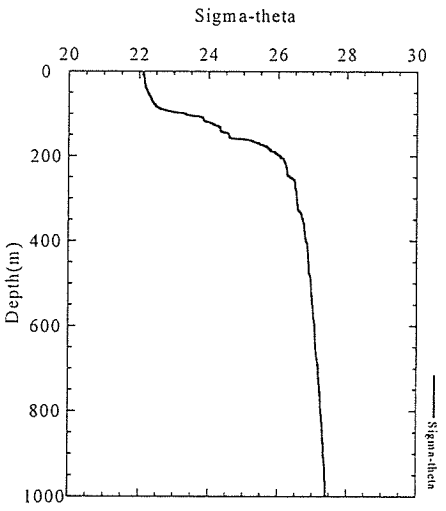

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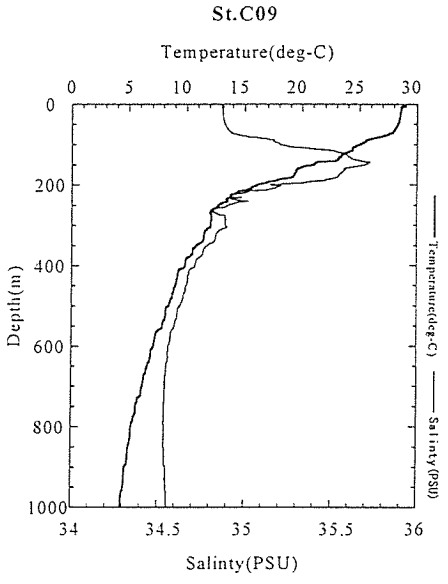

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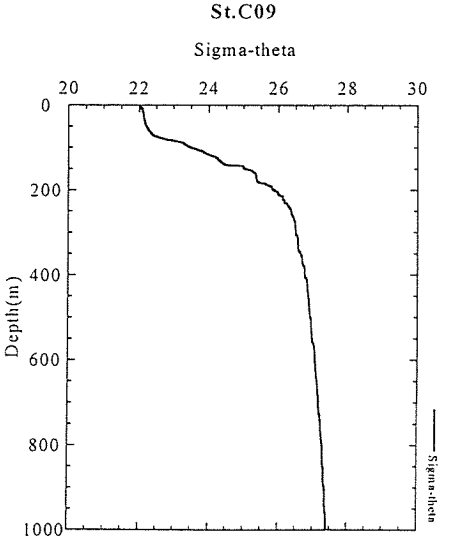

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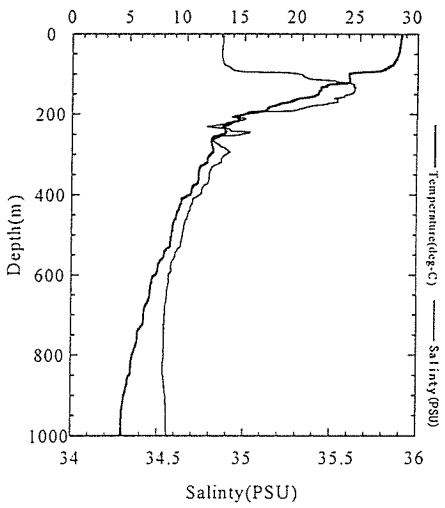

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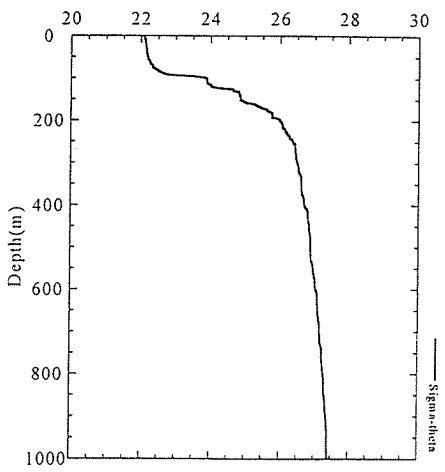

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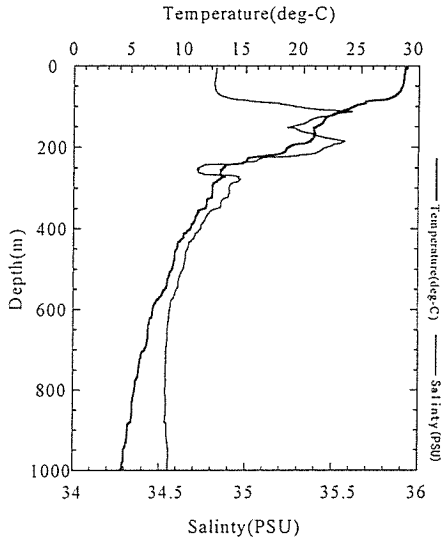

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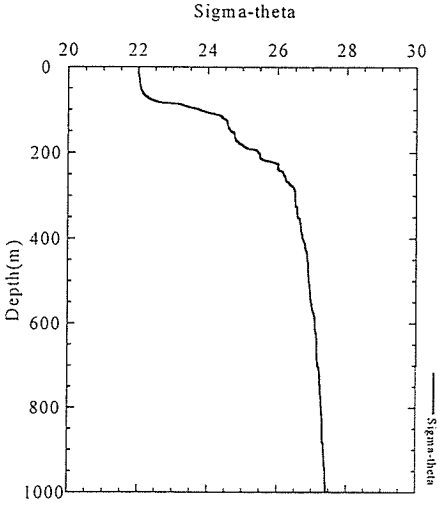

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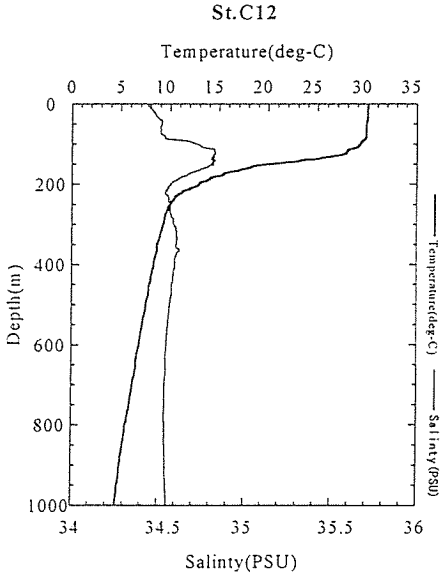

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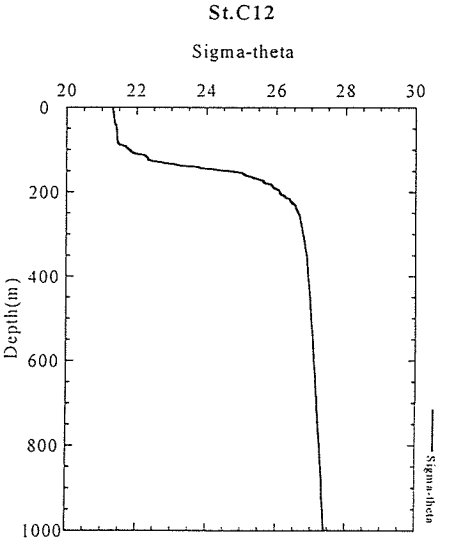

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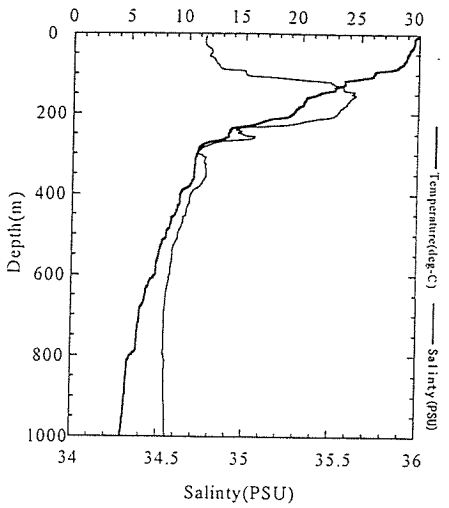

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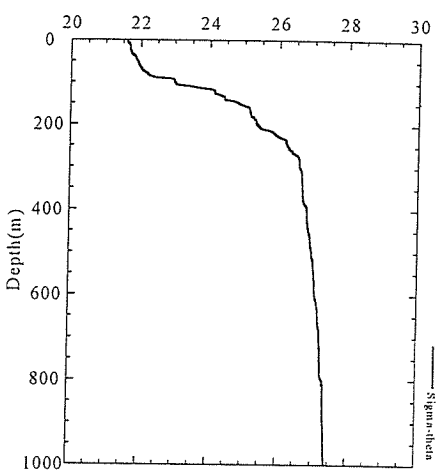

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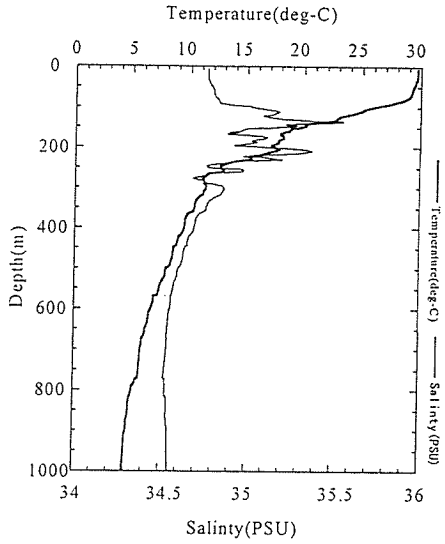

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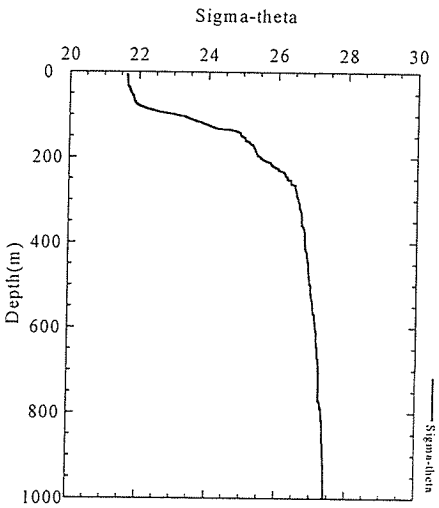

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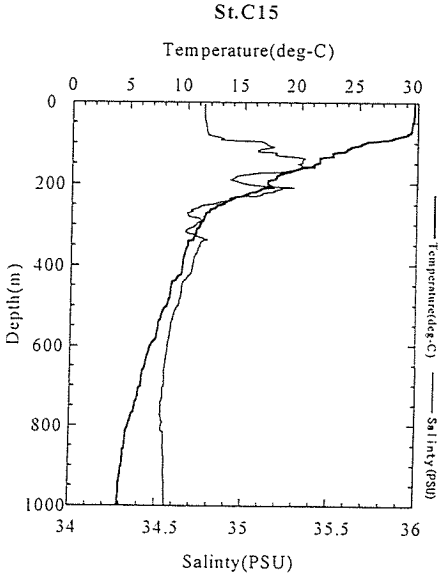

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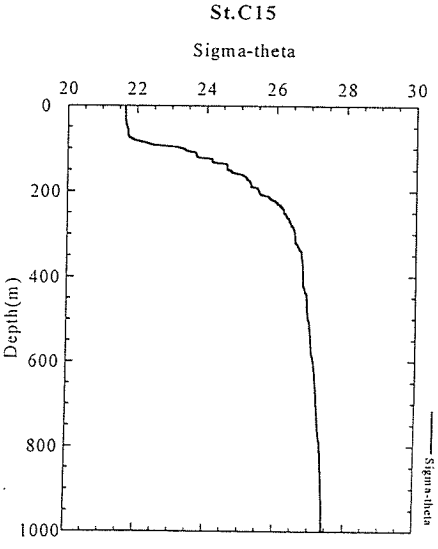

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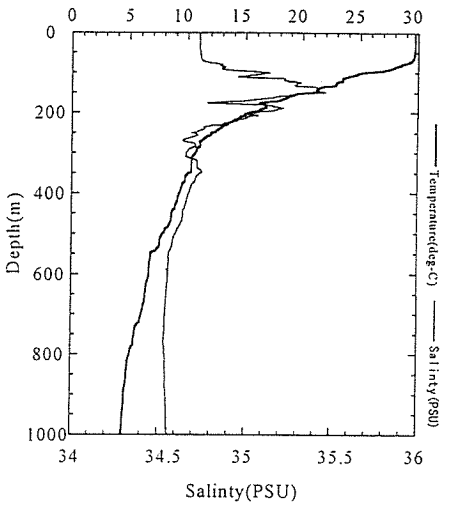

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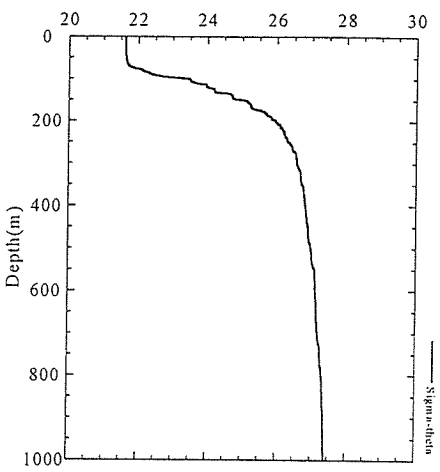

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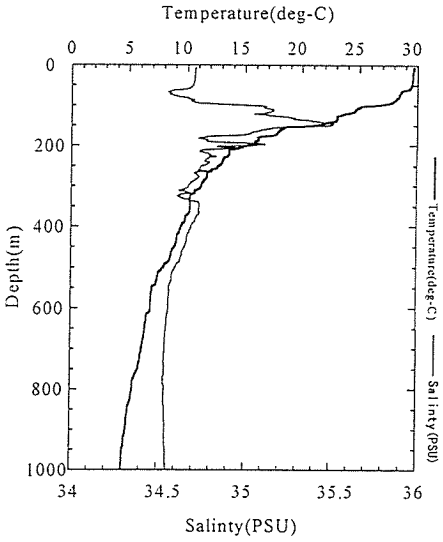

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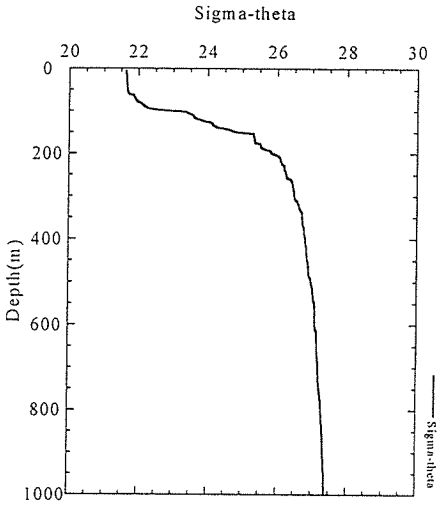

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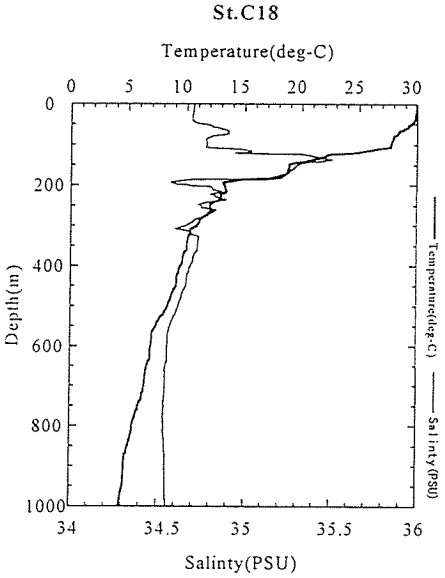

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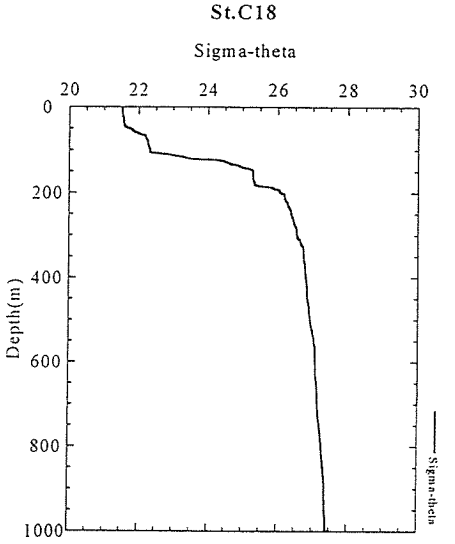

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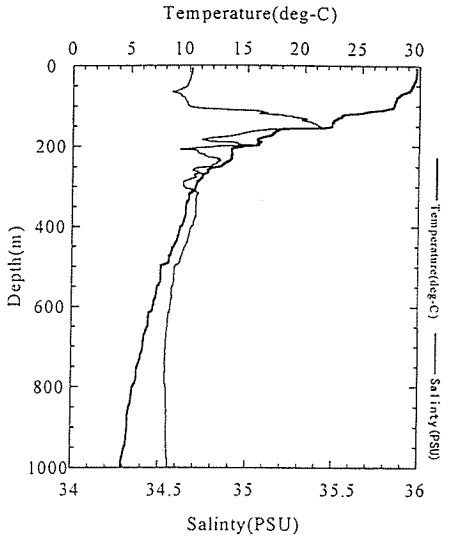

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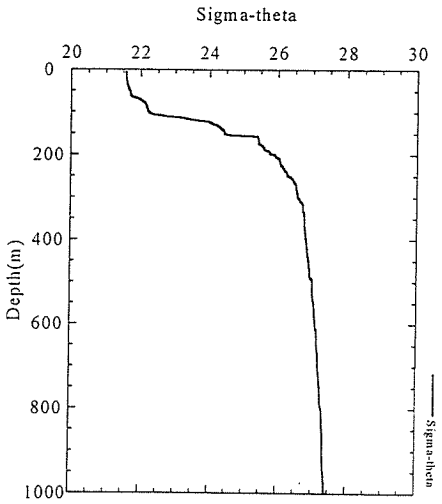

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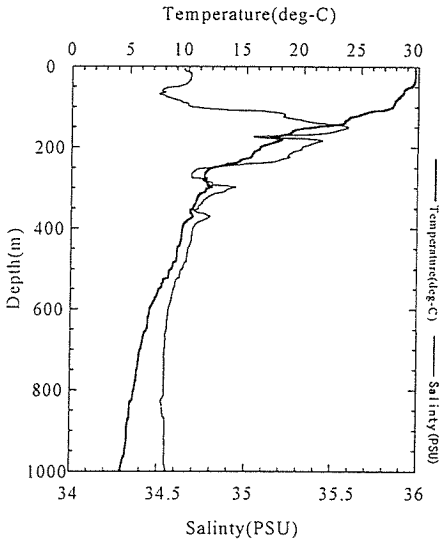

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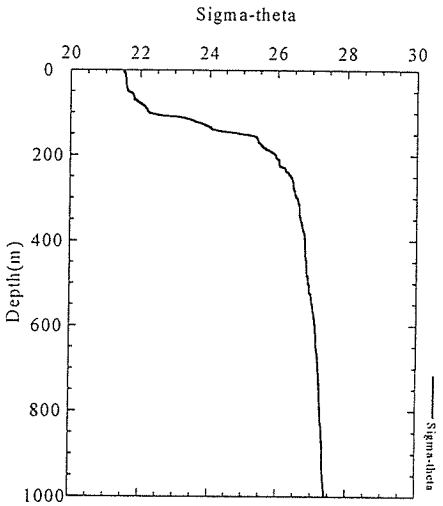

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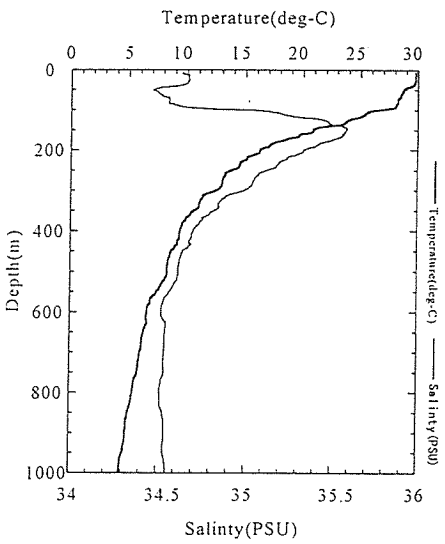

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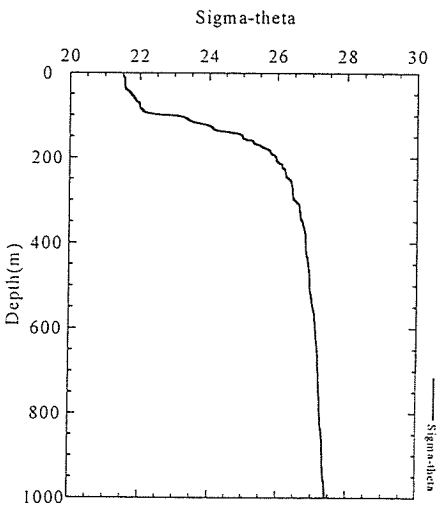

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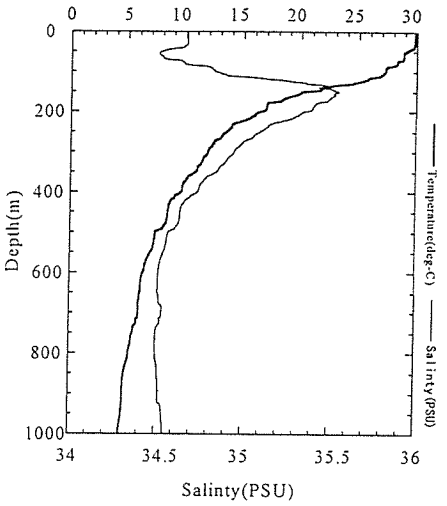

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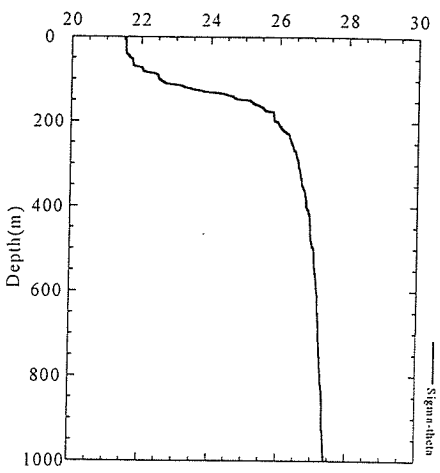

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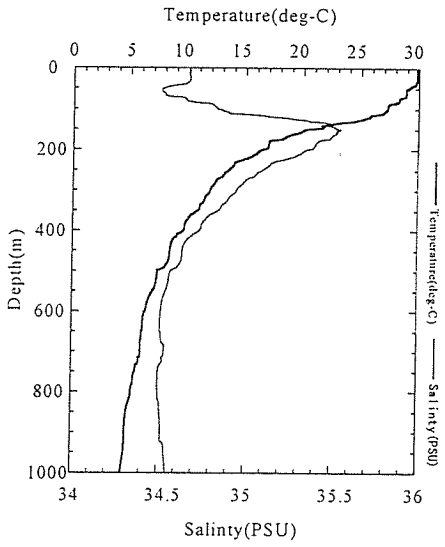

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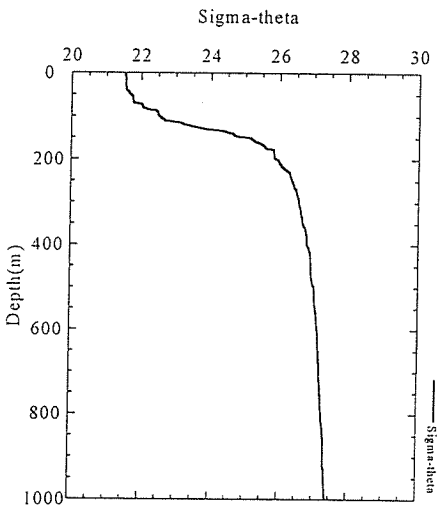

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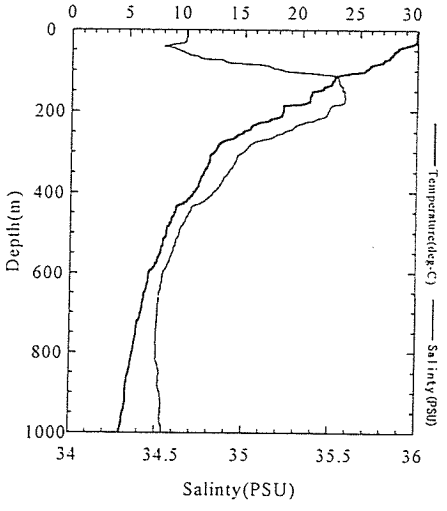

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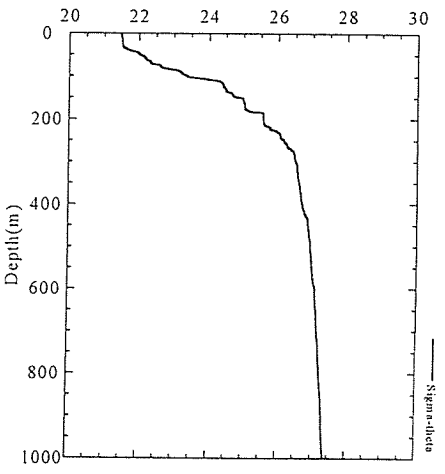

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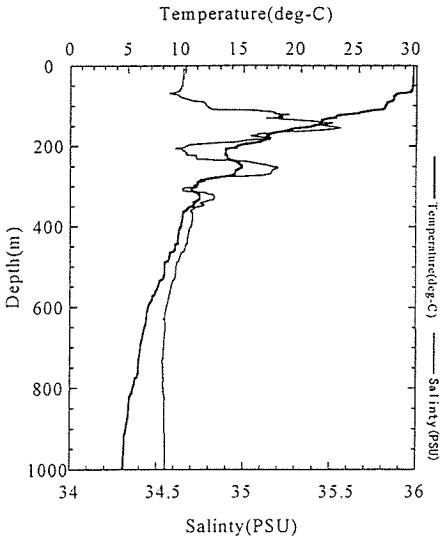

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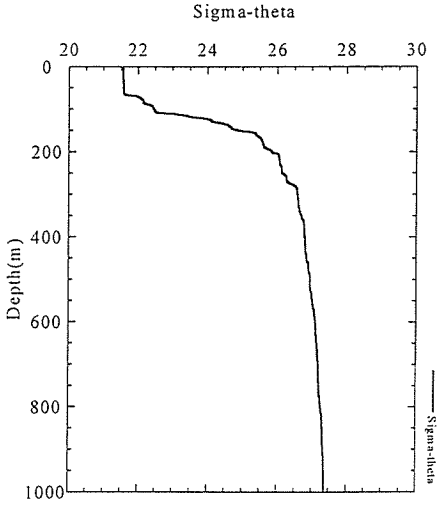

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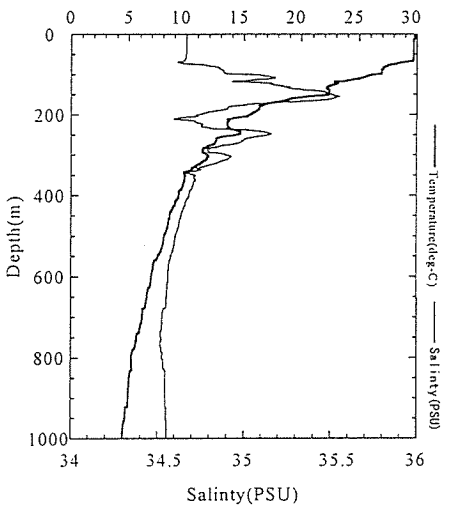

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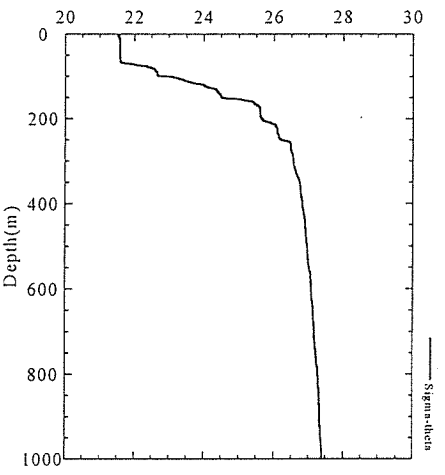

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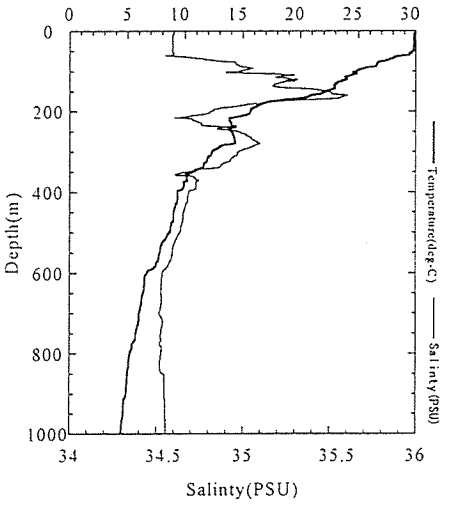

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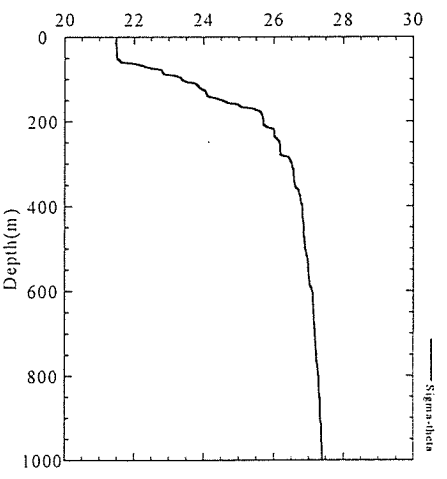

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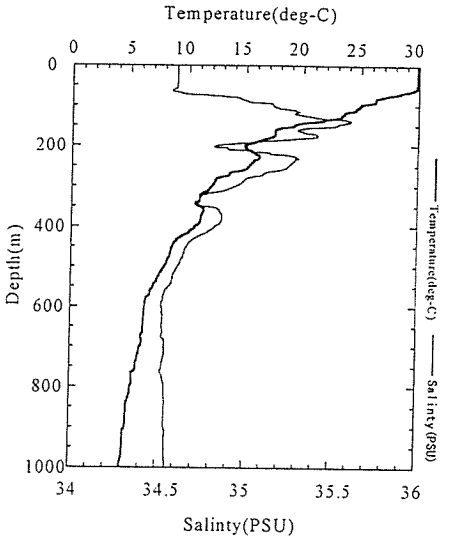

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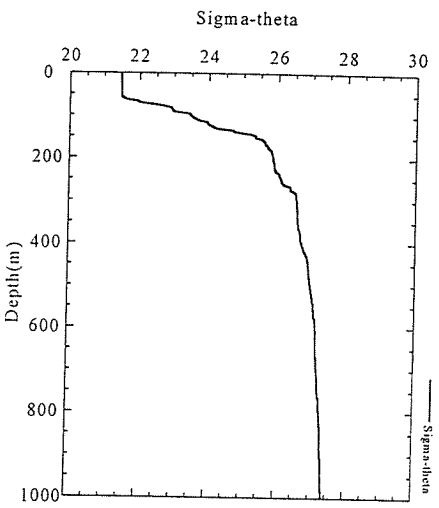

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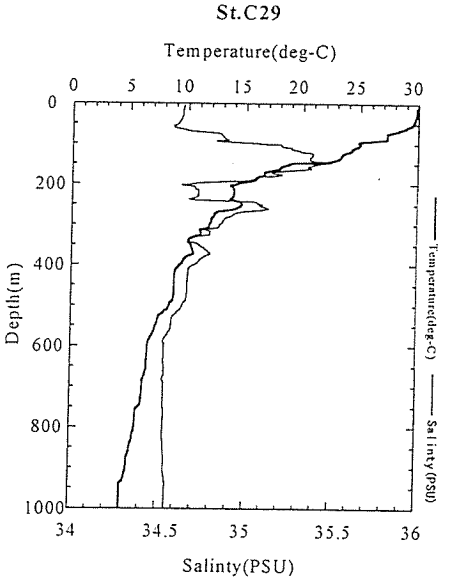

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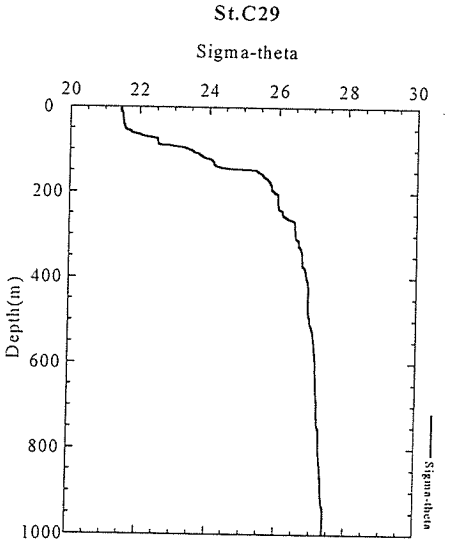

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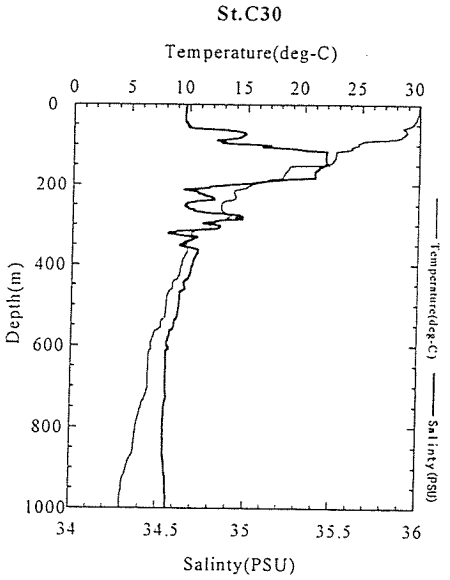

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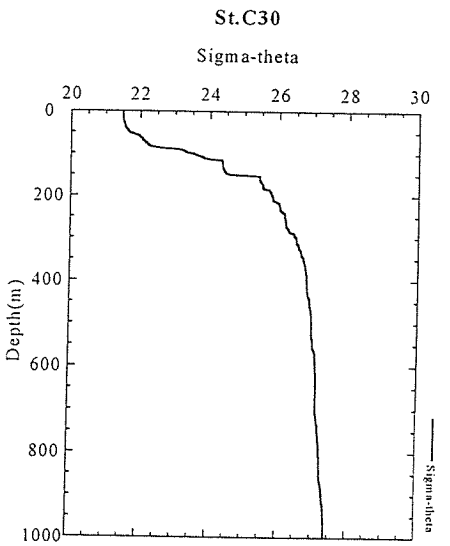

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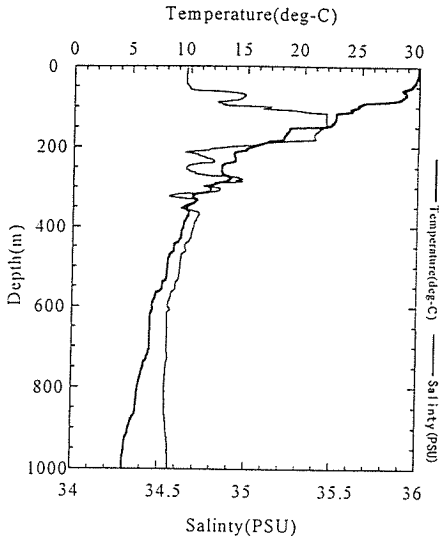

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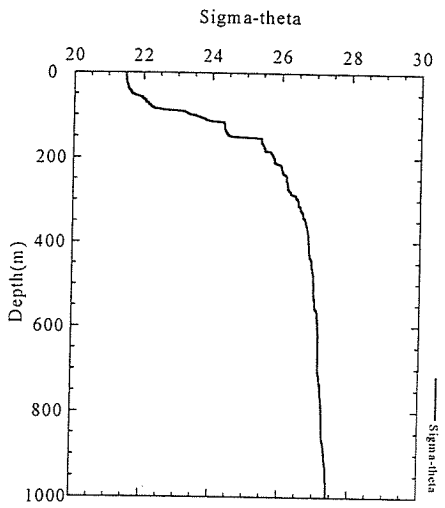

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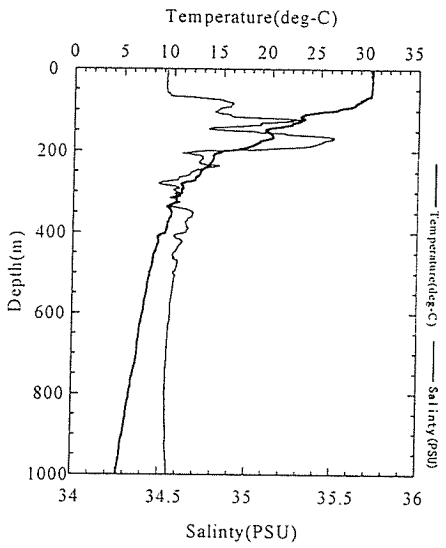

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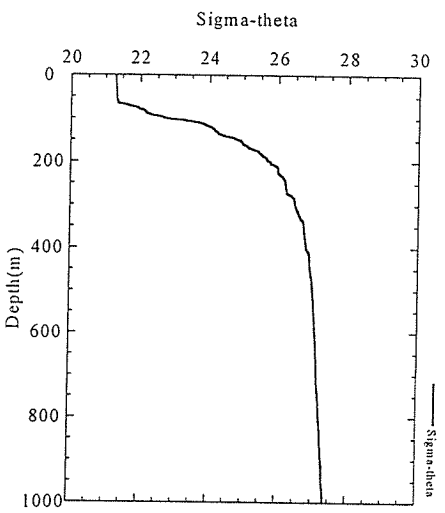

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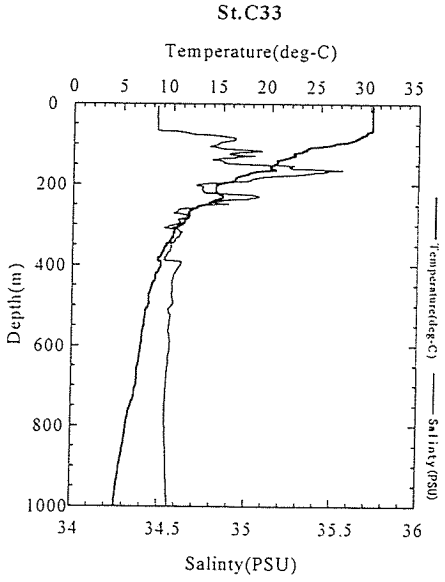

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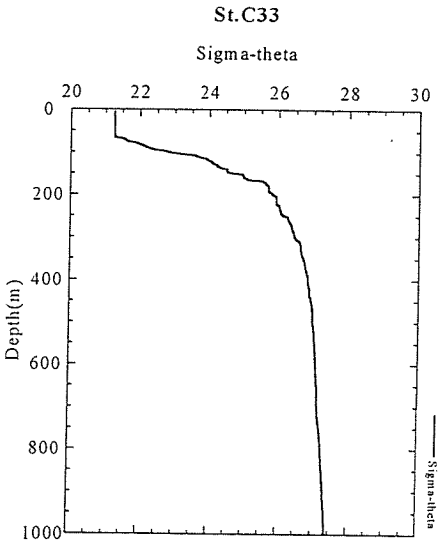

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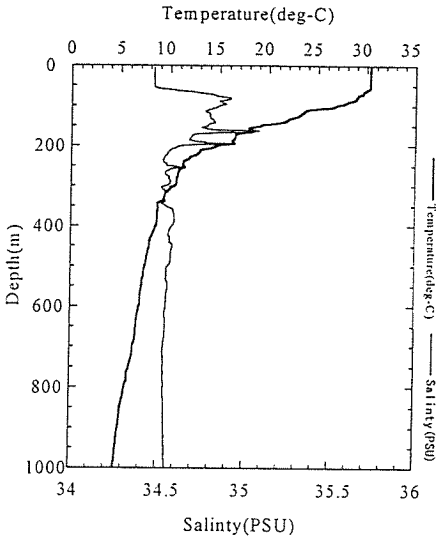

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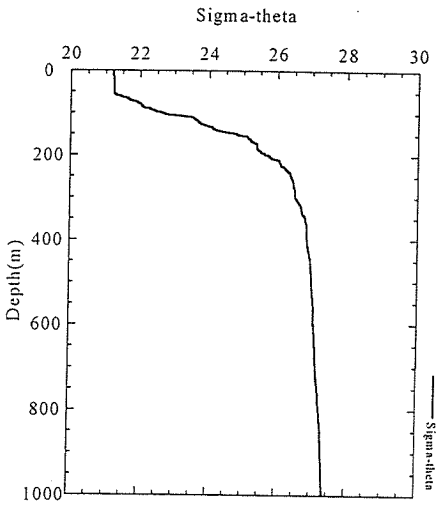

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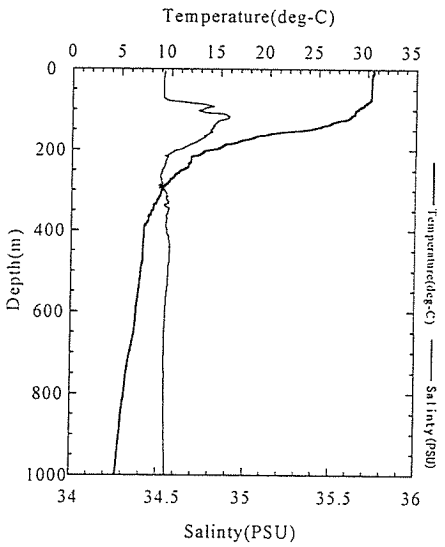

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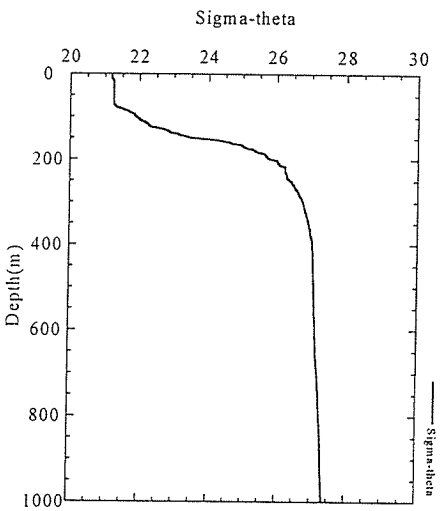

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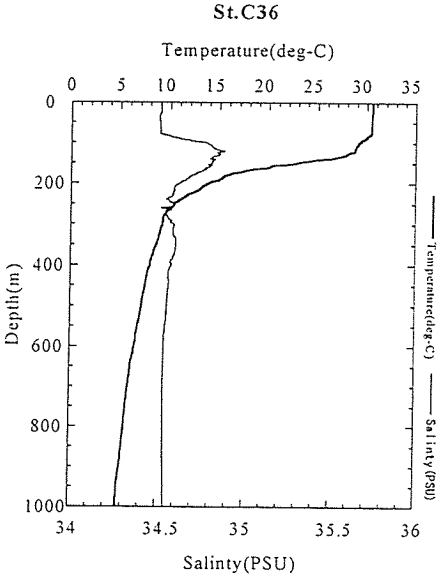

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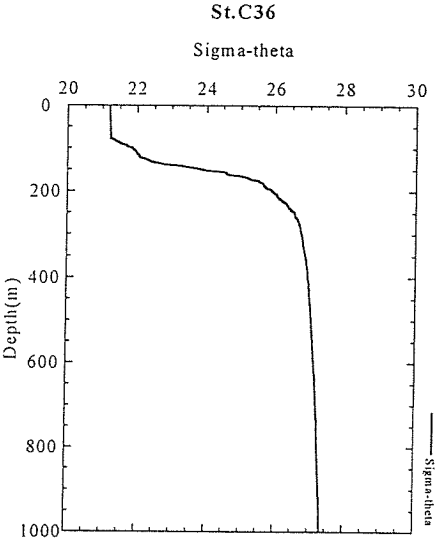
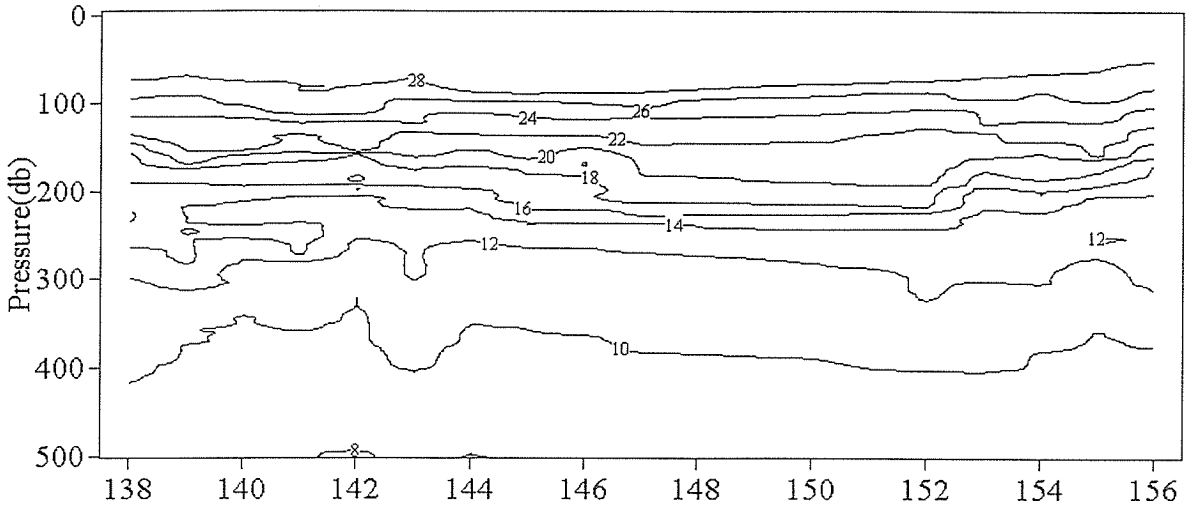


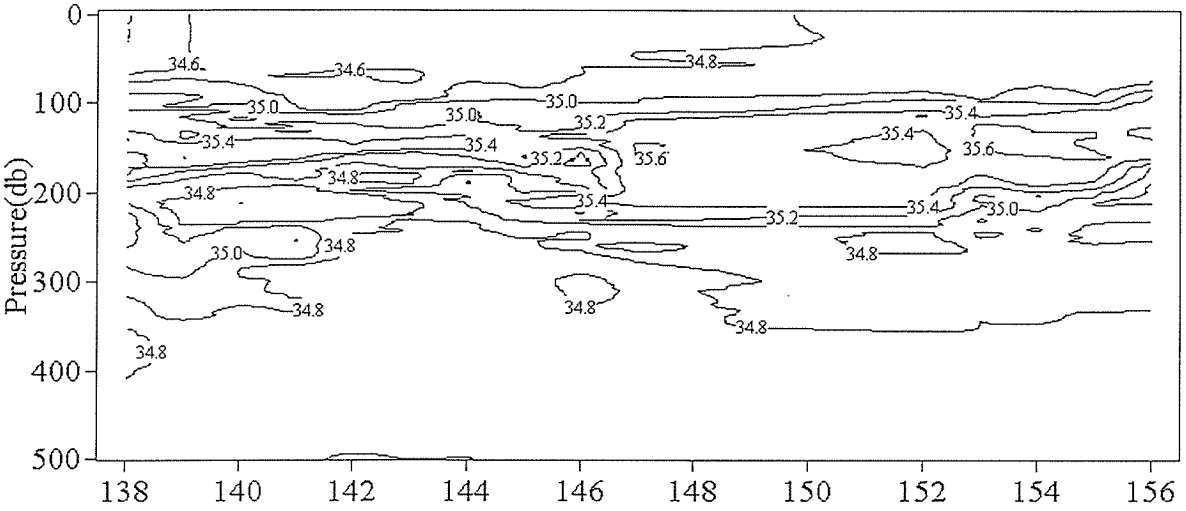
4.4 CTD Sections

Equator Temperature(deg-C)



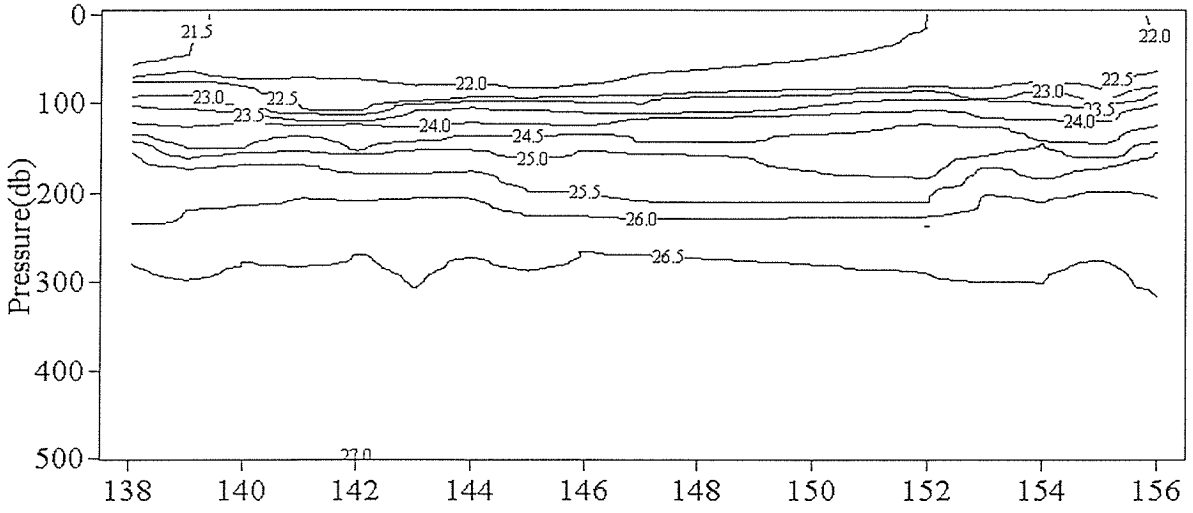
Longitude

Equator Salinity(PSU)



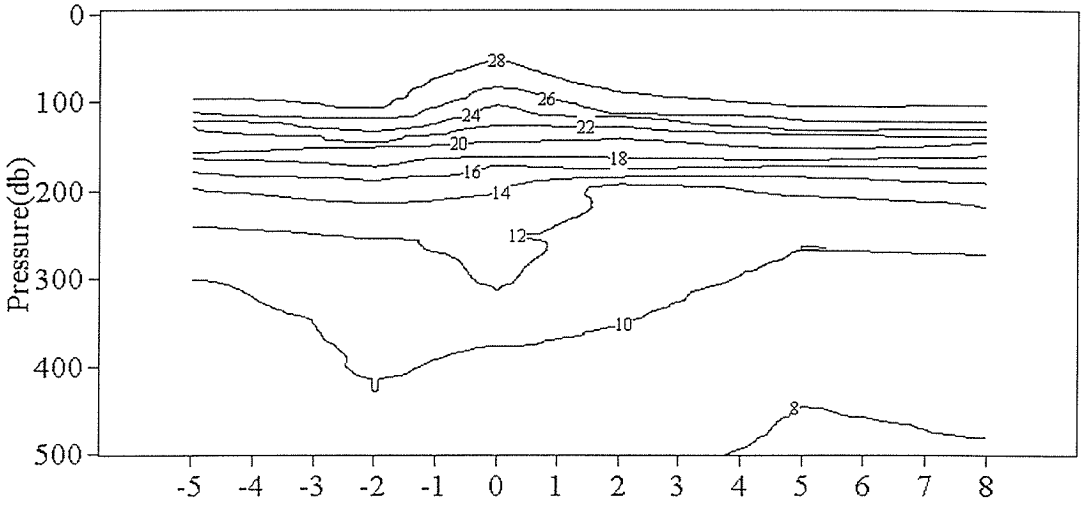
Longitude

Equator Sigma-theta

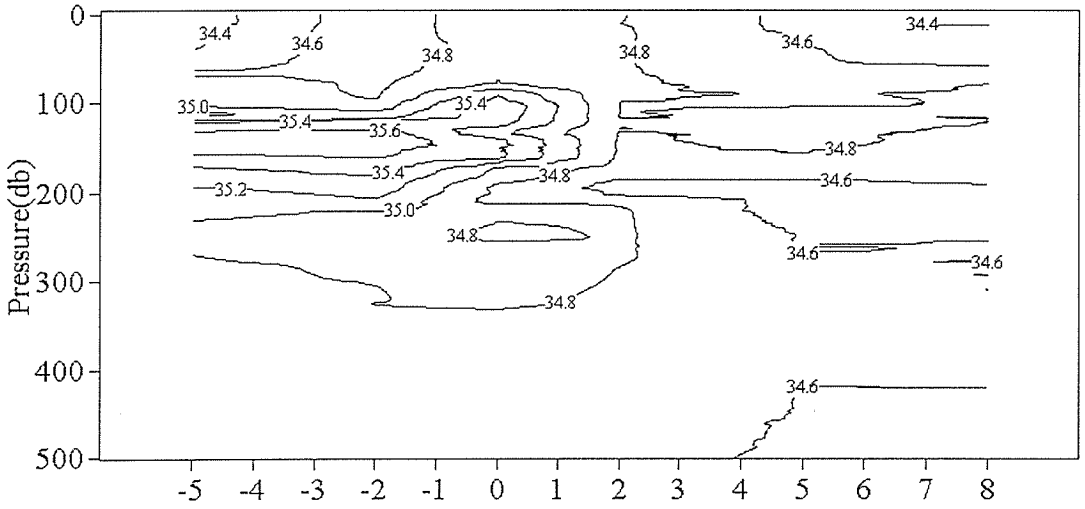


Latitude

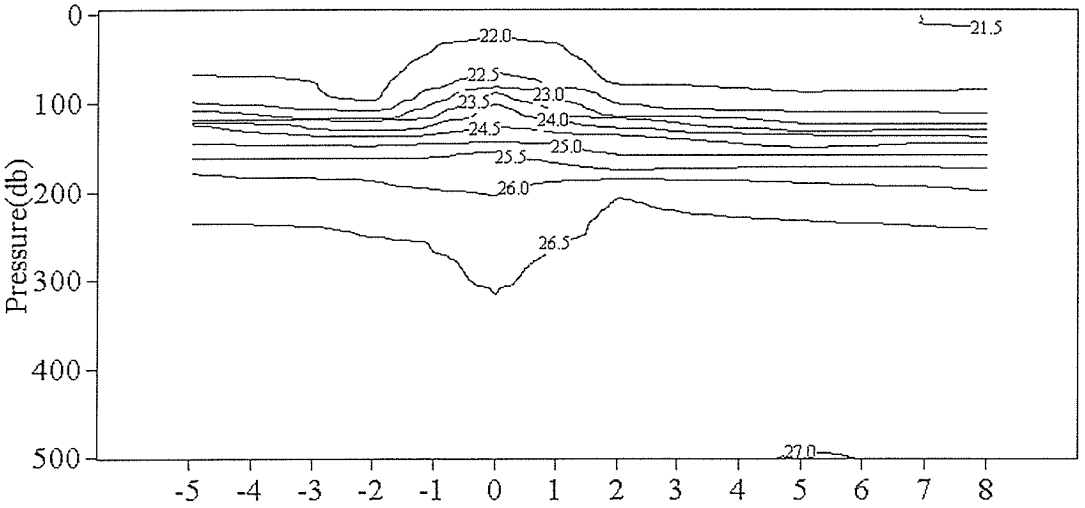
156E Temperature(deg-C)



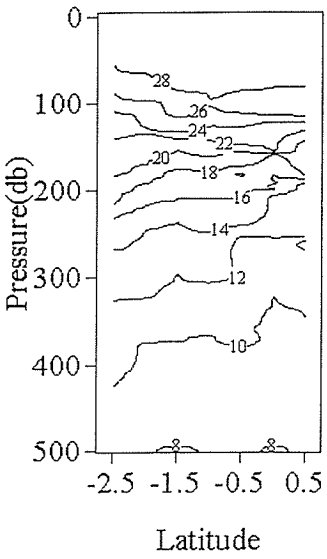
156E Salinity(PSU)



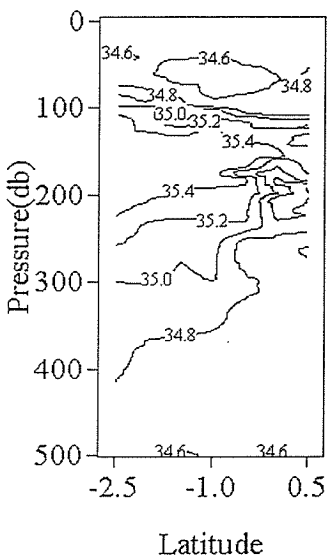
156E Sigma-theta



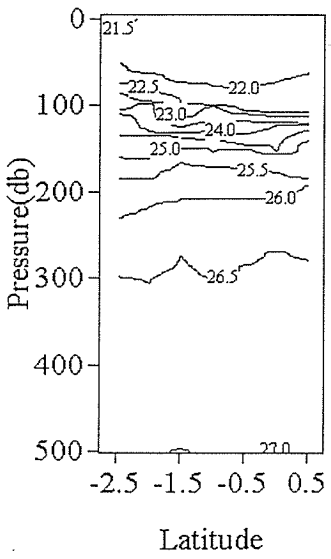
142E Temperature(deg-C)



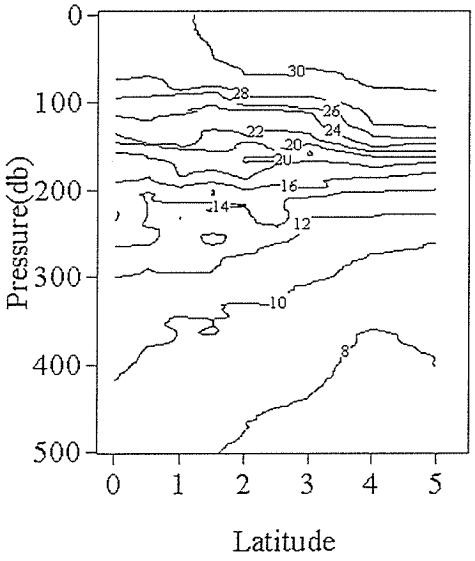
142E Salinity(PSU)



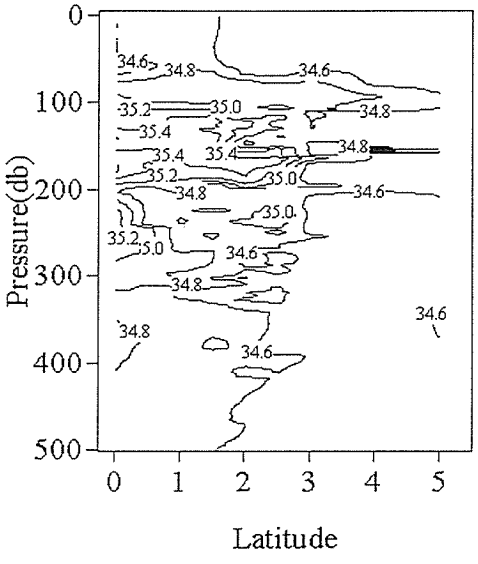
142E Sigma-Theta



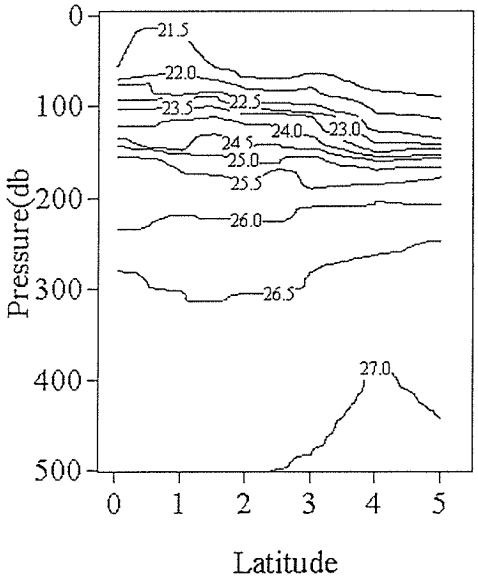
138E Temperature(dig-C)



138E Salinity(psu)



138E Sigma-theta



4.5 Bottle Salinity

T. Shiribiki and A. Ito

Marine Works Japan, LTD.

Objective:

Comparison of CTD Salinity data with directly measured data.

Instrument:

Guild Line Autosal Model 8400B / S/N60132

Methods:

The Niskin water samplers (Carousel) sampled sea water at 1000db. We collected water sample from the 5-liter Niskin water samplers into 250ml glass bottles. Before analysis, water samples left more than 24 hours for adapting room temperature in special room(room temperature was about 24 degC). After all CTD observations sites was finished, we analyed water samples. The standardizations have been performed before analysis.

Results:

Unfortunately, we could not analyze water samples in this cruise because the condition of Autosal was so bad. Then, we will analyze at JAMSTEC with good condition Autosal after this cruise. That bad condition was that:

Sub-standard seawater salinty values were comparatively stable, but in standardizations standard water values was not stable, so it was not performed well. And we used 8 standard water bottles for standardizations and cross check, however all was not performed well.

5. Shipbord ADCP

R/V Kaiyo mounts the VM(Vessel-Mounted)-NB(Narrow-Band) ADCP (Acoustic Doppler Current Plofiler) manufacutured by RD Instrument. The serial number of transducer is 501 of the frequency 7 7KHz and the 30degreebeam angle.The ADCP was setas listed below.

Depth Cell Length : 16m
No. of Depth Cell : 64
Average Time : 600 sec
Tilt misalignment : 0.0
Pitch offset : 0.0
Roll offset : 0.0

6. JAMSTEC ADCP MOORING

To get the knowledge of physical process in the western equatorial pacific. In this cruise (KY98-10), we recovered four subsurface ADCP moorings at(00-156E),(2.5S-142E),(2S-142E), and (00-138),and deployed three ADCP mooring at (00-156E),(2,5S-142E)and(00-138E).

Instrument:

1) ADCP

Distance to first bin : 8m

Pings per ensemble : 16

Time per ping : 2.00s

Bin length : 8.00m

Sampling Interval : 3600s

Recoreved ADCP

- Serial Number : 1223 (Mooring No.970809-00156E)
- Serial Number : 1225 (Mooring No.970821-25S142E)
- Serial Number : 1220 (Mooring No.970821-2S142E)
- Serial Number : 1222 (Mooring No.970824-00138E)

Deployed ADCP

- Serial Number : 1150 (Mooring No.980825-00156E)
- Serial Number : 1151 (Mooring No.980906-25S142E)
- Serial Number : 1154 (Mooring No.980907-00138E)

2) CTD

SBE-16

Sampling Interval : 1800s

Recoreved CTD

- Serial Number : 1278 (Mooring No.970809-00156E)
- Serial Number : 1280 (Mooring No.970821-25S142E)
- Serial Number : 1282 (Mooring No.970821-2S142E)
- Serial Number : 1283 (Mooring No.970824-00138E)

Deployed CTD

- Serial Number : 1284 (Mooring No.980825-00156E)
- Serial Number : 1276 (Mooring No.980906-25S142E)
- Serial Number : 1275 (Mooring No.980907-00138E)

Deployment :

Three ADCP mooring were deployed at (00-156E), (2.5S- 142E)and (00-138E) . The moorings were designed to moor the ADCP at about 270m. After we dropped the anchor, we monitored depth of the acoustic releaser (Fig.6-1 ～ 6-2). The descending rate was about 2.4m/sec. Each position of the mooring were showed below.

Results of calibration

- Mooring No.980825-00156E

  Lat: 0 ° 00.003N Long: 156 ° 00.126E

- Mooring No.980906-25S142E

  Lat: 2 ° 28.065S Long: 141 ° 58.683E

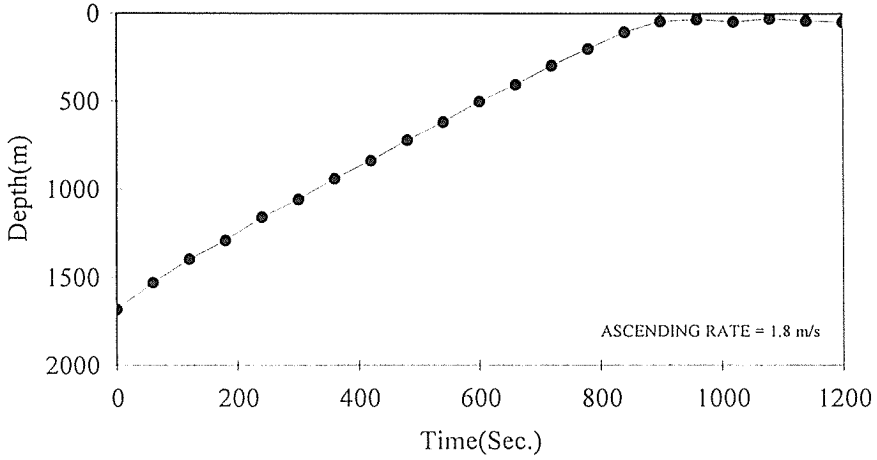
- Mooring No.970824-00138E

  Lat: 0 ° 01.154S Long: 138 ° 01.851E

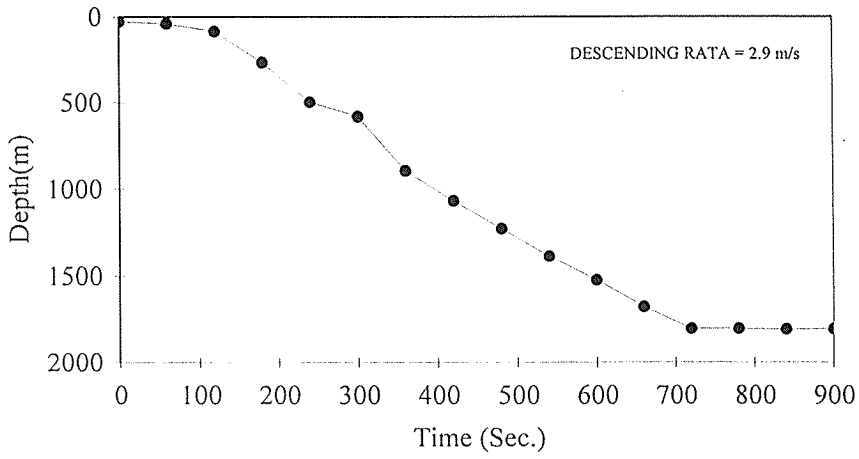
Recovery

We recovered four ADCP moorings which were deployed on Aug.-Sep.1998 (KY98-10).

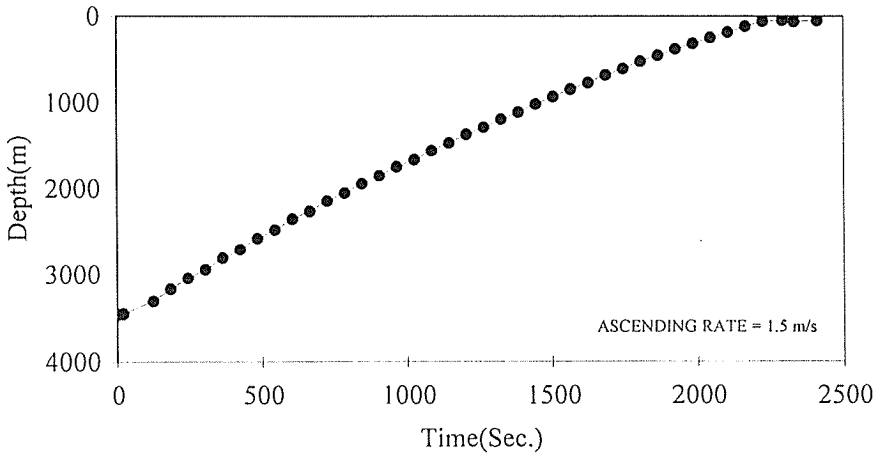
We monitored depth of acoustic releaser after we released theanchor.(Fig.6-1 ～ 6-2) After the recovery, we uploaded ADCP and CTD data into a computer,then raw data were converted into ASCII code. Results were shown in the figures on following pages. Fig.6-3 shows CTD depth . Fig.6-4 ～ 6-15 shows the velocity data (eastward and northward component) at 50m(23bins for 00-156E ADCP,23bins for 2.5S-142E, 25bins for 2S-142E, 23bins for 00-138E), 100m(17bins for 00-156EADCP,17bins for 2.5S-142E, 18bins for 2S-142E, 17bins for 00-138E) and 150m(11bins for 00-156E ADCP,11bins for 2.5S-142E, 12bins for 2S-142E, 11bins for 00-138E) depth.



970809-00156E Recovery

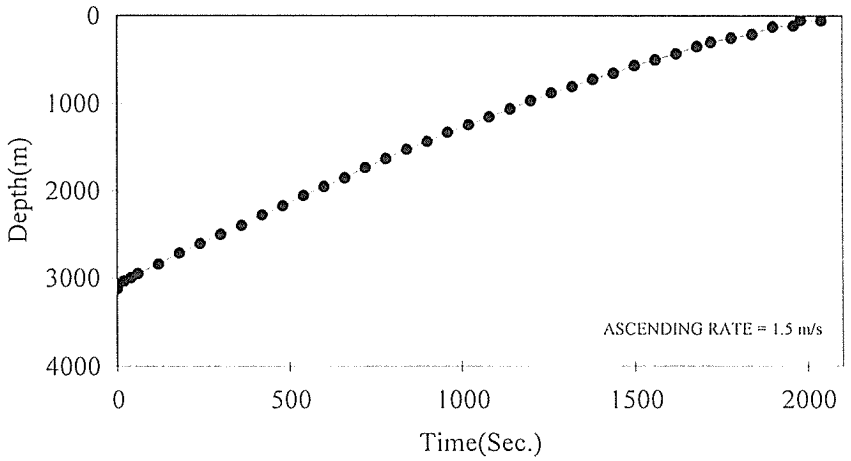


980825-00156E Deployment

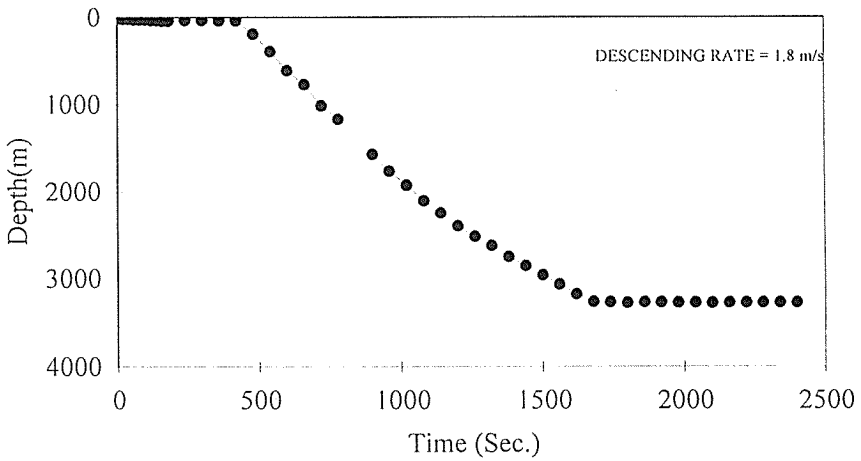


970821-2S142E Recovery

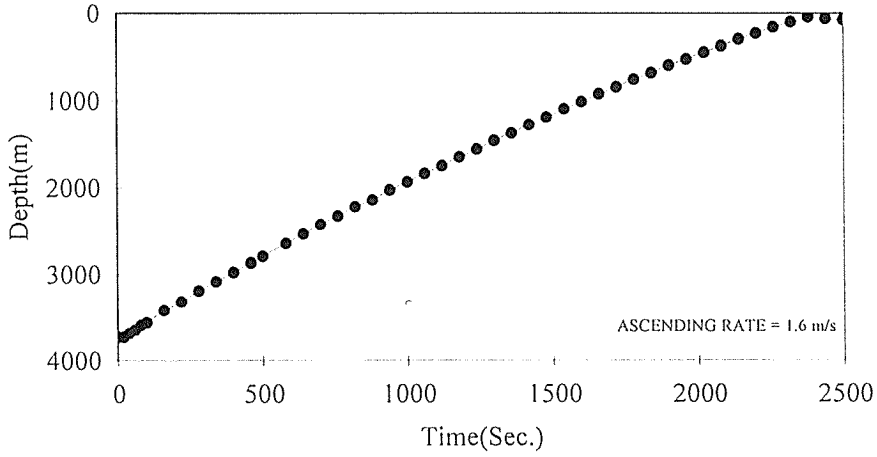
Fig.6-1 Depth Monitor of Acoustic Releaser



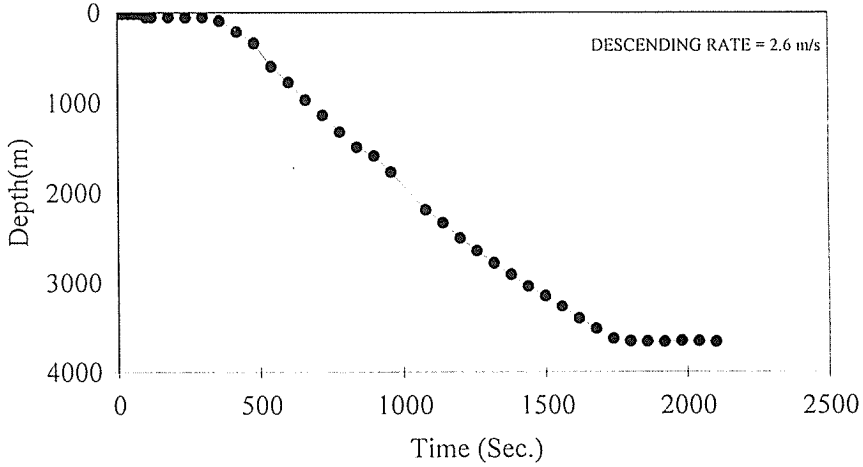
970821-25S142E Recovery



980906-25S142E Deployment

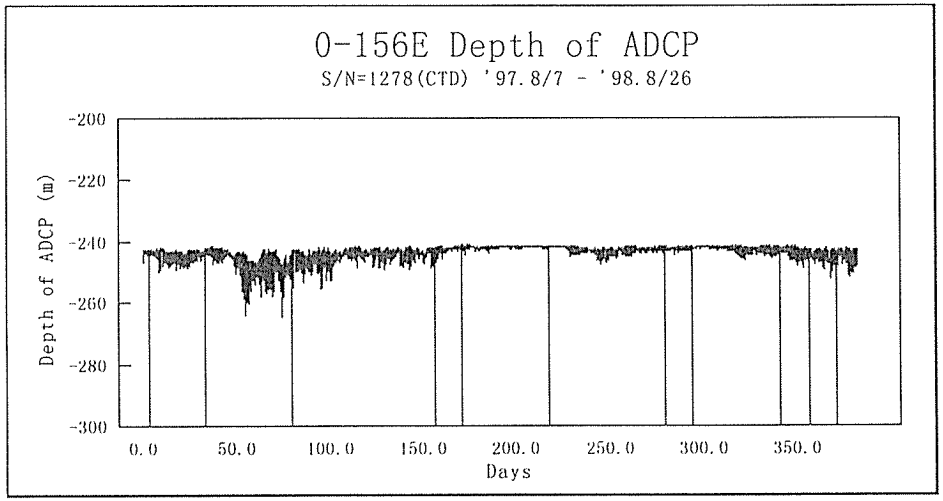


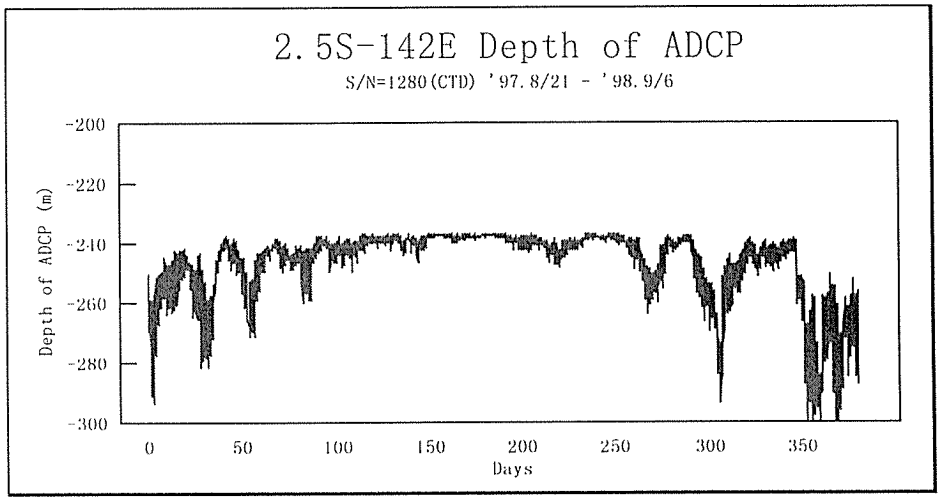
970824-00138E Recovery

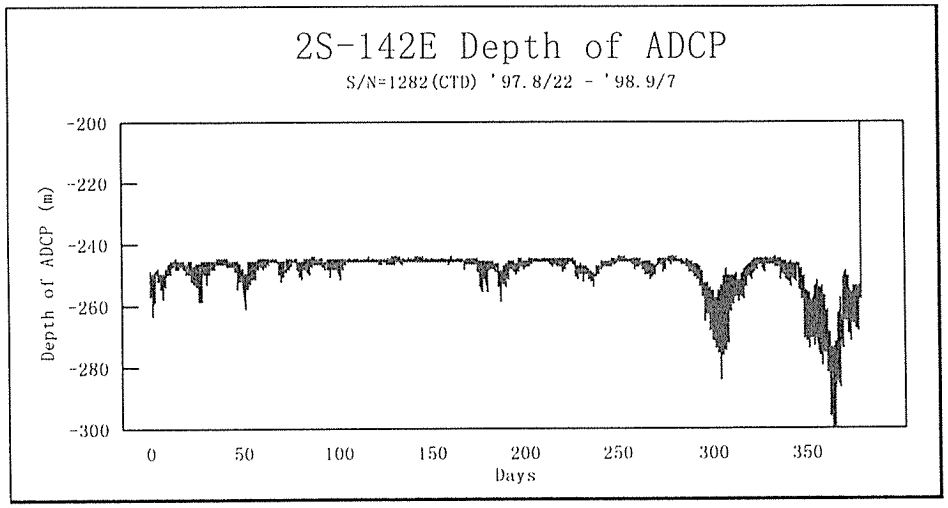


980907-00138E Deployment

Fig.6-2 Depth Monitor of Acoustic Releaser







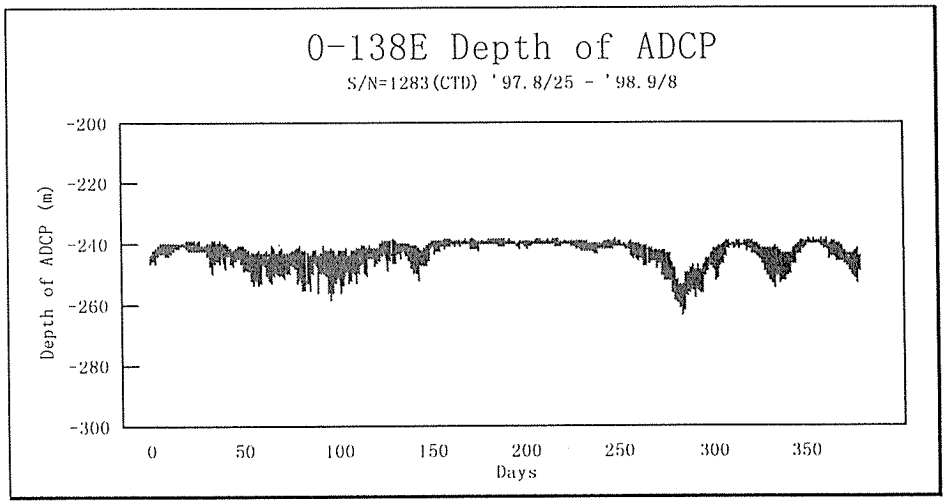
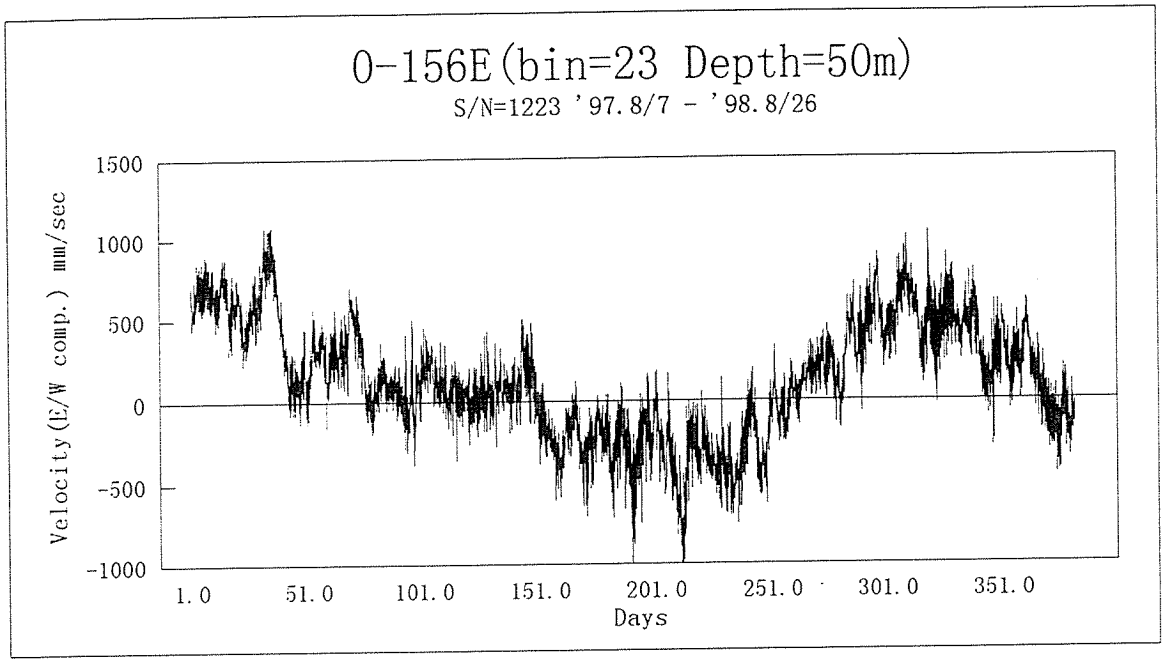


Fig.6-3 CTD Depth(db) Time Series Monitoring



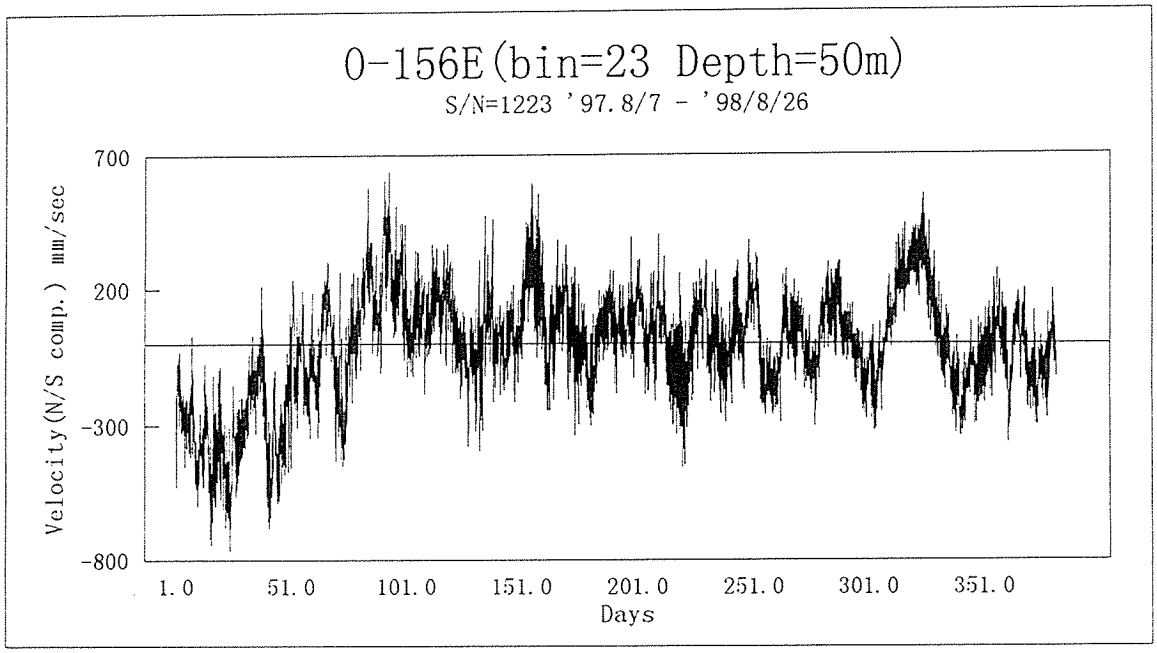
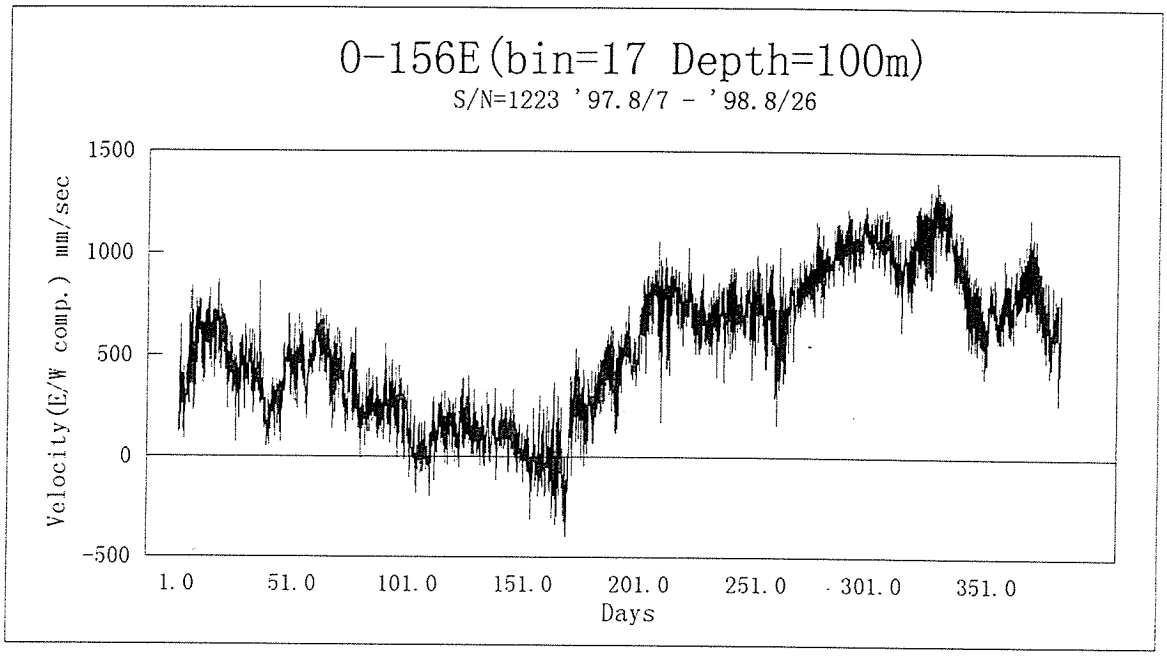


Fig.6-4 Velocity Monitoring



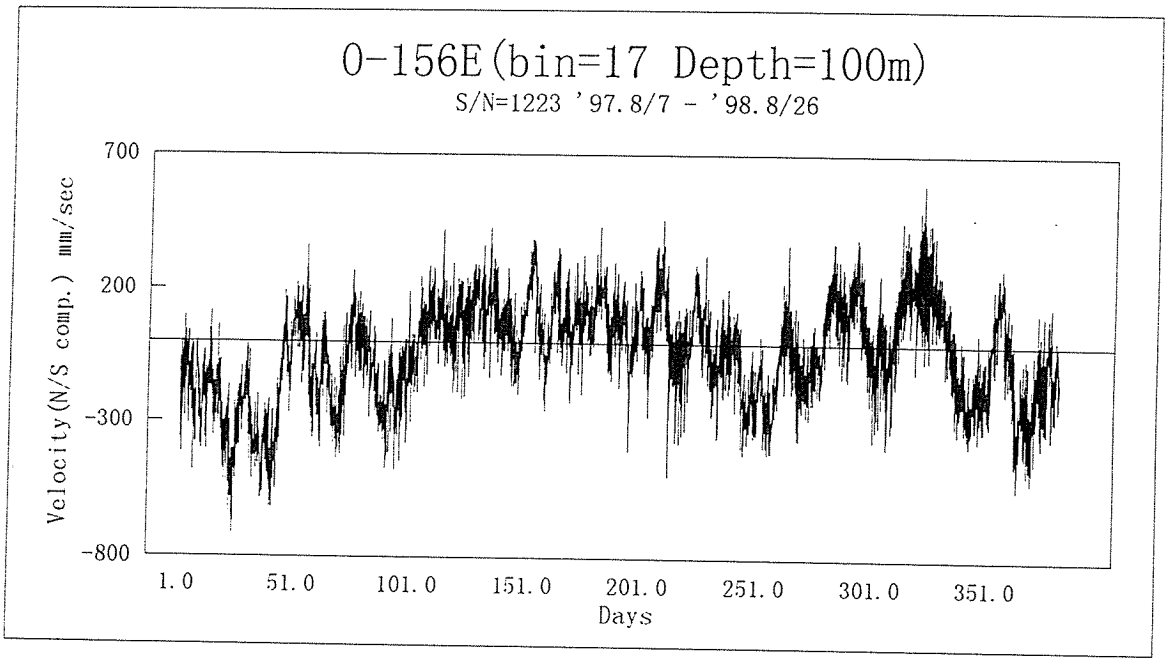
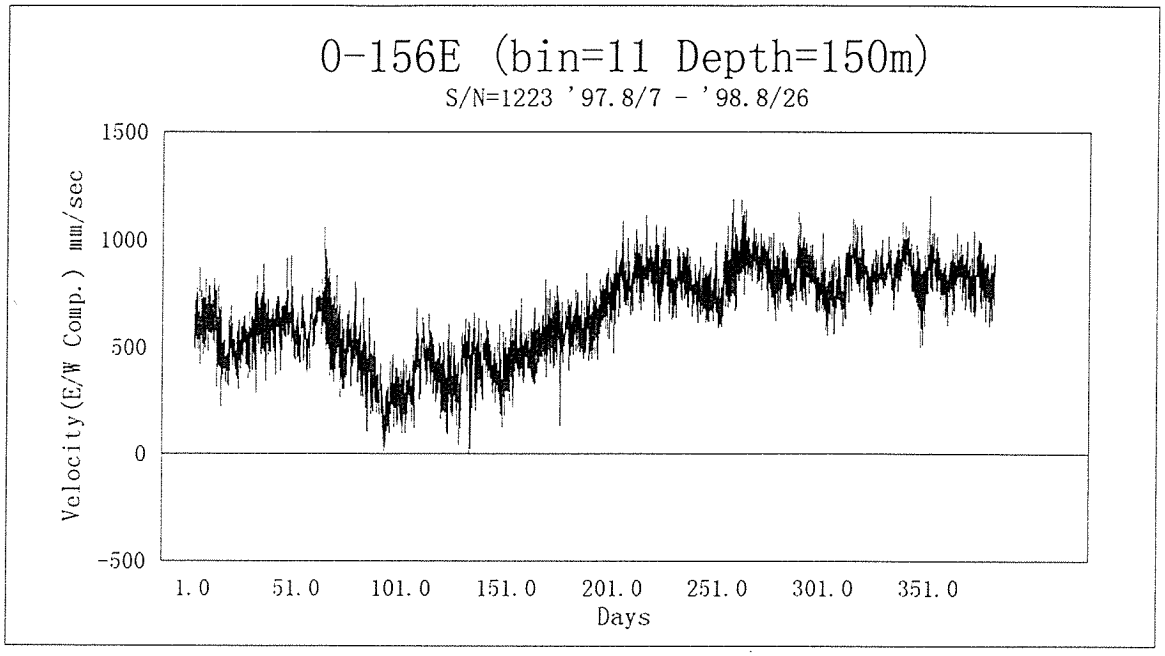


Fig.6-5 Velocity Monitoring



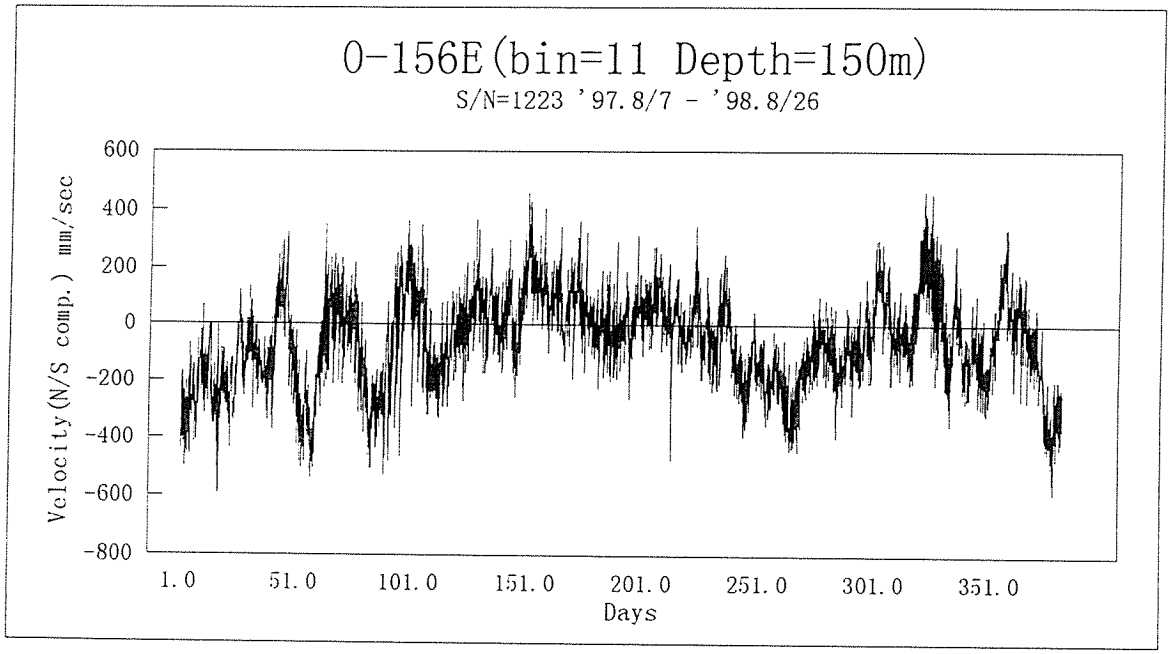
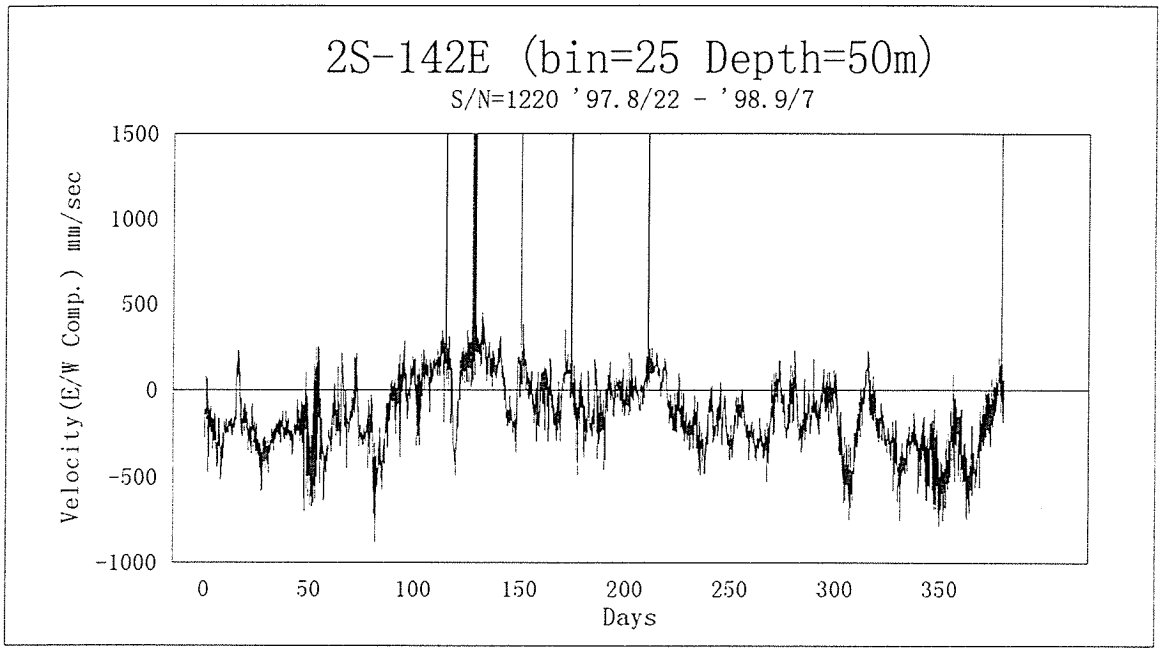


Fig.6-6 Velocity Monitoring



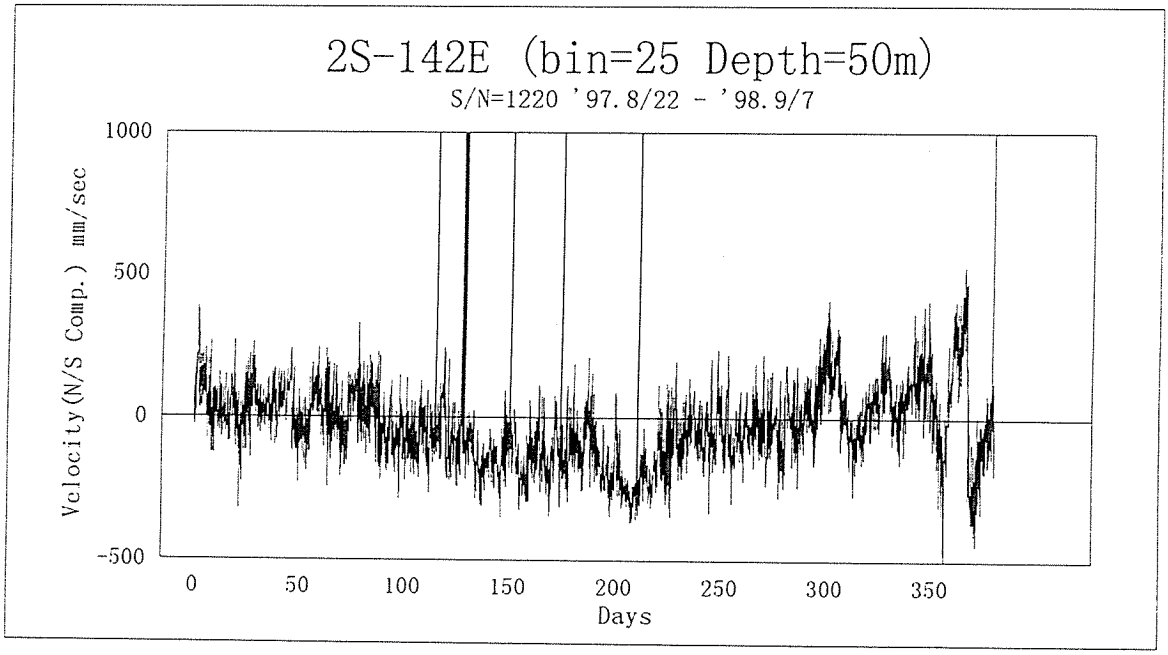
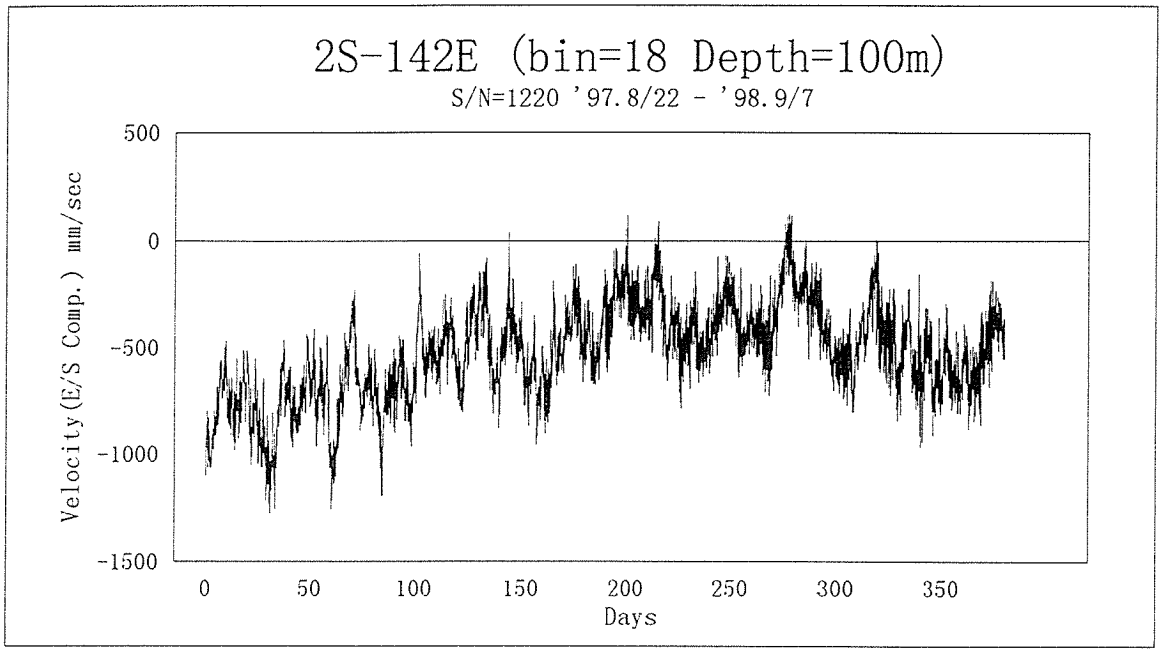


Fig.6-7 Velocity Monitoring



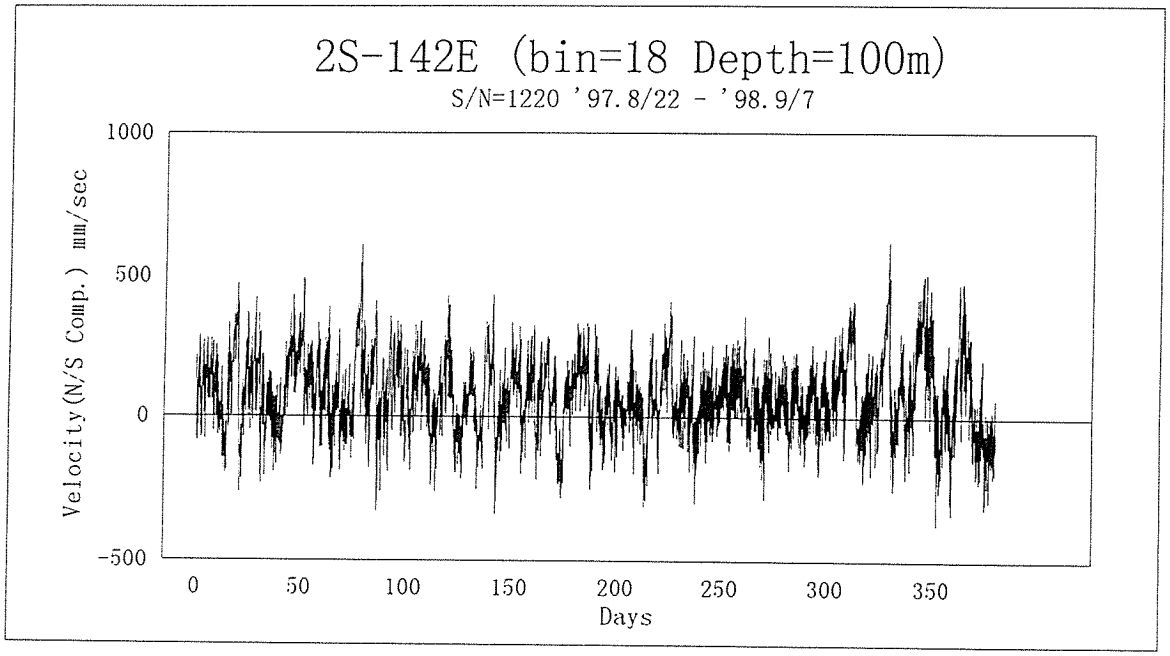
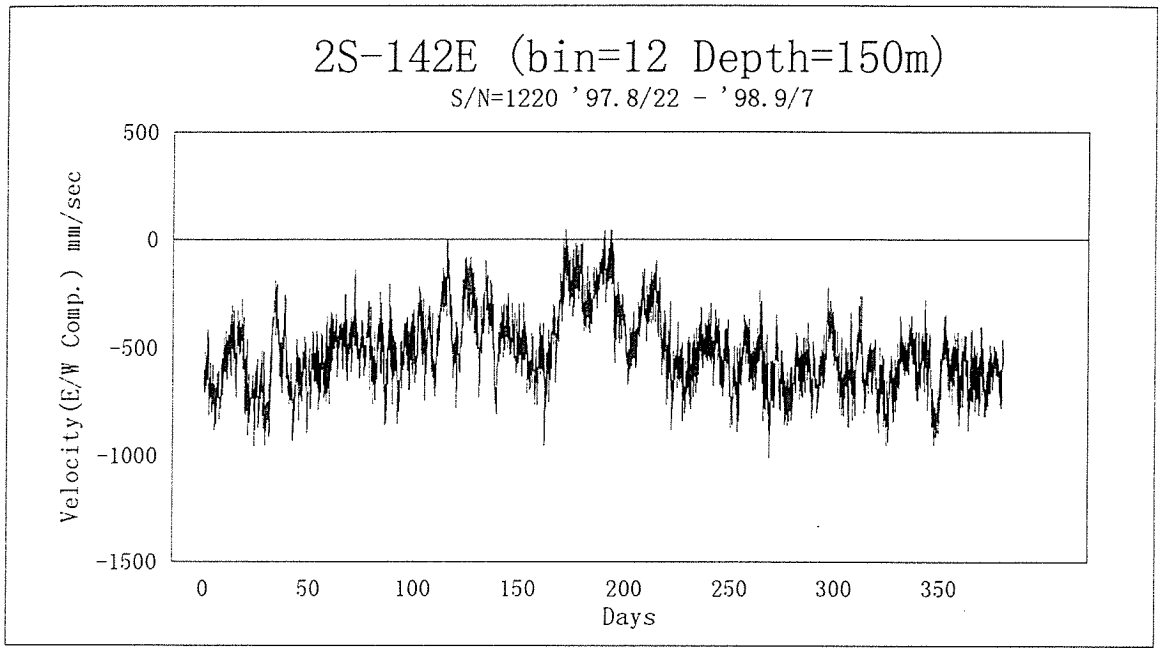


Fig.6-8 Velocity Monitoring



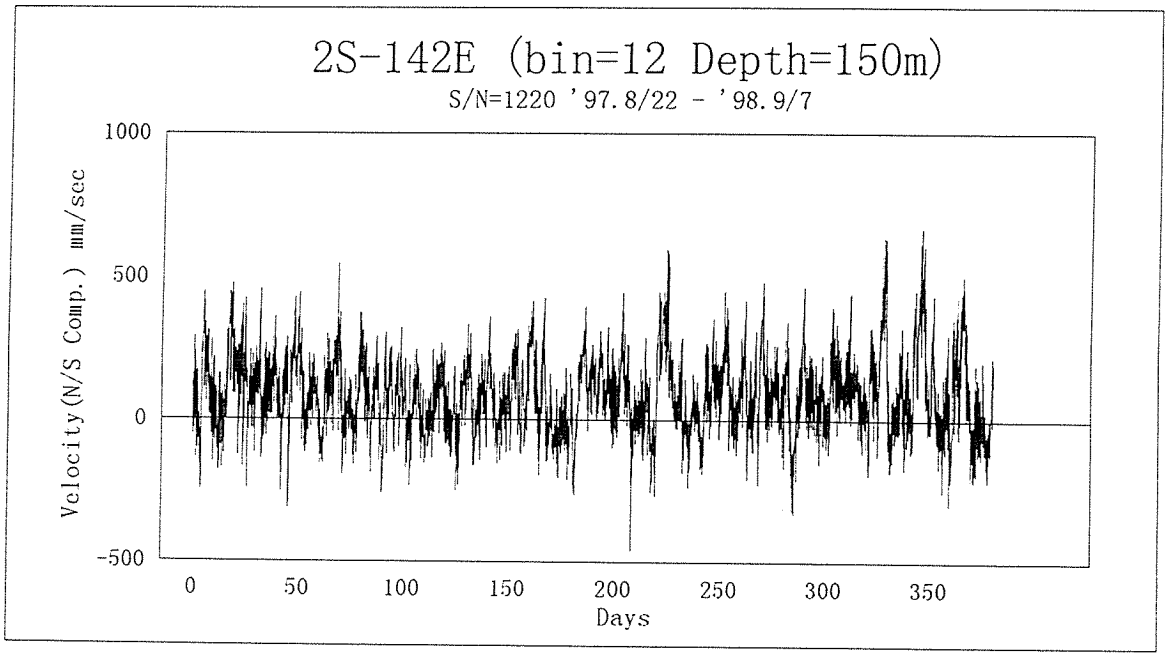
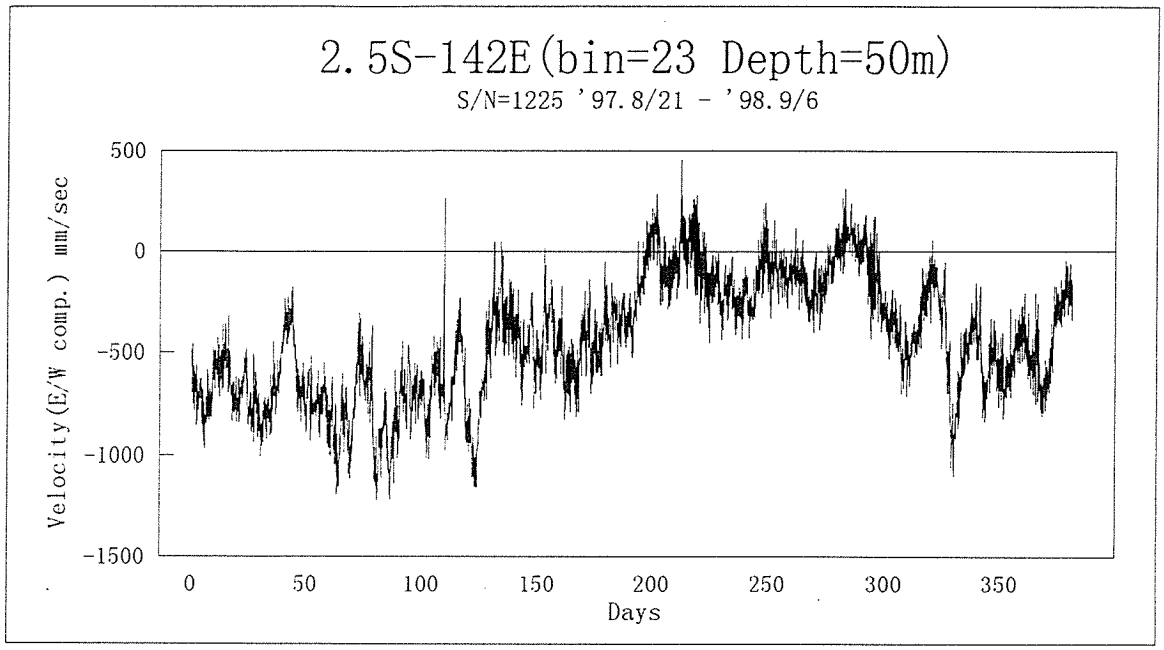


Fig.6-9 Velocity Monitoring



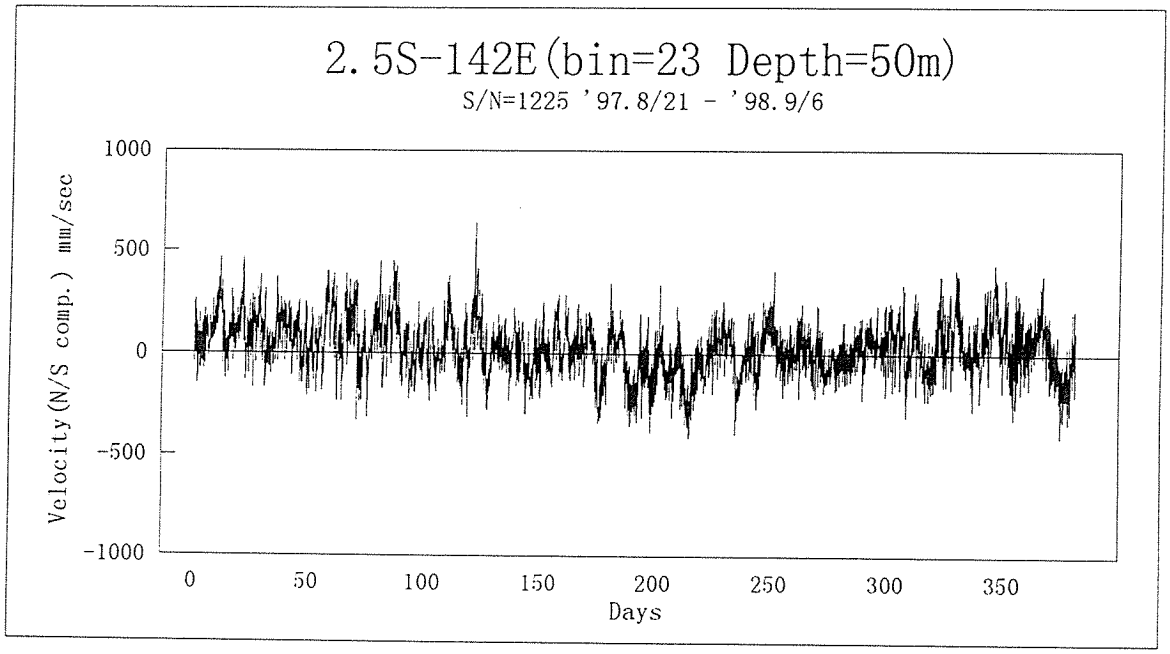
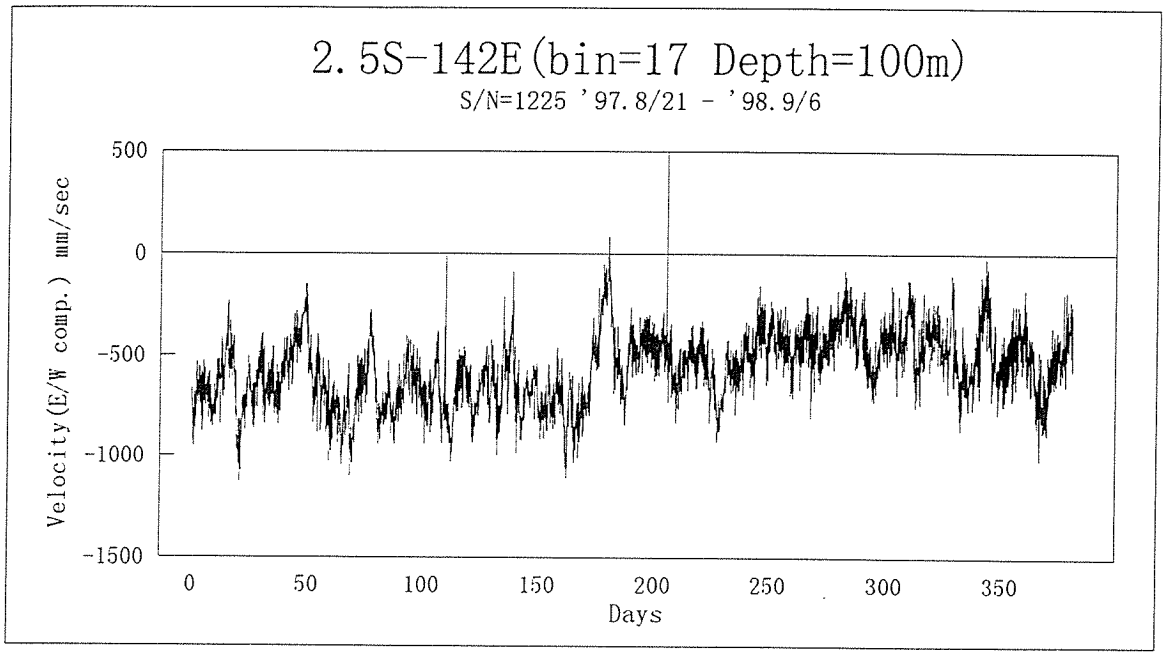


Fig.6-10 Velocity Monitoring



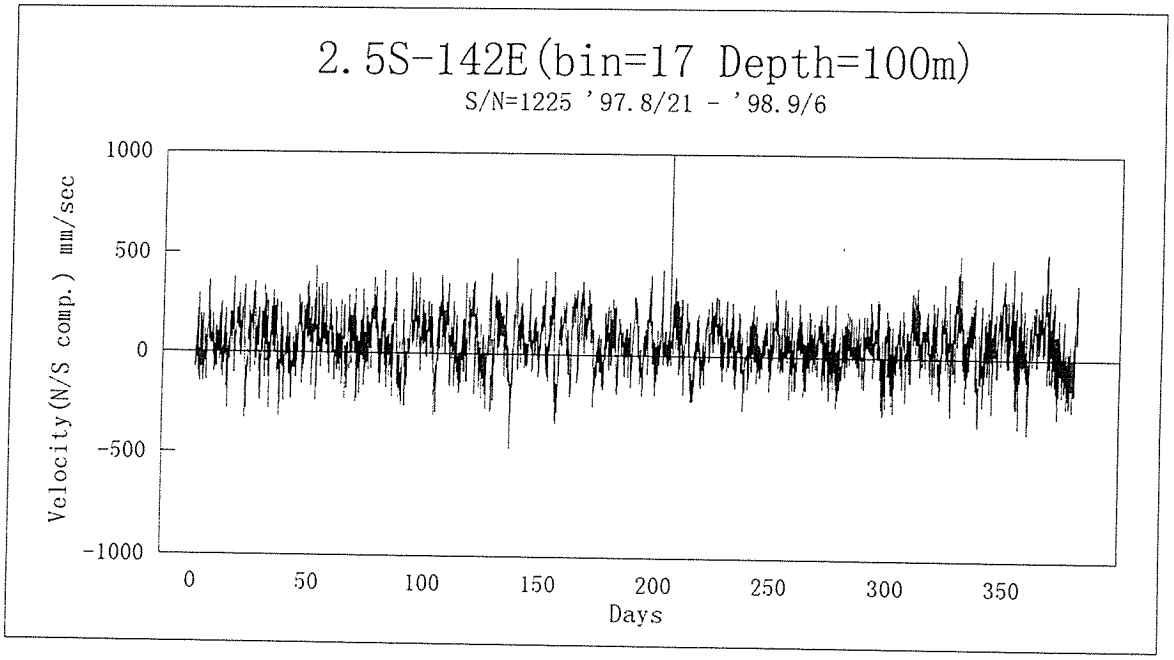
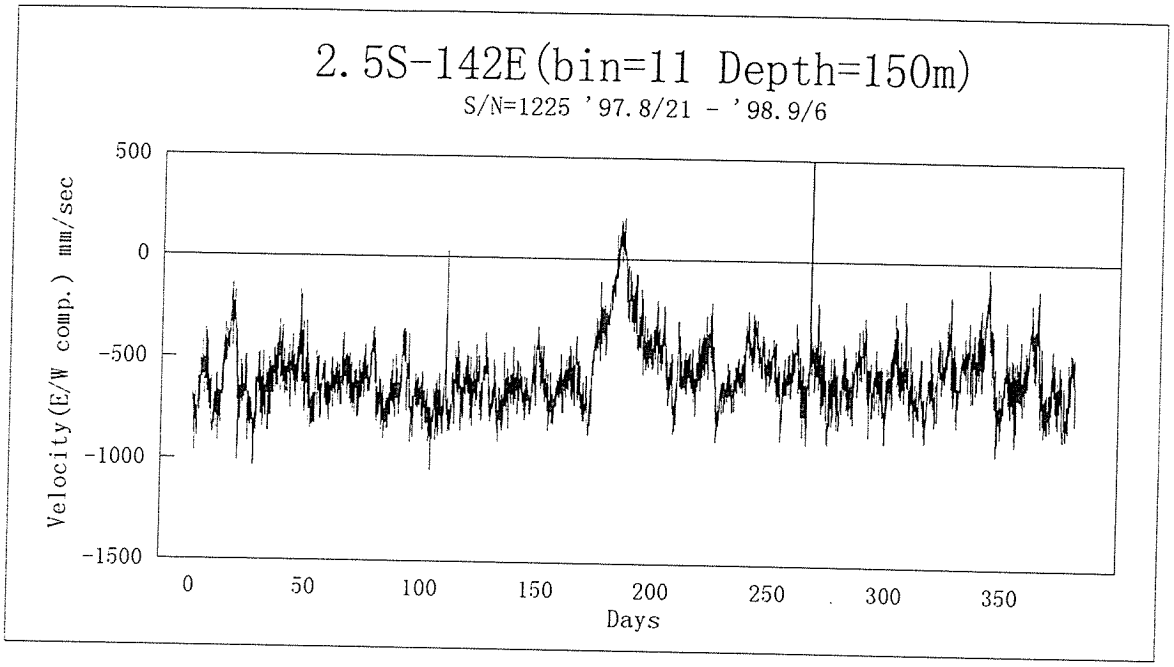


Fig.6-11 Velocity Monitoring



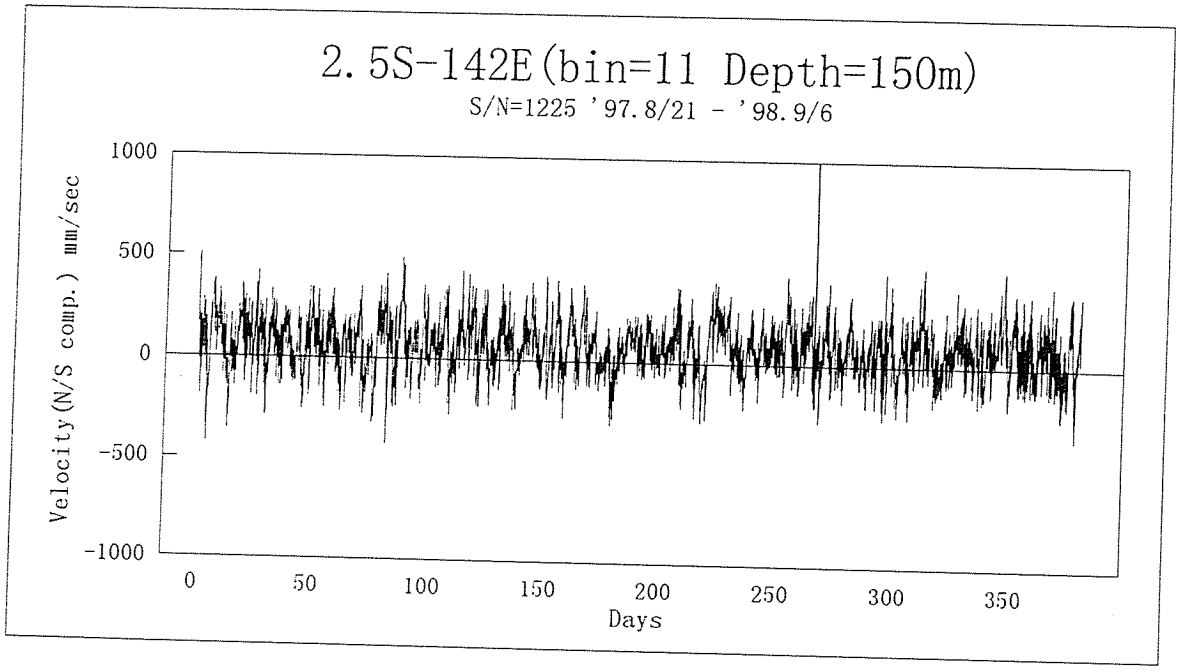
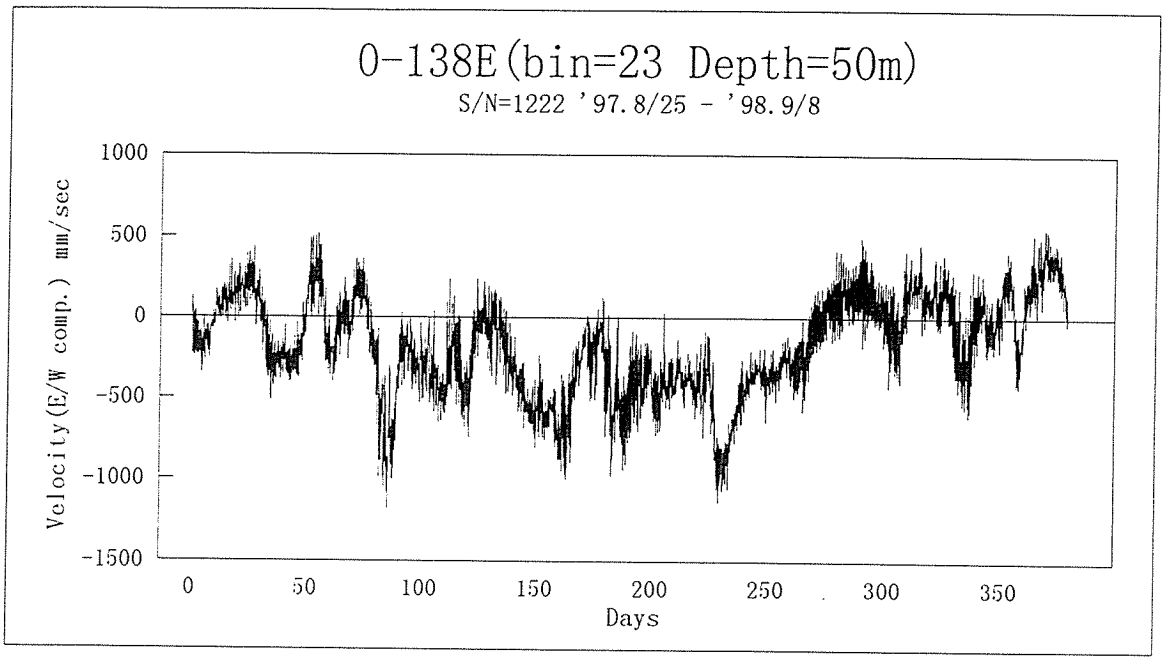


Fig.6-12 Velocity Monitoring



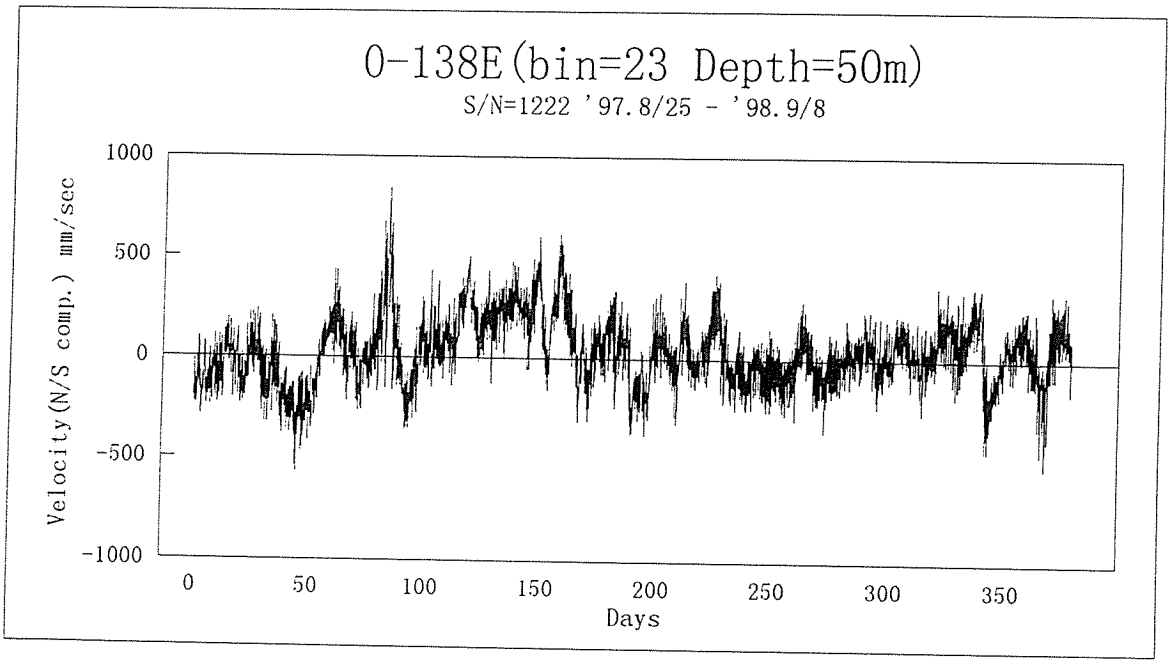
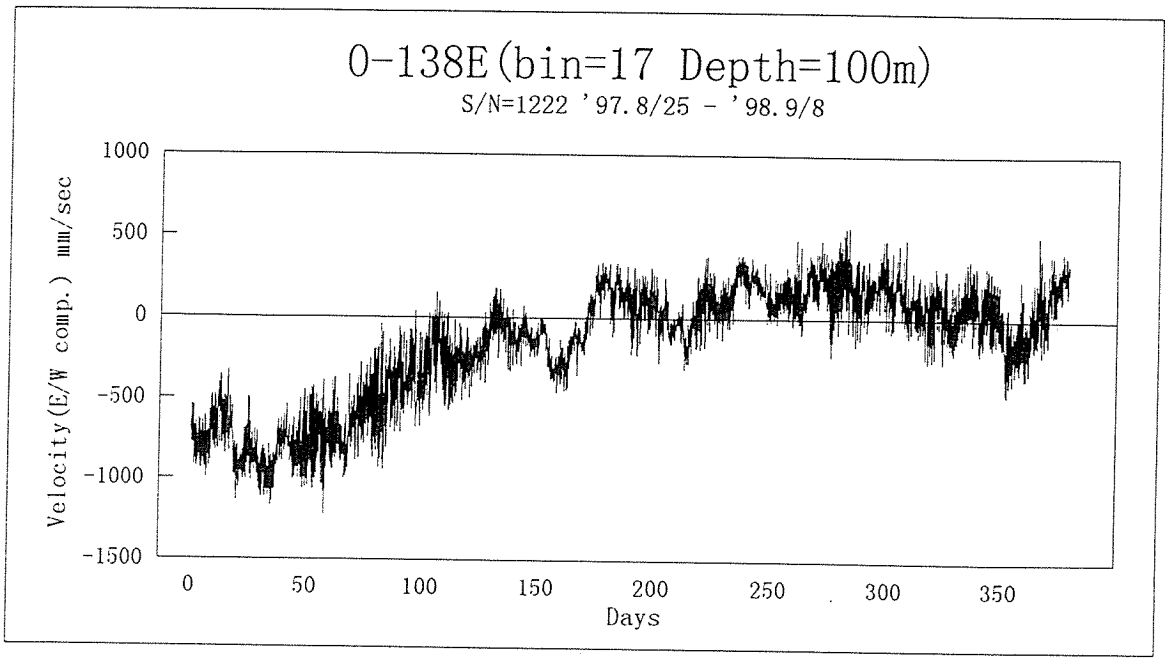


Fig.6-13 Velocity Monitoring



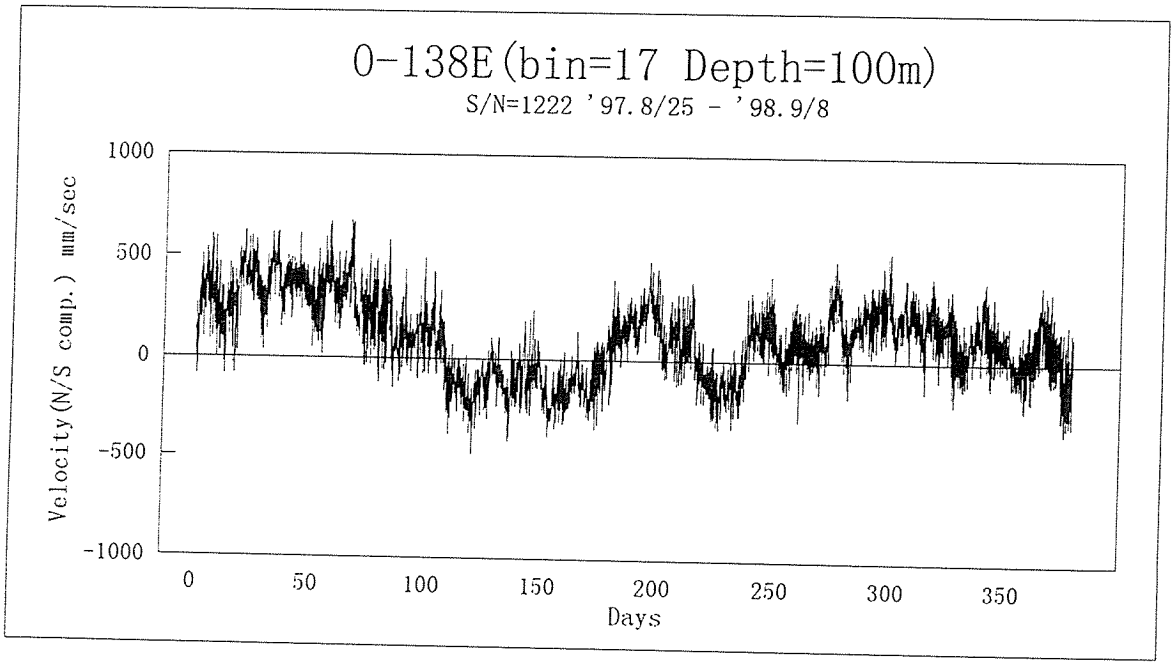
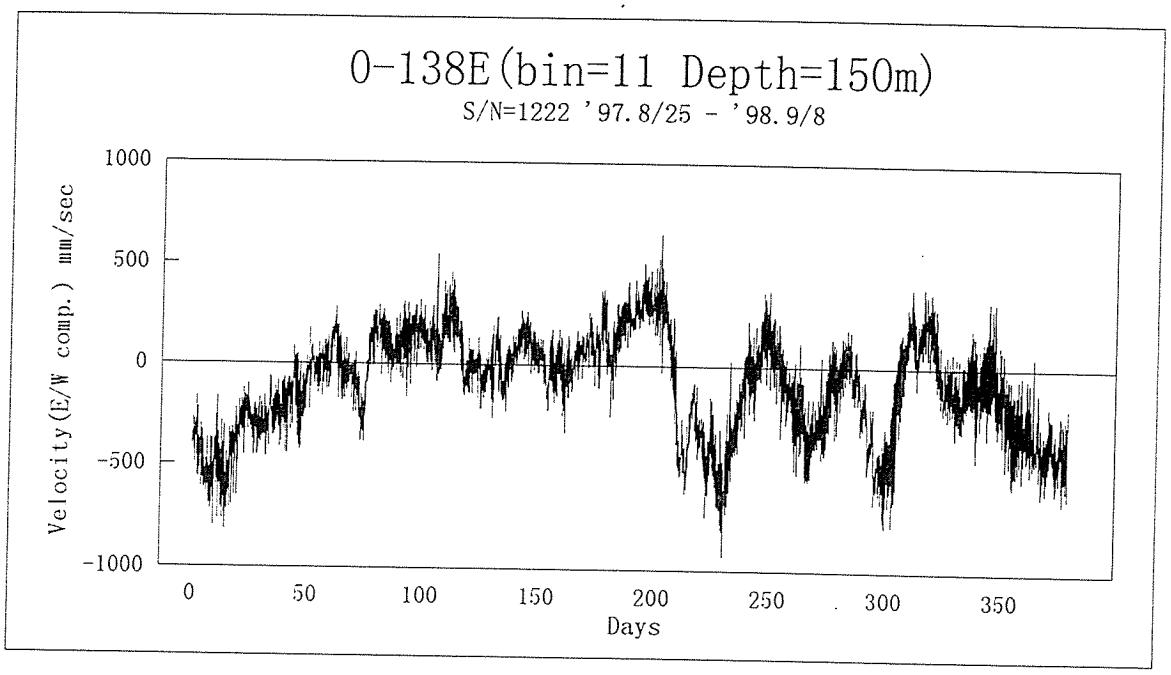


Fig.6-14 Velocity Monitoring



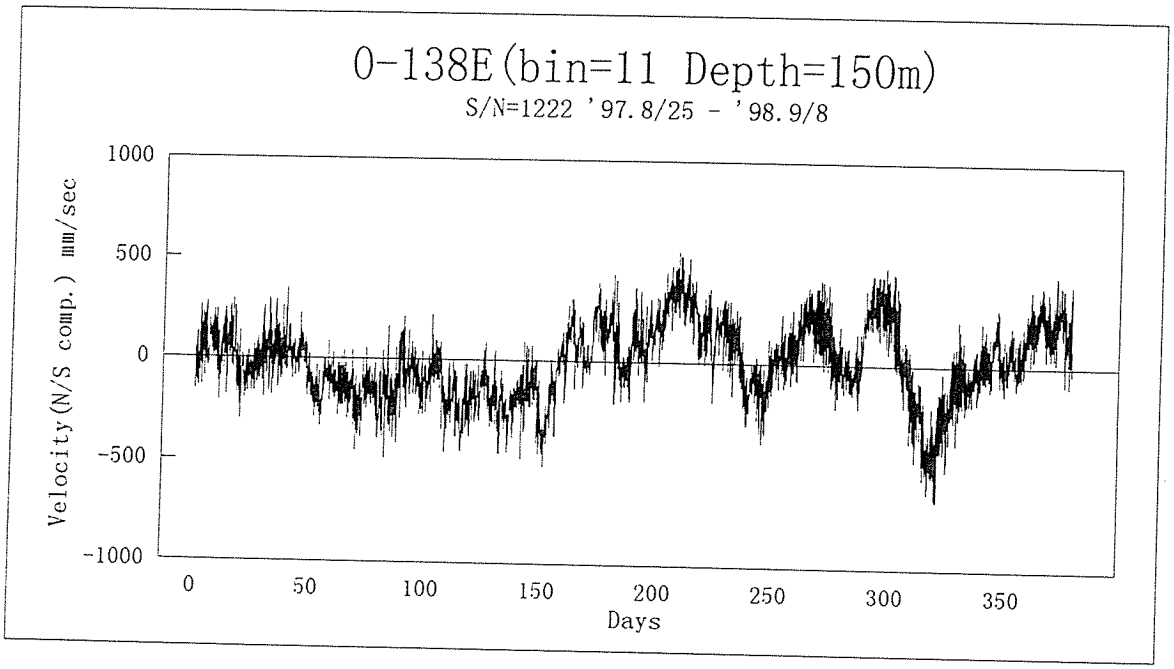


Fig.6-15 Velocity Monitoring

DEPLOYMENT & RECOVERY

MOORING No. 980825 – 00156E

PROJECT	TOCS	TIME	UTC
AREA	Western Pacific	RECORDER (D)	T. Shiribiki
POSITION	0 , 156°E	(R)	
DEPTH	1956m		
PERIOD	25. Aug. 98 ~	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	662	S/N	692
RECEIVE F.	13.0 kHz	RECEIVE F.	13.0 kHz
TRANSMIT F.	13.5 kHz	TRANSMIT F.	14.0 kHz
ENABLE C.	B	ENABLE C.	E
RELEASE C.	A	RELEASE C.	D
BATTERY	2 years.	BATTERY	2years
TEST on DECK		TEST on DECK	

DEPLOYMENT

DATE 25 Aug. 98 SHIP KAIYO CRUISE No. KY9810

WEATHER bc CONDITIONS 0.8m - 9sec DIR. of WIND 140° VEL. of WIND 3 m/sec

DEPTH 1961 m DEPTH of A.R. 1803 m DESCEND. RATE 2.5 m/s

POS. of STRT 0° 00.021N 155° 59.034E HOR.RANGE m

POS. of DEP. 0° 00.053N 156° 00.163E SINKER 23 :07 DISAPPEAR. 23 : 14

POS. of MOORING 0° 00.003N 156° 00.126E LANDING 23 :19

NOTE

アンカー上 Nylon 125 → 100m 変更

全没 2314 (UTC)

着底 2319

Depth 1961m

	TIME	S / R	DEPTH
S	23:07		37.7
S	23:11		553
B	23:13		943
L	23:16		1425
	23:19		1803

AIRドが切り離し信号

着底

2.15 m/s

3.25 kg

2.58

2.1

2.5

RECOVERY

DATE SHIP CRUISE No.

WEATHER CONDITIONS DIR. of WIND VEL. of WIND

START of RELEASE : FINISH of RELEASE :

POS. of DISCOVERY ° ° (Time :)

DIRECTION ° DISTANCE m ASCENDING RATE m/s

NOTE

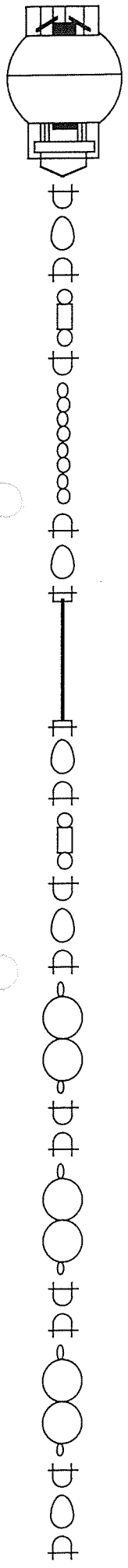
	TIME	S / R	DEPTH
S			
S			
B			
L			

TIME RECORD

MOORING NO. 980825 - 00156E

		DEPLOYMENT		RECOVERY (Date:)	
		START : 22:26 FINISH : 23:07		START : FINISH :	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP	ADCP 1150 CTD 1284	22:28			
WIRE	50m	22:28			
ABS BUOY	2	22:31			
〃	2	22:31			
〃	2	22:32			
WIRE	200m	22:32～22:39			
KEVLER	976m	22:39～22:50	K1-09		
〃	188m	22:50～22:55	K2-01		
〃	88m	22:55～23:00	K1-05		
GLASS BALL	12	23:00～23:01			
BENTOS A.R.	S/N 662	23:01			
〃	692	23:01			
NYLON	125m	23:01～23:06	100mへ変更		
RAIL ANCHOR	1.8t	23:07			

23:14 全没 (深1700m)
23:19 着底
1961m 水深



FLOAT(F-04)
ADCP S/N 1150
CTD SBE16 S/N 1284

SHACKLE 20mm
RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8

CHAIN
13mm x 3.0m

SHACKLE 16mm
RING 19mm

WIRE
10mm x 50m

RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8
RING 19mm
SHACKLE 26mm (7/8)

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 26mm (7/8)
SHACKLE 26mm (7/8)

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 26mm (7/8)
SHACKLE 26mm (7/8)

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 26mm (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 16mm

KEVLER(K10-19)
12mm x 976m

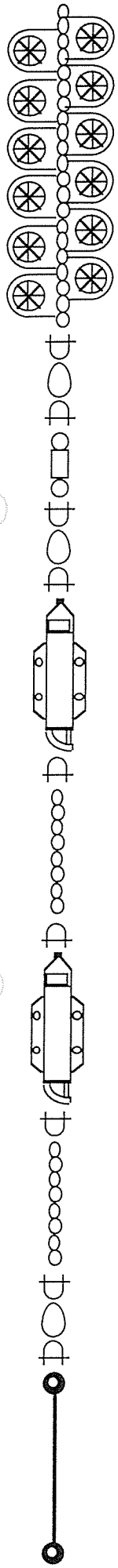
SHACKLE 16mm
SHACKLE 16mm

KEVLER(K2-01)
12mm x 188m

SHACKLE 16mm
SHACKLE 16mm

KEVLER(K1-05)
12mm x 88m

SHACKLE 16mm
RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 5/8
RING 19mm
SHACKLE 16mm



BENTHOS
GLASS BALL
2040-17V x 12ps.

CHAIN
13mm x 8.0m

SHACKLE 16mm
RING 19mm
SHACKLE 18mm

SWIVEL BS103

SHACKLE 18mm
RING 19mm
SHACKLE 16mm

BENTHOS A.R.
S/N 662 E.C.= B
13.5kHz R.C.= A

SHACKLE 16mm

CHAIN
16mm x 5.0m

SHACKLE 16mm

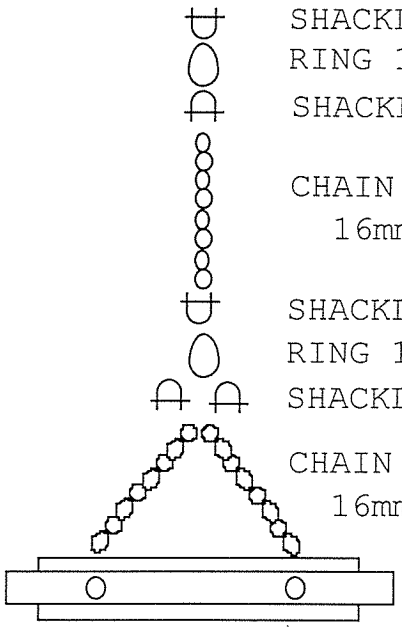
BENTHOS A.R.
S/N 692 E.C.= E
14.0kHz R.C.= D

SHACKLE 16mm

CHAIN
16mm x 2.0m

SHACKLE 18mm
RING 19mm
SHACKLE 5/8

NYLON
16mm x 100m



SHACKLE 5/8
RING 19mm
SHACKLE 18mm

CHAIN
16mm x 5.0m

SHACKLE 16mm
RING 19mm
SHACKLE 16mm x 2

CHAIN
16mm x 2.5m x 2

SHACKLE 5/8 x 2

RAIL ANCHOR 1.8t

0° N, 156° E
水深：1,956m
索長：1,634.1m

DEPLOYMENT & RECOVERY

MOORING No. 9702 09 - 00155E

PROJECT	TOCS	TIME	UTC
AREA	Western Pacific	RECORDER (D)	R. Kaneko
POSITION	0°N, 156° E	(R)	T. Shinibiki
DEPTH	1957m		
PERIOD	9 August 1997 ~25 Aug 98	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	667		S/N	664	
RECEIVE F.	13.0	kHz	RECEIVE F.	13.0	kHz
TRANSMIT F.	14.5	kHz	TRANSMIT F.	14.0	kHz
ENABLE C.	G		ENABLE C.	D	
RELEASE C.	F		RELEASE C.	C	
BATTERY	2 year		BATTERY	2 year	
TEST on DECK	OK		TEST on DECK	OK	

DEPLOYMENT

DATE	'97 Aug 9	SHIP KAIYO	CRUSE No. K97-09
WEATHER	bc	CONDITIONS 2.2s, 1.4m DIR. of WIND 175°	VEL. of WIND 10 m/s
DEPTH	1956 m	DEPTH of A.R. 1812 m DESCEND. RATE ~~2.1~~ m/s	BUOY 4:55
POS. of STRT	00° 00.023N 156° 00.878E	HOR.RANGE 2.7 m/s m	
POS. of DEP.	00° 00.326N 156° 00.051E	SINKER 5:39	DISAPPEAR. 5:50
POS. of MOORING	00° 00.031N 156° 00.036E		LANDING 5:52

NOTE

シンカー投入後の直上水深は 1956m

着底 5:52 (GMT)

ガラス玉 計八ヶ所(チェーン、シャックル)

	TIME	S / R	DEPTH
S	05:40		163
S	05:41		451
B	05:44		995
L	05:48		1489
	05:51		1808

RECOVERY

DATE	25 Aug. 98	SHIP KAIYO	CRUSE No. KY9810
WEATHER	bc	CONDITIONS 0.8m 9sec DIR. of WIND 140°	VEL. of WIND 4 m/sec
START of RELEASE	20 : 24	FINISH of RELEASE	20 : 24
POS. of DISCOVERY	0° 00.093S 155° 59.914E	ASCENDING RATE	1.8 m/s
DIRECTION	050 °	DISTANCE 450 m	

NOTE

開始 980825 20:20

T A.R. enable 20:22

ブザー 20:22

1回 1848.9

2回 1848.9

CR.

R.C. 20:24

R.C. 20:24

	TIME	S / R	DEPTH	
S	20:24		1684	
S	20:27		1292	-2.2
B	20:32		723	-1.9
L	20:36		296	-1.0
	20:39		44	-1.4
				(1.2)

TIME RECORD

MOORING NO. 970809-00156E

		DEPLOYMENT		RECOVERY (Date: 25 Aug 98)	
		START : 4:48 FINISH : 5:39		START : 21:14 FINISH : 21:57	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP	ADCP 1223 CTD 1278	4:55		21:18	
WIRE	50m	4:55		〃	
ABS BUOY	2	4:57		21:24	
〃	2	4:57		21:24	
〃	2	4:57		21:24	
WIRE	200m	4:57 ~ 5:02		21:28 ~ 21:33	
KEVLER	988m	5:05 ~ 5:17	K10-06	21:33 ~ 21:49	よりなし
〃	202m	5:18 ~ 5:21	K2-05	21:50 ~ 21:52	よりなし
〃	101m	5:22 ~ 5:24	K1-01	21:53 ~ 21:54	
GLASS BALL	12	5:31		21:54 ~ 21:56	
A.R.	667	5:31	14.5 kHz G F	21:56	
A.R.	664	5:31	14.0 kHz D C	21:56	
NYLON	93m	5:31 ~ 5:34			
ANCHOR	1.7t	5:39	1.7t		

着底 5:52

修理作業 21:05 ～ 21:14

浮上開始 20:25
修理
浮上確認 20:25

DEPLOYMENT & RECOVERY

MOORING No. 970821-2S142E

PROJECT	TOCS	TIME	
AREA	Western Pacific	RECORDER (D)	Kaneko
POSITION	2°S 142°E	(R)	Shinbiki
DEPTH			
PERIOD	21 Aug 1997~	NAVIGATION SYSTEM :	WGS 84
No.of DAYS			
LENGTH :	m	DEPTH of BUOY :	m BUOYANCY : kg

ACOUSTIC RELEASER

TYPE	BENTHOS A.R.(UPPER)		TYPE	BENTHOS A.R.(Lower)	
S/N	693		S/N	632	
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	2years		BATTERY	2years	
TEST on DECK	OK		TEST on DECK	OK	

DEPLOYMENT

DATE	21 Aug '97	SHIP	KAIYO	CRUSE No.	K9709
WEATHER	bc	CONDITIONS	3sec/0.5m	DIR. of WIND	079
VEL. of WIND	8.7 m/s				
DEPTH	3607 m	DEPTH of A.R.	3440 m	DESCEND. RATE	2.8 m/s
BUOY	21 : 22				
POS. of STRT	01°59.970S 141°58.291E	HOR.RANGE	m		
POS. of DEP.	01°59.995S 142°00.113E	SINKER	22:22	DISAPPEAR.	:
POS. of MOORING	02°00.023S 142°00.093E			LANDING	22:44

NOTE
- ガラスブイのチェーンとシャックルを新しくした。
- CTD取付け台(アルミ)とボルト(ステンレス)とが接触しない様にナイロンのワッシャーを入れた。

	TIME	S / R	DEPTH
S	22:23		109.4
S	22:28		1052.7
B	22:34		2069.6
L	22:42		3100
	22:44		3400

RECOVERY

DATE	5 Sep. 98	SHIP	KAIYO	CRUSE No.	KY9810
WEATHER	bc	CONDITIONS	0.3m 3sec	DIR. of WIND	095°
VEL. of WIND	7 m/sec				
START of RELEASE	20 : 56	FINISH of RELEASE	20 : 57		
POS. of DISCOVERY	2°00'332S 141°59'623E	ASCENDING RATE	1.3 m/s		
DIRECTION	-43°	DISTANCE	700 m		

NOTE ABS ブイ 綺麗に揚収.

	TIME	S / R	DEPTH
S	05:58		3230.6
S	06:06		2293.3
B	06:16		1312.5
L	06:21		880.7
	06:27		407.5
	06:39		60.7

1.3 m/s

6.24

~~Ship Time~~ JST

TIME RECORD

MOORING NO. 970821-2S142E

		DEPLOYMENT		RECOVERY (Date: 980905)	
		START : 21:19 FINISH : 22:22		START : 2125 FINISH : 2256	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP & CTD	ADCP 1220 CTD 1282	21:22		21:49	CTD 1282
WIRE	50m	21:19～21:20		21:50～~~54~~ 54	~~からみ除去後開始~~
ABS BUOY	2	21:24		21:55	
〃	2	21:25		21:55	からまり
〃	2	21:25		21:56	〃
WIRE	150m	21:25～21:28		21:57～2212	からみ除去後開始
〃	100m	21:29～21:31		~~20~~ 2212～2213	
KEVLER	1010m	21:34～21:46	K10-08	2213～2226	
〃	987m	21:48～21:56	K10-07	2226～2241	
〃	488m	21:59～22:03	K5-02	2241～2248	
〃	202m	22:06～22:07	K2-06	2248～2251	
〃	202m	22:09～22:11	K2-07	2251～2254	
GLASS BALL	12	22:16		2255	
A.R.	693	22:16		2255	
〃	632	22:16		2255	
NYLON	95m	22:16～22:18			
ANCHOR		22:22			

回収 Bottom 起 2052
スラント 3605.4
水深 3469m
切離 コマンド 2056
確認 2057
ADCP ブイ 確認 2058 (水平700m)

作業艇降下 2126
CTD 2241 はずし

DEPLOYMENT & RECOVERY

MOORING No. 980906 -2S142E

PROJECT	TOCS	TIME	UTC
AREA	Western Pacific	RECORDER (D)	T. Shimbiki
POSITION	02°-30S 142°E	(R)	
DEPTH			
PERIOD	6 Sep. 98 ~	NAVIGATION SYSTEM :	
No.of DAYS			
LENGTH :	m	DEPTH of BUOY : m	BUOYANCY : kg

ACOUSTIC RELEASER

TYPE	Benthos (Upper)		TYPE	Benthos (Lower)	
S/N	663		S/N	694	
RECEIVE F.	13.0	kHz	RECEIVE F.	13.0	kHz
TRANSMIT F.	13.5	kHz	TRANSMIT F.	14.5	kHz
ENABLE C.	C		ENABLE C.	G	
RELEASE C.	B		RELEASE C.	F	
BATTERY	2 years		BATTERY	2 years	
TEST on DECK			TEST on DECK		

DEPLOYMENT

DATE	6 Sep. 98	SHIP KAIYO	CRUISE No. KY98-10
WEATHER	bc	CONDITIONS 03m, 4m/sec DIR. of WIND 085°	VEL. of WIND 5 m/sec
DEPTH	3453 m	DEPTH of A.R. 3271 m	DESCEND. RATE 2.1 m/s
POS. of STRT	02°26'784S	141°56'950E	HOR.RANGE m
POS. of DEP.	02°28'067S	141°58'757E	SINKER 04 : 53 DISAPPEAR. 05 : 07
POS. of MOORING	02°28'065S	141°58'683E	LANDING 05 : 15

NOTE
アンデラーは、1 Sep 98 320 (UTC) SWオン (2時間後 ガントcheck)
上より S/N 10662, 9728, 11622, 94
3ps ナスホール 青-黄-黄-ピンク
アンカー上 Nylon 138 → 120 m 変更
ブイ全没 0508
着底 0516
Depth 3453m

SSBL	TIME	S / R	DEPTH	
S	1349 (JST)		43.2	
S	1354 (JST)		191.0	
B	1357 (JST)		768.3	
L	14:02 (JST)		1765.9	
	14:11 (JST)		2962.2	2.1 m/s
	14:15 (JST)		3267.4	/

RECOVERY

DATE		SHIP	CRUISE No.
WEATHER	CONDITIONS	DIR. of WIND	VEL. of WIND
START of RELEASE	:	FINISH of RELEASE	:
POS. of DISCOVERY	°	°	(Time :)
DIRECTION	°	DISTANCE m	ASCENDING RATE m/s

NOTE

SSBL	TIME	S / R	DEPTH
S			
S			
B			
L			

TIME RECORD

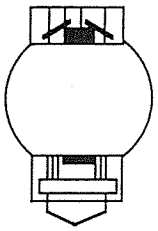
MOORING NO. 980906 - 258:42E

		DEPLOYMENT Shimbiki		RECOVERY (Date:)	
		START : 0349 (UTC) FINISH : 0455 (UTC)		START : FINISH :	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP	ADCP 1151 CTD 1276	0352 (UTC)			
WIRE	30 m	0350 ~ 0351	WIREから開始		
ABS BUOY	2	0355			
〃	2	0355			
〃	2	0355			
WIRE	160 m	0355 ~ 0400			
GLASS BALL	3 ps	0401	青色 2コ		
AANDERAA (RCM)	S/N 10662	0402	03:20 1Sep98 サンプル24 UTC		
KEVLER	200 m	0402 ~ 0408			
GLASS BALL	3 ps	0409	3コ見える		
#2 AANDERAA (RCM)	S/N 9728 700 m	0410	03:20 1Sep98 サンプル24 UTC		
KEVLER	150 m	0410 ~ 0415			
GLASS BALL	3ps	0415	3コ見える		
#3 AANDERAA (RCM)	S/N 11622 850 m	0415	03:20 1Sep98 サンプル32 UTC		
KEVLER	150 m	0415 ~ 0419			
GLASS BALL	3ps	0419	ピンク 3コ見える		
#4 AANDERAA (RCM)	S/N 94 1000 m	0420	03:20 1Sep98 サンプル24 UTC		
KEVLER	1002 m	0421 ~ 0430			
KEVLER	1002 m	0430 ~ 0440			
KEVLER	200 m	0440 ~ 0445			
GLASS BALL	12 ps	0445			
BENTOS A.R	663	0445	13.5 kHz C-B		
〃	694	0446	14.5 kHz B-F		
NYLON	138 m	0446 ~ 0452	120m変更		
RAIL ANCHOR	1.7t	0453			

アンデラー S.W オン 1 Sep.98 03:20 (UTC) すべてスタート
0レンジ 120分ごと 05:20 (UTC) +6 石確認
係留前確認 O.K. ガラスアイが (3ps) が海底で何コ見えるか記入
CTD, 音. O.K. 0447 リリース音響確認

アイ全没 0508 着底 0516 水深 ~~3456~~ m
3453 m (0529) UTC

2.5S-142(Summer)'98



FLOAT(F-09)
ADCP S/N 1151
CTD SBE16 S/N 1276

SHACKLE 20mm
RING 19mm
SHACKLE 5/8

SWIVEL AB102
SHACKLE 5/8

CHAIN
13mm x 3.0m

SHACKLE 16mm
RING 19mm

WIRE
10mm x 50m

RING 19mm
SHACKLE 5/8

SWIVEL AB102

SHACKLE 5/8
RING 19mm
SHACKLE 26mm (7/8)

ABS BUOY CT608B
NYLON 2.2m

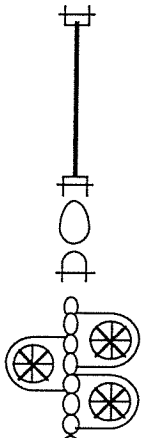
SHACKLE 26mm (7/8)
SHACKLE 26mm (7/8)

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 26mm (7/8)
SHACKLE 26mm (7/8)

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 26mm (7/8)
RING 19mm
SHACKLE 5/8
RING 19mm



WIRE
10mm x 160m

RING 19mm
SHACKLE 5/8

BENTHOS
GLASS BALL 3ps.(BLUE)
CHAIN 13mm x 3.0m

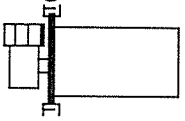
SHACKLE 5/8
RING 19mm
SHACKLE 5/8

VECTOLAN
12mm x 10m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

SWIVEL AB102

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



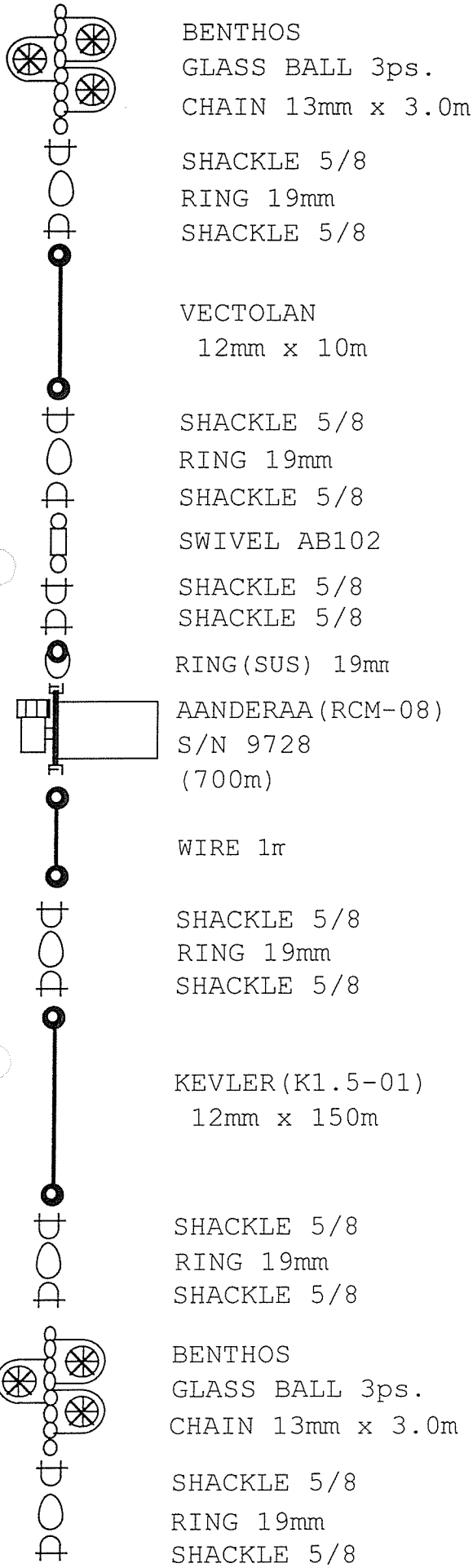
AANDERAA(RCM-08)
S/N 10662
(500m)

WIRE 1m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

KEVLER(K2-11)
12mm x 200m

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

AANDERAA(RCM-08)
S/N 9728
(700m)

WIRE 1m

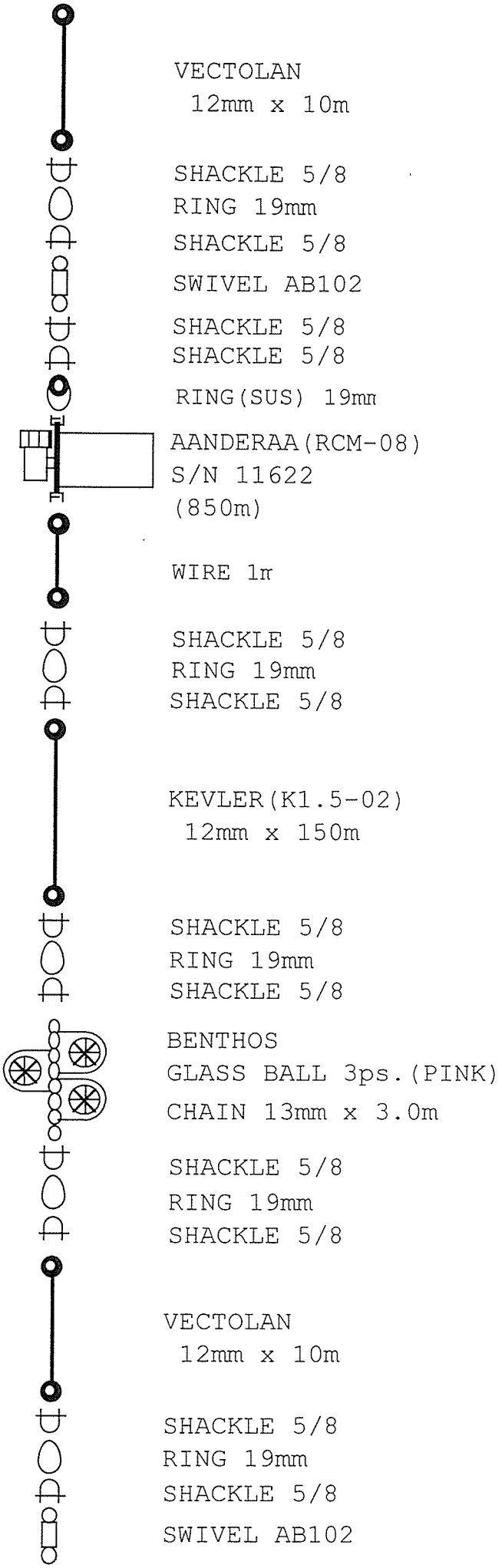
SHACKLE 5/8
RING 19mm
SHACKLE 5/8

KEVLER(K1.5-01)
12mm x 150m

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

AANDERAA(RCM-08)
S/N 11622
(850m)

WIRE 1m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

KEVLER(K1.5-02)
12mm x 150m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

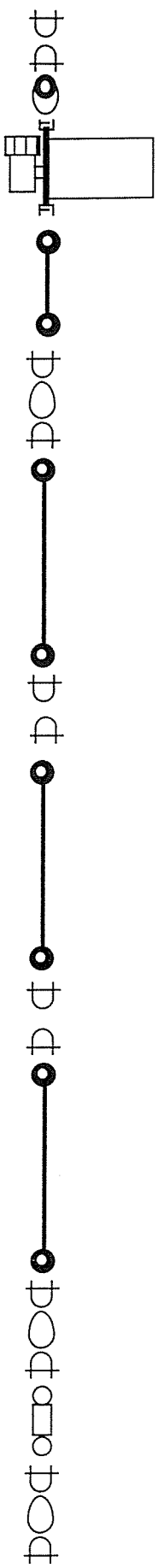
BENTHOS
GLASS BALL 3ps.(PINK)
CHAIN 13mm x 3.0m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

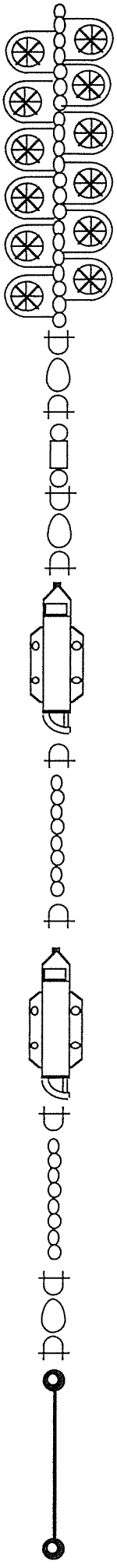
VECTOLAN
12mm x 10m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

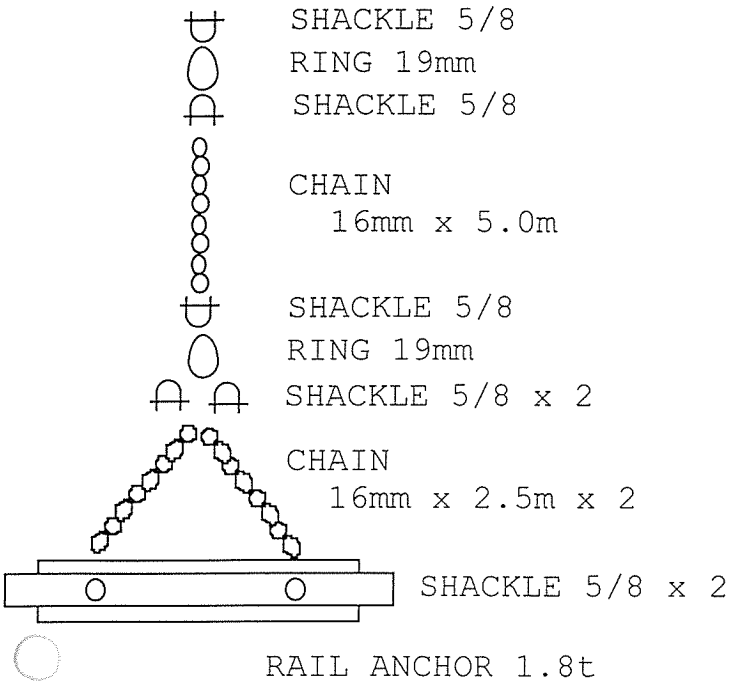
SWIVEL AB102



SHACKLE 5/8
SHACKLE 5/8
RING(SUS) 19mm
AANDERAA(RCM-08)
S/N 94
(1,000m)
WIRE 1m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
KEVLER(K10-17)
12mm x 1,002m
SHACKLE 16mm
SHACKLE 16mm
KEVLER(K10-18)
12mm x 1,002m
SHACKLE 16mm
SHACKLE 16mm
KEVLER(K2-12)
12mm x 200m
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 663 E.C.= C
13.5kHz R.C.= B
SHACKLE 5/8
CHAIN
16mm x 5.0m
SHACKLE 5/8
BENTHOS A.R.
S/N 694 E.C.= G
14.5kHz R.C.= F
SHACKLE 5/8
CHAIN
16mm x 2.0m
SHACKLE 5/8
RING 19mm
SHACKLE 5/8
NYLON
16mm x 120m



2.5°S, 142°E
水深:3,441m
索長:3,118.1m

DEPLOYMENT & RECOVERY

MOORING No. 970821 -25S142E

PROJECT	TOCS	TIME	UTC
AREA		RECORDER (D)	
POSITION	02°-30.S 142°E	(R)	Shiribiki
DEPTH			
PERIOD	20 Aug 1997~	NAVIGATION SYSTEM :	
No.of DAYS			
LENGTH :	m	DEPTH of BUOY : m	BUOYANCY : kg

ACOUSTIC RELEASER

TYPE	BENTHOS A.R (UPPER)	TYPE	BENTHOS A.R. (lower)
S/N	691	S/N	630
RECEIVE F.	13.0 kHz	RECEIVE F.	13.0 kHz
TRANSMIT F.	14.0 kHz	TRANSMIT F.	13.5 kHz
ENABLE C.	D	ENABLE C.	B
RELEASE C.	C	RELEASE C.	A
BATTERY	2 Years	BATTERY	2 Years
TEST on DECK	OK	TEST on DECK	OK

DEPLOYMENT

DATE	21 Aug 1997	SHIP	KAIYO	CRUSE No.	K97-09
WEATHER	C	CONDITIONS	6sec/0.8m	DIR. of WIND	130
VEL. of WIND	6.0 m/sec				
DEPTH	3441 m	DEPTH of A.R.	3220m	DESCEND. RATE	2.7 m/s
BUOY	0:30				
POS. of STRT	02°28.038S	141°56.043E	HOR.RANGE	m	
POS. of DEP.	02°28.059S	141°58.678E	SINKER	1:49	DISAPPEAR. :
POS. of MOORING	02°27.953S	141°58.633E			LANDING 2:10

NOTE
3441m 141°58.678E 2°28.1S らへんさがり
CTDの取付け台がアルミの為、ステンレスと接触しない様にナイロンのワッシャーを入れた。
(2S142Eと0138Eも)

	TIME	S / R	DEPTH
SSBL	11:50		33.3
	11:53		589.9
	11:56		1129.2
	12:01		2015.6
	12:08		3028.3

RECOVERY

DATE	6 Sep. 98	SHIP	KAIYO	CRUSE No.	KY9810
WEATHER	bc	CONDITIONS	0.3m 4sec	DIR. of WIND	135°
VEL. of WIND	6 m/sec				
START of RELEASE	01:19	FINISH of RELEASE	01:21		
POS. of DISCOVERY	2°27'565S	141°58'274E	ASCENDING RATE	1.5 m/s	
DIRECTION	20°	DISTANCE	900 m		

NOTE 回収後 リリーサーのテスト
S/N 691 の作動不良発見
バッテリー切れが原因

	TIME	S / R	DEPTH
SSBL	10:24 (JST)		2841.7
	10:33 (JST)		1854.9
	10:44 (JST)		809.8
	10:49 (JST)		432.9
	10:53 (JST)		213.7
	10:55 (JST)		533

1.5m/s

TIME RECORD

MOORING NO. 970821 - 25S 142E

		DEPLOYMENT		RECOVERY (Date: 980906)	
		START : 0:25 FINISH : 1:49		START : 02:04 FINISH : 03:07	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP	ADCP 1225 CTD 1280	0:30		02:10	
WiRE	50m	0:27~0:29		02:14~02:16	
ABS BUOY	2	0:32		02:16	
〃	2	0:33		02:16	
〃	2	0:33		02:16	
WiRE	150m	0:33~0:36	内側につながっていること	02:17~02:22	
〃	100m	0:38(44)~0:46		02:22~02:24	
KEVLER	988m	0:50~1:02	K10-04	02:24~02:39	
〃	988m	1:04~1:14	K10-05	0239~0253	
〃	488m	1:16~1:20	K5-01	0253~0300	
〃	202m	1:22~1:25	K2-08	0300~0305	
GLASS BALL	12	1:42		0305	
A.R.	691	1:42	14.0 kHz D C	0307	
A.R.	630	1:43	13.5 kHz B A	0307	
NYLON	138m	1:43~1:45			
ANCHOR	1.7t	1:49			

回収記録
リリース信号発信 0119
bottom リリーサー起 0120 (enable送)
スラントレンジ 3396.7, 3396
トラッキング
切離 0121
離脱信号 0121

浮上確認 0123
ABS アイ 0123
ガラス玉
※回収後のリリーサーテストで
S/N 691の故障発見 (9/7)
バッテリー切れが原因

DEPLOYMENT & RECOVERY

MOORING No. 980907 - 00138E

PROJECT	TOCS	TIME	UTC
AREA	Western Pacific	RECORDER (D)	T. Shimbiki
POSITION	0°N 138°E	(R)	
DEPTH			
PERIOD	7 Sep. 98 ~	NAVIGATION SYSTEM :	
No.of DAYS			
LENGTH :	m	DEPTH of BUOY : m	BUOYANCY : kg

ACOUSTIC RELEASER

TYPE	Benthos (Upper)	TYPE	Benthos (Lower)
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	O.K.	TEST on DECK	O.K.

DEPLOYMENT

DATE 7 Sep. 98 SHIP KAIYO CRUISE No. KY9810

WEATHER bc CONDITIONS 0.4m, 4sec DIR. of WIND 100° VEL. of WIND 8m/sec

DEPTH 3903 m DEPTH of A.R. m DESCEND. RATE 2.3 m/s

POS. of STRT 0°00'440S 137°59'397E HOR.RANGE m

POS. of DEP. 0°01'243S 138°01'800E SINKER 0:38 DISAPPEAR. 0:45

POS. of MOORING 0°01'154S 138°01'851E LANDING 1:03

NOTE
作業時間 7 Sep. 98 2329 ~ 8 Sep. 98 042 (UTC)
アンテナ SWオン 6 Sep. 98 2307 (UTC)
ケアラーロープ K10-22 投入後、15分間 曳航
アンカー上 Nylon 変更 185 → 160 m
アイ全没 045 (UTC)
着底 103 (UTC)
Depth 3903 m

	TIME	S / R	DEPTH
S	936 (JST)		52.2 m
S	940		213.4 m
B	942		596.6 m
L	945		1134.1 m
	953		2505.8m
	1001		3517.5m

RECOVERY

DATE SHIP CRUISE No.

WEATHER CONDITIONS DIR. of WIND VEL. of WIND

START of RELEASE : FINISH of RELEASE :

POS. of DISCOVERY ° ° (Time :)

DIRECTION ° DISTANCE m ASCENDING RATE m/s

NOTE

	TIME	S / R	DEPTH
S			
S			
B			
L			

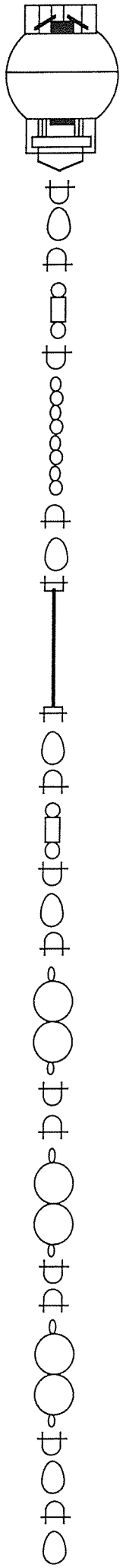
TIME RECORD

MOORING NO. 980907 - 00138E

		DEPLOYMENT Shimbiki		RECOVERY (Date:)	
		START : 2329 FINISH : 042		START : FINISH :	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP	ADCP 1154 CTD 1075	2331			
WIRE	50m	2329 ~ 2334			
ABS BOUY	2	2334			
〃	2	2334			
〃	2	2334			
WIRE	200m	2334 ~ 2338			
KEVLER	188m	2339 ~ 2343	K2-02		
GLASS BALL	3ps	2344	海面上で 2ヶ目視確認		
AANDERAA (RCM)	RU-1 S/N 4055U	2345			
KEVLER	976m	2345 ~ 2354	K10-20		
〃	976m	2355 ~ 0:03	K10-21		
〃	976m	0:04 ~ 0:15	K10-22		
GLASS BALL	12ps	0:32	エイ航後投入		
BENTOS A.R.	634	0:33	13.0~14.5 kHz F-E		
〃	717	0:33	13.0 - 14.0 D-C		
NYLON	185m	0:34 ~ 0:38	160m 変更		
RAIL ANCHOR	1.7t	0:39			

Ship Time A.M. 9:07 S.W.オン 98.09.07
UTC 98.09.06 23:07 S.Wオン
エイ航が必要 ケブラーK10-22 後でエイ航
0:15より 800m エイ航 (~0:30まで)
ブイ全没 0:45頃
着底 0:53 水深 3903m

00-138(Summer)'98



FLOAT(F-05)
ADCP S/N 1154
CTD SBE16 S/N 1275

SHACKLE 20mm
RING 19mm
SHACKLE 5/8
SWIVEL AB102
SHACKLE 16mm

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 26mm (7/8)

ABS BUOY CT608B
NYLON 2.2m

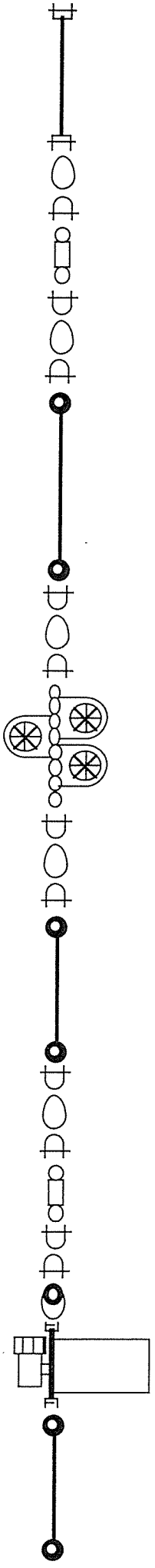
SHACKLE 26mm (7/8)
SHACKLE 26mm (7/8)

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 26mm (7/8)
SHACKLE 26mm (7/8)

ABS BUOY CT608B
NYLON 2.2m

SHACKLE 26mm (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

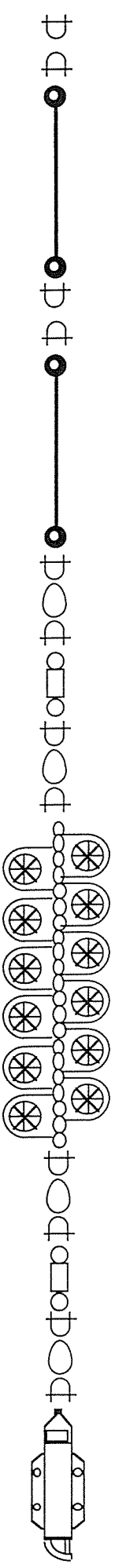
KEVLER(K2-02)
12mm x 188m

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
Ru-1
S/N 4055u
(700m)

KEVLER
12mm x 1.5m



SHACKLE 16mm
SHACKLE 16mm

KEVLER(K10-20)
12mm x 976m

SHACKLE 16mm
SHACKLE 16mm

KEVLER(K10-21)
12mm x 976m

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.

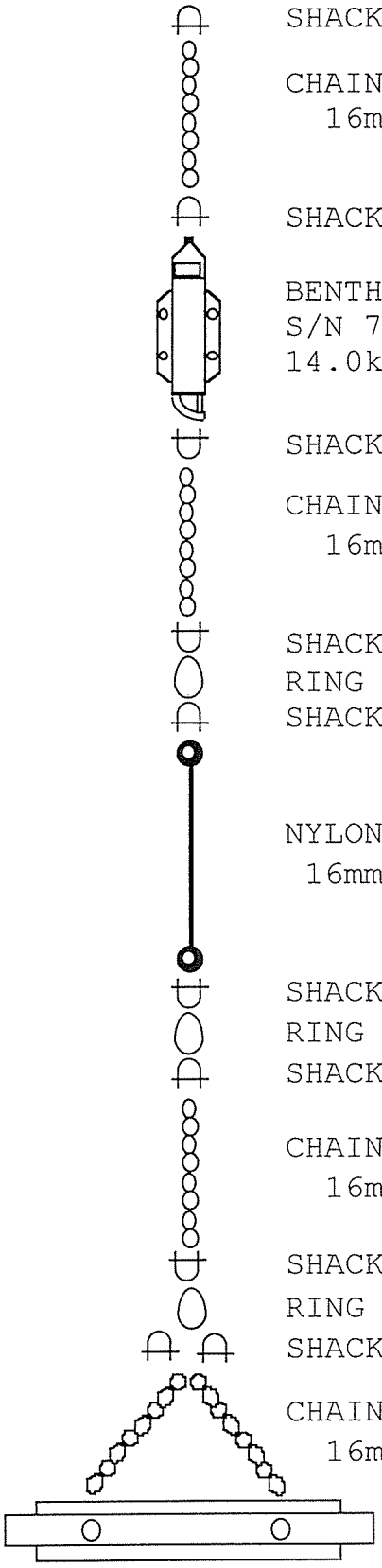
CHAIN
13mm x 8.0m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

SWIVEL BS103

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

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



SHACKLE 5/8

CHAIN
16mm x 5.0m

SHACKLE 5/8

BENTHOS A.R.
S/N 717 E.C.= D
14.0kHz R.C.= C

SHACKLE 5/8

CHAIN
16mm x 2.0m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

NYLON
16mm x 160m

SHACKLE 5/8
RING 19mm
SHACKLE 5/8

CHAIN
16mm x 5.0m

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

CHAIN
16mm x 2.5m x 2

SHACKLE 5/8 x 2

RAIL ANCHOR 1.8t

0° N, 138° E
水深：3,907m
索長：3,572.6m

DEPLOYMENT & RECOVERY

MOORING No. 970824-00138E

PROJECT	TOCS	TIME	
AREA	Western Pacific	RECORDER (D)	R.Kaneko
POSITION	0°N 138°E	(R)	
DEPTH			
PERIOD	24 Aug '97 ~	NAVIGATION SYSTEM :	WGS84
No.of DAYS			
LENGTH :	m	DEPTH of BUOY : m	BUOYANCY : kg

ACOUSTIC RELEASER

TYPE	Benthos (Upper)		TYPE	Benthos (Lower)	
S/N	689		S/N	665	
RECEIVE F.	13.0	kHz	RECEIVE F.	13.0	kHz
TRANSMIT F.	13.5	kHz	TRANSMIT F.	14.0	kHz
ENABLE C.	B		ENABLE C.	F	
RELEASE C.	A		RELEASE C.	D	
BATTERY	2 years		BATTERY	2 years	
TEST on DECK	OK		TEST on DECK	OK	

DEPLOYMENT

DATE 24 Aug '97 SHIP KAIYO CRUSE No. K9709

WEATHER bc CONDITIONS 03m.2s DIR. of WIND 134° VEL. of WIND 4.6 m/s

DEPTH 3907 m DEPTH of A.R. 3735 m DESCEND. RATE 2.7 m/s BUOY 23:32

POS. of STRT 00°01.246S 137°59.537E HOR.RANGE m

POS. of DEP. 00°01.216S 138°01.875E SINKER 0:22 DISAPPEAR. :

POS. of MOORING 00°01.247S 138°01.799E LANDING 0:46

NOTE

ワイヤー100mをケブラー100mに変えスイベルを1つ重力した。

ナロープ120m→110mにした。

	TIME	S / R	DEPTH
S	00:25		496.4
S	00:28		1035
B	00:34		2055
L	00:40		3008
	00:44		3505
	00:48		3719

RECOVERY

DATE 7 Sep. 98 SHIP KAIYO CRUSE No. KY9810

WEATHER bc CONDITIONS 04m 4sec DIR. of WIND 085° VEL. of WIND 7 m/sec

START of RELEASE 20:56 (UTC) FINISH of RELEASE 20:56 (UTC)

POS. of DISCOVERY 0°01'206S 138°01'331E ASCENDING RATE 1.5 m/s

DIRECTION 船首より左5° DISTANCE 900 m

NOTE

切離信コマンド送信僅(送会程)

2053 ~ 2057

コマンド送信 2056

信号確認 2056

ADCPスイ確認 2058

	TIME	S / R	DEPTH
S	600 (JST)		3087.2
S	610		2028.8
B	621		1014.3
L	627		527.8
	631		228.2
	633		99.4

TIME RECORD

MOORING NO. 970824 - 00138E

		DEPLOYMENT		RECOVERY (Date: 980907)	
		START : 23:27 (24 Aug) FINISH : 0:22 (25 Aug)		START : ~~0927~~ 2129 (UTC) FINISH : 22:59	
ITEM	S/N etc.	TIME	MEMO	TIME	MEMO
ADCP CTD	ADCP 1222 CTD 1283	23:30		21:57	
WIRE	50m	23:27~23:30		21:57~22:01	
ABS BUOY	2	23:32		22:02	
〃	2	23:32		22:02	
〃	2	23:32		22:02	
WIRE	150m	23:32 ~23:36		22:08~2209	
KEVLER	100m	23:36~23:38	K1-02	22:10~2211	
〃	988m	23:47~23:50	K10-01	22:12~22:25	
〃	988m	23:51~23:59	K10-02	22:26~22:39	
〃	988m	0:01~0:07	K10-03	22:40~2253	
〃	200m	0:09~0:10	K2-04	22:54~22:57	
GLASS BALL	12	0:15		22:57	
A.R.	S/N 689	0:15		22:58	
A.R.	S/N 665	0:16		22:58	
NYLON	110m	0:16~0:18			
ANCHOR	1.7t	0:22			

WIRE 100m → ケブラー 100mに変えた.
NYLON D-7° 120m → 110mに変えた.

切離 2053~2057 980907
下AR起 2054
スラント 3854.0, 3852.0
切離コマンド 2056
確認信号 2056
ADCPアイ確認 2058

7. TAO (Tropical Atmosphere - Ocean) Moorings

Douglas R. Schleiger, John C. Shanley
NOAA/PMEL
National Oceanic and Atmospheric Administration, Pacific Marine Environmental Laboratory, Seattle, Washington USA

Overview:

The TAO (Tropical Atmosphere - Ocean) array is a network of moored buoys which span the Pacific Ocean consisting of approximately 70 buoys. Standard ATLAS (Automated Temperature - Line Acquisition System) buoys measure surface wind speed and direction, air temperature, relative humidity, sea surface temperature, and 10 discrete subsurface temperatures to 500m depth. The second type of system deployed is the known as ATLAS II. In addition to the suite of surface sensors utilized in the Standard Atlas system, Atlas II adds rainfall and solar radiation measurements. Subsurface measurements are provided by a sea surface sensor along with 10 inductively-coupled sensor modules which measure temperature, conductivity, and pressure to depths of 500 meters. The ATLAS II utilizes newer technology which eliminates the need for a separate temperature cable, thus simplifying the recovery and deployment operations. The TAO array also contains 4 subsurface ADCP (Acoustic Doppler Current Profiler) moorings and 3 surface current meter moorings with in-line mechanical current meters in the central and eastern Pacific Ocean. All surface moorings transmit data in near real-time via the Argos satellite system. The buoys are an integral component or the ocean observing system, and are used primarily for the prediction of El Nino and other climatic phenomena, and for validation of Ocean General Circulation Models.

The *KAIYO* visited 9 mooring sites on KY-98-10 along the 156E, 147E, and 137E meridians. Moorings were recovered at 7 sites, deployed at 6, repaired at 2, and 1 site was visited during the duration of the cruise. Work performed was done through a joint cooperation between PMEL and JAMSTEC. The ship departed GUAM, USA on the 15 Aug 1998 and arrived in the Republic of Palau on 11 Sep 1998. The ship made a mid-cruise stop in Chuuk, Federal States of Micronesia from 29 - 31 Aug 1998.

With ample deck space and machinery along with the SWATH/Catamaran design, *KAIYO* provides a extremely stable platform in which to conduct our mooring operations.

Summary of Cruise Work:

The *KAIYO* departed GUAM, USA, and proceeded directly to the 8N 156E site at which she headed southward servicing all sites along the 156E line. This work included 6 recoveries, 5 deployments and 1 visit. The recovery of ET435, which had been deployed at 8N 156E for over 18 months, was conducted at this time. Recovery of this buoy had previously been missed due to inclimate weather preventing the launching of the small boat. A visit was made to the other mooring at this site ET482. In addition to the standard ATLAS instrumentation, Seabird Conductivity/Temperature (Seacat) recorders were deployed at 1m depth at all deployments. A capacitance rain gauge and radiometer was deployed at 0 156E were an ATLAS II replaced the recovered standard system.

In conjunction with the TAO work performed along this line, JAMSTEC conducted CTD casts at all the sites and performed an ADCP recovery and deployment at 0 156E. The ship then transited to Chuuk, Federated States of Micronesia for mid-cruise stop involving the exchange of scientific personnel, fueling and provisioning.

The departed Chuuk the afternoon of 31 Aug 1998 and proceeded to the 147E line. A recovery and deployment was conducted at 5N 147E and a tube swap performed at 0 147E in which the replaced tubes battery voltage had prematurely dropped. As before, CTD casts were conducted at all sites. The KAIYO then continued west along the equator and south down the 142E meridian before heading up to the equator on a westward course. Additional JAMSTEC CTD casts and ADCP recovery and deployments at various locations along this track..

Summary of Cruise Work: (cont)

Heading north up the 137E meridian the ship continued additional CTD work for JAMSTEC then an anemometer swap at our lone site of the 137E line 2N. Four additional CTD casts were made as we continued on a northerly trek. The ship then made a final turn and headed for the Republic of Palau where we arrived on 11 Sep 1998.

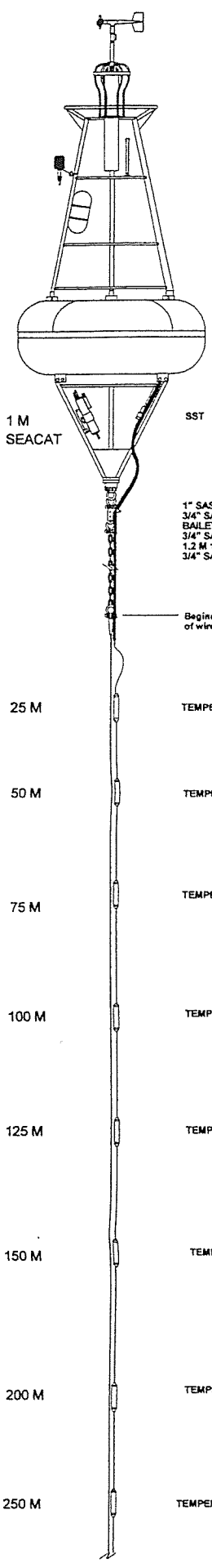
Acknowledgments:

We would like to extend our gratitude to Captain Hasegawa and the fine officers and crew of the KAIYO along with the JAMSTEC, Marine Works Japan and the Nippon Marine Enterprises scientific personnel. Their skillful and diligent efforts were a large part in making this cruise a safe and successful one. They also provided a pleasant environment to both work and sail under which is much appreciated. A special thanks goes out to Chief Scientist KenTaro Ando who worked hand in hand with us in assuring that all work was successfully completed. Also worth mentioning was the role he played as chief translator and head food identifier during meal times. Minasan domo arigatou!

Table 1 - SUMMARY OF TAO MOORING OPERATIONS - TOCS KY98-10

SITE	DATE	BUOY #	LATITUDE	LONGITUDE	MOORING TYPE	OPERATION
8N 156E	18-Aug-98	ET-435	07 - 59.66N	155 - 59.48E	STD ATLAS	RECOVERY
8N 156E	18-Aug-98	ET-482	08 - 05.12N	156 - 01.17E	STD ATLAS	VISIT
5N 156E	19-Aug-98	ET-464	04 - 59.24N	156 - 03.87E	STD ATLAS	RECOVERY
5N 156E	19-Aug-98	ET-501	04 - 59.37N	156 - 03.78E	STD ATLAS (sc)	DEPLOYMENT
2N 156E	20-Aug-98	ET-452	02 - 04.39N	156 - 12.56E	STD ATLAS (sc)	RECOVERY
2N 156E	20-Aug-98	ET-502	01 - 59.68N	156 - 01.00E	STD ATLAS (sc)	DEPLOYMENT
0 156E	21-Aug-98	ET-454	00 - 02.55N	156 - 09.30E	STD ATLAS (sc) *	RECOVERY
0 156E	21-Aug-98	PM-057	00 -00.32S	156 - 10.07E	ATLAS II (sc) *	DEPLOYMENT
2S 156E	23-Aug-98	ET-456	01 - 59.44S	156 - 56.22E	STD ATLAS (sc)	RECOVERY
2S 156E	23-Aug-98	ET-503	02 - 00.07S	156 - 01.20E	STD ATLAS (sc)	DEPLOYMENT
5S 156E	24-Aug-98	ET-457	05 - 04.82S	155 - 59.42E	REV CATENARY (sc)	RECOVERY
5S 156E	24-Aug-98	ET-504	05 - 00.11S	155 - 59.10E	REV CATENARY (sc)	DEPLOYMENT
5N 147E	2-Sep-98	ET-463	04 - 58.28N	147 - 00.38E	STD ATLAS	RECOVERY
5N 147E	2-Sep-98	ET-505	04 - 58.64N	147 - 00.46E	STD ATLAS	DEPLOYMENT
0 147E	3-Sep-98	ET-483	00 - 00.03N	146 - 59.86E	STD ATLAS	REPAIR (tube swap)
2N 137E	9-Sep-98	ET-484	02 - 25.18N	137 - 24.88E	STD ATLAS	REPAIR (wind)

(sc) with seacat (1M)
* These moorings also include a radiometer and rain gauge



1 M SEACAT

SST

1" SAS
3/4" SAS
BAILEY BRACKET
3/4" SAS
1.2 M 1/2" CHAIN
3/4" SAS

Beginning of 525 M piece of wire rope

25 M — TEMPERATURE SENSOR

50 M — TEMPERATURE SENSOR

75 M — TEMPERATURE SENSOR

100 M — TEMPERATURE SENSOR

125 M — TEMPERATURE SENSOR

150 M — TEMPERATURE SENSOR

200 M — TEMPERATURE SENSOR

250 M — TEMPERATURE SENSOR

300 M — TEMPERATURE SENSOR W/ PRESSURE

500 M — TEMPERATURE SENSOR W/ PRESSURE

5/8" SAS
1 M 1/2" CHAIN

5/8" SAS
5 TON MILLER SWIVEL
3/4" SAS
1" SAS

4.5M 1 3/8"STUD LINK CHAIN

1" SAS
3/4" SAS

175 METERS OF NILSPIN

5/8"SAS

(A) 10 M NYLON STIFFENER

The nylon to polyolifin splice is done without a shackle. The thimbles of the two pieces are joined together and then spliced.

Nylon

Polyolifin to Nylon Splice***

600 M Polyolifin (APPROX)

3/4" SAS

4 17" GLASS BALLS

5/8" SAS

2 M 1/2" CHAIN

5/8" SAS
3 TON MILLER SWIVEL
5/8" SAS
5/8" SAS

EG&G RELEASE

5/8" SAS

1 M 1/2" CHAIN

5/8" SAS

50 M 3/4" NYLON

5/8" SAS

.5 M 1/2" CHAIN

5/8" SAS

4 M 1/2" CHAIN

5/8" SAS

ANCHOR
WEIGHT
4200 lbs.

1.35 SCOPE

TOTAL LENGTH OF WIRE and HARDWARE, INCLUDING the 50M PIECE OF NYLON =

769 METERS

This does not include the polyolifin or nylon lengths. The Polyolifin lengths are approximate on this drawing. Please check the shipping inventories for the correct lengths.

SURFACE INSTRUMENTS	
INST	SER#
TUBE	
RMYOUNG	
ROTRONICS	
EPPLEY	
SST	

Fist Grip Spacing, Western Pacific

SPACING	DEPTH
1.5 M	1-50 M
2.5 M	50-175 M
5.0 M	175- 300 M
10 M	300-500 M*

* PANDUITS USED BETWEEN FIST GRIPS

KEY

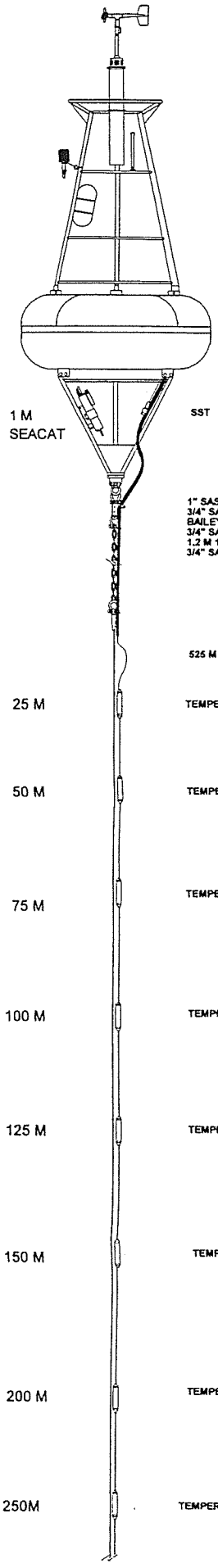
(A) NYLON TERMINATION 2, 5/8" SAS W/DELRIN BUSHINGS

NOAA-PMEL-TAO
7600 SAND POINT WAY NE
SEATTLE, WA 98115
(206) 526-6178

MOORING Reverse Catenary ATLAS Western PACIFIC VERSION 5.1

LOCATION: 5 S, 156 E

DRAWN BY:	DATE:
RICK MILLER	10 AUG 98
APPROVED BY:	DATE:



1 M SEACAT

SST

1" SAS
3/4" SAS
BAILEY BRACKET
3/4" SAS
1.2 M 1/2" CHAIN
3/4" SAS

525 M

25 M — TEMPERATURE SENSOR

50 M — TEMPERATURE SENSOR

75 M — TEMPERATURE SENSOR

100 M — TEMPERATURE SENSOR

125 M — TEMPERATURE SENSOR

150 M — TEMPERATURE SENSOR

200 M — TEMPERATURE SENSOR

250M — TEMPERATURE SENSOR

300 M — TEMPERATURE SENSOR W/ PRESSURE

500 M — TEMPERATURE SENSOR W/ PRESSURE

5/8" SAS
5 TON MILLER SWIVEL
5/8" SAS

.5 M 1/2" CHAIN

5/8" SAS

175 M WIRE

5/8" SAS
5 TON MILLER SWIVEL
5/8" SAS

.5 M 1/2" CHAIN

5/8" SAS

(A)

NYLON — LENGTH DETERMINED BY BOTTOM DEPTH

(A)

5/8" SAS

1 M 1/2" CHAIN

5/8" SAS
3 TON MILLER SWIVEL
5/8" SAS
5/8" SAS

EG&G RELEASE

5/8" SAS

1 M 1/2" CHAIN

5/8" SAS

50 M 3/4" NYLON

5/8" SAS

.5 M 1/2" CHAIN

5/8" SAS

4 M 1/2" CHAIN

5/8" SAS

ANCHOR WEIGHT 4020#

FIST GRIP SPACING, EASTERN PACIFIC

SPACING	DEPTH
1.5M	1-50 M
2.5M	50-175 M
5.0M	176-300 M
10M *	300-600 M

* PANDUITS USED BETWEEN FIST GRIPS

SUBSURFACE INSTRUMENTS
SEACAT 1 METER

SURFACE INSTRUMENTS

INST	SER#
TUBE	
RMYOUNG	
ROTRONICS	
SST	

MOORING REQUIREMENTS

.985 SCOPE

TOTAL LENGTH OF WIRE, HARDWARE, INCLUDING 50M PIECE OF NYLON= 763 M

KEY

(A) NYLON TERMINATION 2, 5/8" SAS W/DELRIN BUSHINGS

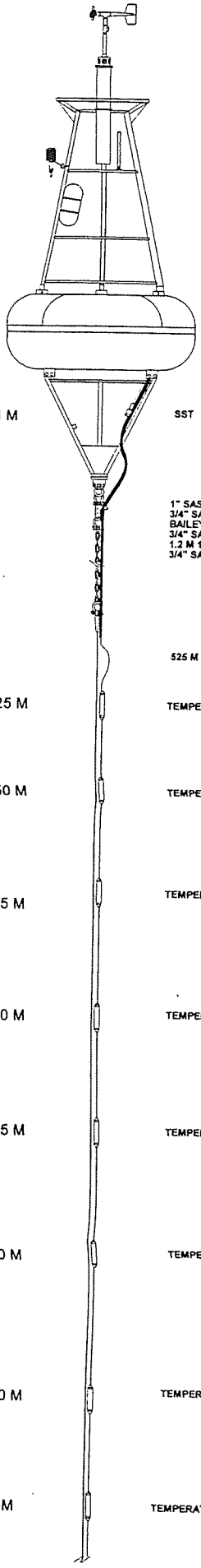
NOAA-PMEL-TAO
7600 SAND POINT WAY NE
SEATTLE, WA 98115
(206) 526-6178

MOORING: STANDARD ATLAS WESTERN PACIFIC

LOCATION:

DRAWN BY: RICK MILLER — DATE: 10 APRIL 98

APPROVED BY: — DATE:



1 M SST

1" SAS
3/4" SAS
BAILEY BRACKET
3/4" SAS
1.2 M 1/2" CHAIN
3/4" SAS

525 M

25 M TEMPERATURE SENSOR

50 M TEMPERATURE SENSOR

75 M TEMPERATURE SENSOR

100 M TEMPERATURE SENSOR

125 M TEMPERATURE SENSOR

150 M TEMPERATURE SENSOR

200 M TEMPERATURE SENSOR

250M TEMPERATURE SENSOR

300 M TEMPERATURE SENSOR W/ PRESSURE

500 M TEMPERATURE SENSOR W/ PRESSURE

5/8" SAS
5 TON MILLER SWIVEL
5/8" SAS

.5 M 1/2" CHAIN

5/8" SAS

175 M WIRE

5/8" SAS
5 TON MILLER SWIVEL
5/8" SAS

.5 M 1/2" CHAIN

5/8" SAS

(A)

NYLON — LENGTH DETERMINED BY BOTTOM DEPTH

(A)

5/8" SAS

1 M 1/2" CHAIN

5/8" SAS
3 TON MILLER SWIVEL
5/8" SAS
5/8" SAS

EG&G RELEASE

5/8" SAS

1 M 1/2" CHAIN

5/8" SAS

50 M 3/4" NYLON

5/8" SAS

.5 M 1/2" CHAIN

5/8" SAS

4 M 1/2" CHAIN

5/8" SAS

ANCHOR
WEIGHT
4020#

FIST GRIP SPACING, EASTERN PACIFIC

SPACING	DEPTH
1.5M	1-50 M
2.5M	50-175 M
5.0M	175-300 M
10M *	300-500 M

* PANDUITS USED BETWEEN FIST GRIPS

SURFACE INSTRUMENTS	
INST	SER#
TUBE	
RMYOUNG	
ROTRONICS	
SST	

MOORING REQUIREMENTS

.985 SCOPE

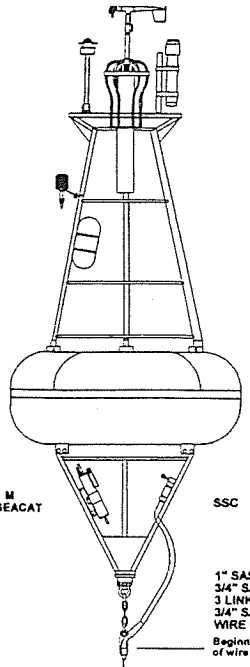
TOTAL LENGTH OF WIRE, HARDWARE, INCLUDING 50M PIECE OF NYLON= 763 M

KEY

(A) NYLON TERMINATION 2, 5/8" SAS W/DELRIN BUSHINGS

NOAA-PMEL-TAO
7600 SAND POINT WAY NE
SEATTLE, WA 98115
(206) 526-6178

MOORING:	STANDARD ATLAS ©WESTERN-PACIFC
LOCATION:	5N 147E
DRAWN BY: RICK MILLER	DATE: 10 APRIL 95
APPROVED BY:	DATE:



1 M SEACAT

SSC

1" SAS
3/4" SAS
3 LINKS CHAIN
3/4" SAS
WIRE BREAK OUT

Beginning of 700 M piece of wire

25 M T

50 M T

75 M T

100 M T

125 M T

150 M T

200 M T

250 M T

300 M TP

500 M TP

700M

5/8" SAS
5 TON MILLER SWIVEL
5/8" SAS

.5 M 1/2" CHAIN

5/8" SAS

A

NYLON

LENGTH DETERMINED BY BOTTOM DEPTH

A

5/8" SAS

1 M 1/2" CHAIN

5/8" SAS
3 TON MILLER SWIVEL
5/8" SAS

EG&G RELEASE

5/8" SAS

1 M 1/2" CHAIN

5/8" SAS

50 M 3/4" NYLON

5/8" SAS

.5 M 1/2" CHAIN

5/8" SAS

4 M 1/2" CHAIN

5/8" SAS

ANCHOR WEIGHT 4320#

SURFACE INSTRUMENTS	
INST	SER #
TUBE	
AT/RH	
WIND	
RAIN	
EPPLEY	

SUBSURFACE INSTRUMENTS		
DEPTH (M)	INST.	SER #
1	SEACAT	
1	SSC	
25	T	
50	T	
75	T	
100	T	
125	T	
150	T	
200	T	
250	T	
300	TP	
500	TP	

Scope .985

TOTAL LENGTH OF WIRE, HARDWARE, INCLUDING 50M PIECE OF NYLON =

761 M

KEY

A — NYLON TERMINATION 2, 5/8" SAS W/DELRIN BUSHINGS

NOAA-PMEL-TAO
7600 Sandpoint Way NE
Seattle, Wa. 98115
(206) 526-6175

MOORING: TAUTLINE NEXT GENERATION - WP

LOCATION: 0 156E

DRAWN BY: Rick Miller DATE: 10 AUG 98

APPROVED BY: DATE:

8. SUMMARY REPORT

Endan Suwandana & M.Irfan

The Agency for the Assessment and Application of Technology

(B P P T)

PURPOSE

The purpose of TOCS (Tropical Ocean Climate Study) 98 cruise was to observe physical oceanographic condition and ocean atmospheric interaction in Western Tropical Pacific, and to study further of the effect to ENSO (El Nino Southern Oscillation) and global climate change.

TIME DURATION & FIELD

TOCS 98 cruise was started out on August 15th, 1998 to September 14th 1998, from Guam to Palau through Pacific Ocean and Indonesian Exclusive Economic Zone (EEZ) in Northern of Irian Island, by Research Vessel Kaiyo, JAMSTEC, Japan.

SURVEY ACTIVITY

TOCS 98 cruise carried out some activities during the survey as follows :

1. CTD Observation

   CTD (Conductivity Temperature Depth) was used to observe physical characteristic of the ocean, such as salinity, conductivity, temperature, pressure, and also sound velocity. This cruise had 36 CTD stations, downcast until 1000 m by taking one water sample in that depth. Except at CTD station number 11 downcast until 2000 m and at the last station downcast until 1500 m. This observation also got Dissolved Oxygen data that its sensor was attached on CTD cast.

2. ATLAS Mooring

   ATLAS (Automated Temperature-Line Acquisition System) mooring was a mooring system with a buoy at the sea surface equipped by some sensor to measure wind speed and direction, air temperature, relative humidity, sea surface temperature, rainfall, radiation, and 10 subsurface temperature to 500 m depth. There were 7 standard ATLAS's recovered, 5 standard ATLAS's deployed, 1 new generation ATLAS deployed and 2 station ATLAS's repaired by replacing the tube and wind sensor respectively.

3. Subsurface ADCP Mooring

ADCP (Acoustic Doppler Current Profiler) 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. The cruise recovered 4 mooring and deployed 3 mooring.

CONCLUSION

All activities of the TOCS 98 cruise have been successful. It might be worked because the cooperation between all members of TOCS 98 cruise was very good. 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. Indroyono Soesilo, MSc. APU.

We really appreciate all the kindness given by Chief Scientist Mr. Kentaro Ando, Captain Hasegawa and the crew members of Research Vessel Kaiyo, and all the members of TOCS 98 cruise.

9. Participants List

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Norio Tanaka	MWJ
Takehiko Shiribiki	MWJ
Shinichiro Yokogawa	MWJ
Hirokatsu Uno	MWJ
Reiko Kaneko	MWJ
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R / V KAIYO Crew Menbers

Captain	Kiyoshi Hasegawa
Cheif Officer	Yoshiyuki Mizui
Second Officer	Takafumi Aoki
Third Officer	Masayuki Kobori
Cheif Engineer	Toshiichi Hirose
First Engineer	Yoichi Kikuchi
Second Engineer	Yoshinobu Hiratsuka
Third Engineer	Dai Yamanishi
Cheif Radio Officer	Masayuki Sasaki
Second Radio Officer	Azuma Suzuki
Boatswain	Norio Nagatani
Able Seaman	Makio Nakamura
Able Seaman	Seiji Hosokawa
Able Seaman	Kiyofumi Kuramura
Able Seaman	Kingo Nakamura
Able Seaman	Hideo Isobe
Able Seaman	Shigeru Kikuya
Able Seaman	Hirohiko Nakagawa
Able Seaman	Mikio Ishimori
No.1 Oiler	Kazumi Sakamoto
Oiler	Seiichi Matsuda
Oiler	Kazuo Abe
Oiler	Katsuyuki Miyazaki
Oiler	Takashi Suda
Cheif Steward	Kiyotoshi Teranishi
Steward	Tomihisa Morita
Steward	Isao Matsumoto
Steward	Yukihide Chikuba
Steward	Yasushi Wakana

A.1 Time Table of TOCS KY9810 Cruise

Aug.14 (Fri) (Guam V-berth)
08:00 - 11:00 Load PMEL's gear

Aug.15 (Sat)
09:00 Depart Guam
10:30 - 11:30 Guidance for Safety Life
13:00 - 14:00 Meeting for Leg-1
14:00 - 15:00 ATLAS buoy assembly
16:45 - 17:00 Konpira-san

Aug.16 (Sun)
13:00 - 15:30 Preparation of CTD Observation & ATLAS recovery/deployment

Aug.17 (Mon)
13:03 - 13:55 Benthos Releaser Test (9-00N, 153-46E)

Aug.18 (Tue)
06:30 - 09:04 ATLAS Recovery (07-59.66N, 155-59.48E)
09:39 - 10:11 CTD-01 (08-00N, 156-00E)

Aug.19 (Wed)
06:28 - 08:42 ATLAS Recovery (04-59.181N, 156-03.917E)
09:55 - 11:55 ATLAS Deployment (04-59.056N, 156-03.722E)
12:14 - 12:47 CTD-02 (04 - 57N, 156 - 03E)

Aug.20 (Thu)
07:13 - 08:39 ATLAS Recovery (02-04.466N, 156-12.527E)
09:48 - 11:14 ATLAS Deployment (01-59.899N, 156-00.570E)
11:38 - 12:06 CTD-03 (01 - 59N, 156 - 00E)

Aug.21 (Fri)
06:29 - 08:30 ATLAS Recovery (00-02.546N, 156-09.143E)
09:23 - 10:37 ATLAS (New Generation) Deployment (00-00.261S, 156-09.650E)
10:56 - 11:26 CTD-04 (00 - 01S, 156 - 09E)

Aug.22 (Sat)
Dayoff

Aug.23 (Sun)
06:30 - 08:27 ATLAS Recovery (01-59.452S, 155-56.089E)
09:26 - 10:43 ATLAS Deployment (01-59.908S, 156-01.233E)
11:04 - 11:38 CTD-05 (02 - 01S, 156 - 01E)

Aug.24 (Mon)
06:30 - 08:20 ATLAS Recovery (Reverse Catenary) (05-04.883S, 155-59.262E)
09:13 - 10:38 ATLAS Deployment (Reverse Catenary) (04-59.817S, 155-59.735E)
11:02 - 11:32 CTD-06 (05-01S, 156-00E)

Aug.25 (Tue)
10:20 - 11:09 CTD-07 (01-00S, 156-00E)
Preparation for ADCP moorings

Aug.26 (Wed)
06:23 - 07:55 Recovery ADCP mooring (0-00.09S, 155-59.914E)
08:27 - 09:07 Deployment ADCP mooring (0-00.127N, 156-00.126E)
14:10 - 14:45 CTD-08 (00-00N, 155-00E)
19:25 - 19:56 CTD-09 (00-00N, 154-00E)

Aug.27 (Thu) Fine
00:35 - 01:10 CTD-10 (00-00S, 153-00E)
06:02 - 06:54 CTD-11 (00-00S, 152-00E) 2,000m and 12 bottles samples
13:00 - 14:32 Test for Releasers (Cable length 3,900m) & wire wash

Aug.28 (Fri)
Cruising to Chuuk

Aug.29 (Sat)
08:00 Arrive Chuuk (Pilot Station)
Fueling
Aug.30 (Sun)
Fueling etc.
Aug.31 (Mon)
15:00 Deaprt from Chuuk
18:00 Guidance for life on Kaiyo

Sep.1 (Tue)
10:00 Boat & Fire Drill
10:30 Meeting for Leg-2

Sep.2 (Wed)
07:00 - 09:38 Recovery ATLAS at 5N147E
10:21 - 11:39 Deployment ATLAS at 5N147E
12:26 - 12:58 CTD12

Sep.3 (Thu)
14:00 - 14:30 Repaire ATLAS at 0N147E (Swap tube)
14:45 - 15:15 CTD13 (0N,147E)
21:00 - 21:32 CTD14 (0N,146E)

Sep.4 (Fri)
02:20 - 02:51 CTD15 (0N,145E)
07:40 - 08:10 CTD16 (0N,144E)
13:04 - 13:31 CTD17 (0N,143E)
18:57 - 19:25 CTD18 (0-30N,142E)
22:05 - 22:33 CTD19 (0N,142E)

Sep.5 (Sat)
01:07 - 01:35 CTD20 (0-30S, 142E)
04:12 - 04:40 CTD21 (1S, 142E)
07:17 - 07:45 CTD22 (1-30S, 142E)
10:30 - 10:58 CTD23 (2S,142E)
13:35 - 14:05 CTD24 (2-30S, 142E)

Sep.6 (Sun)
06:58 - 08:56 Recovery ADCP mooring at (2S,142E)
11:23 - 13:07 Recovery ADCP mooring at (2-30S,142E)
13:50 - 15:28 Deployment of ADCP mooring at (2-30S,142E)

Sep.7 (Mon)
06:53 - 07:21 CTD25 (0N,141E)
12:20 - 12:50 CTD26 (0N,140E)
17:45 - 18:14 CTD27 (0N,139E)

Sep.8 (Tue)
06:54 - 08:57 Recovery the 0N138E ADCP mooring
09:28 - 10:38 Deployment the 0N138E ADCP mooring
10:57 - 11:24 CTD28 (0N, 138E)
14:20 - 14:48 CTD29 (0-30N, 138E)
17:20 - 17:46 CTD30 (1N, 138E)
20:14 - 20:45 CTD31 (1-30N, 138E)
23:18 - 23:47 CTD32 (2N, 138E)

Sep.9 (Wed)
08:00 - 08:37 Repair ATLAS (2-25N,138-25E)
08:54 - 09:23 CTD33 (2-25N, 137-25E)
12:50 - 13:19 CTD34 (3N, 137E)
18:06 - 18:32 CTD35 (4N, 137E)

Sep.10 (Thu)
07:23 - 08:48 CTD36 (5N, 137E) & wash wire down to 1,500m
10:00 - 10:21 Post cruise meeting

Sep.11 (Thu)
09:00 Palau (Pilot Station)

A.2 音響切離装置の作動不良について(Failure on Acoustic Releaser)

㈱マリン・ワーク・ジャパン
宇野　弘勝

１．概要

TOCS のＡＤＣＰ係留系では、係留系を確実に回収するため音響切離装置を直列に 2 台取り付けている。平成 10 年 9 月 6 日に実施したＡＤＣＰ係留系の回収(2.5S-142E)では、通常通り下側の音響切離装置で切離しを行い、切り離しに成功し回収できた。従って、上部の音響切離装置は作動させていなかったので、回収後船上においてデッキユニットから音響コマンドを送り、空中作動試験を行った。その結果、デッキユニットからの音響コマンドに応答がなく、音響切離装置自体のスイッチを切り替えても作動しなかった。

２．作動不良の認められた音響切離装置について

今回作動不良の認められた音響切離装置は、平成 9 年 8 月 21 日に設置したＡＤＣＰ係留系に取り付けていたものであり、Benthos 社製 865A(S/N 691; Recive = 13.5kHz, Transmit = 13.0kHz; Enable Code = B, Release Code = A; 過去 0-142E に 96 年 2 月 17 日～97 年 2 月 17 日の 1 年間係留、今回が 2 度目の使用)である。設置水深は約 3,220 m で、係留系設置前に行った船上での作動試験は良好であったという記録が残っている。

３．船上で行った試験について

ＡＤＣＰ係留系回収後、船上において次の試験を行った。

	テスト内容	反応
(1)	デッキユニットから Enable コマンドを送信後、Ping を送信。	返信なし。
(2)	Release コマンドを送信。	アーム（音響切離装置の下側から出るピン）が作動しなかった。
(3)	音響切離装置のスイッチを Test に切り替えた。（Test にすることでアームが作動しリリース位置になる。）	アームが作動しなかった。
(4)	音響切離装置を分解。	目視による漏水、ヒューズ切れ等異常は認められなかった。
(5)	バッテリー残量を計測。	上下 2 つに分かれているバッテリーパックは両方とも 4.5V であった。（設置前は 13.5V）
(6)	バッテリーを新品に取り替えて復旧。係留系設置時の状態にした。	

（7）	1. 9月8日、（6）から16時間[*1]以上経過した後、デッキユニットからPingを送信。	リリース確認の返信（4回）あり。アームがリリースの位置になっていた。
	2. 係留系設置時の状態にした。	
（8）	1. 9月10日、（7）から16時間以上経過した後デッキユニットからPingを送信。	返信なし。
	2. Enableコマンドを送信後、Pingを送信。	返信あり。
	3. Releaseコマンドを送信。	アームが作動。
	4. 係留系設置時の状態にした。	

[*1] Enable Timeの16時間後、音響切離装置はスリープモードに入る。

これらの試験（（1）～（6））により、バッテリーの消費による電圧低下が異常に大きく、バッテリー不足のため音響切離装置が作動しなかったことが分かった。（6）の時点では、通常設置後16時間でスリープモードに入るはずが、設置後もずっと起きた状態になっていたため、バッテリーが消費されていたのではないかと考えた。Enableが利いていない可能性があったため（7）-1.を行ったがアームが既にリリース位置にあり、その原因が不明であったため、試験のやり直し（8）-1.を行った。その結果、音響切離装置は16時間後スリープモードに入っていることが分かった。結局、船上での試験ではバッテリー異常消費の原因特定はできなかったが、オシロスコープ等専用機器のない船上において出来る限りの試験を行ったと考える。

4．今後の方針

船上での試験では原因の特定が出来なかったが、2日間の試験ではバッテリーの消費量は計測し難い。そのため、音響切離装置を設置時の状態にし「かいよう」に積んだまま放置しておき、センターに帰り次第バッテリーの消費量を計測する。また、メーカーの検査修理に出し、原因の究明を行う事が望ましい。

以上

A3　Autosal の不調について

㈱マリン・ワーク・ジャパン
尻引武彦

今航 KY9810 において採水した塩検用の海水は、Autosal の不調により船上での分析を行わなかった。塩検は、サンプルが JAMSTEC に到着次第センター内の調子が良好な Autosal にて行うことにした。（主任研究員安藤氏と協議の上決定）

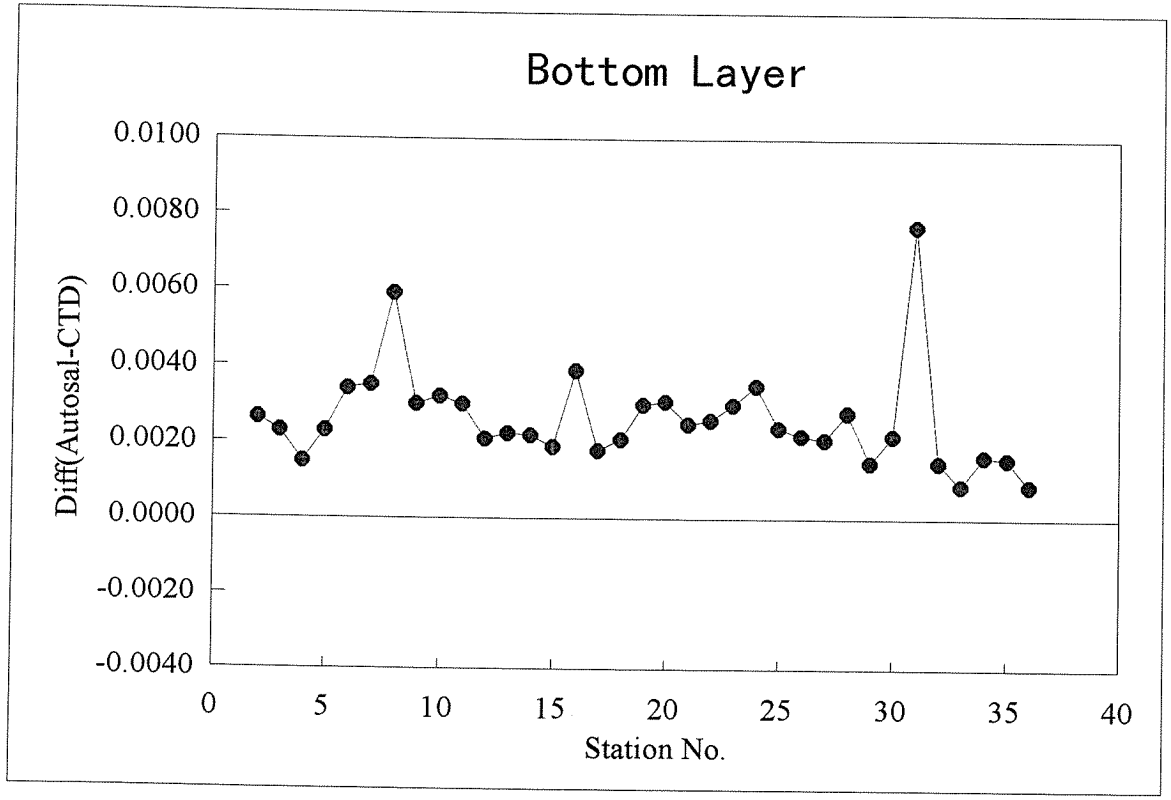
ここでは、今航の事前準備からの Autosal(S/N60132:通称赤道２号)の状態について以下に示す。

・センター内でのテストランの際、水漏れがあるのを確認
・この水漏れが、バスの上蓋から漏れているのが確認され、蓋の固定をしっかりする等の対処をしたが止まらなかった。
・その際、丁度セル内に空気が入りバス内のステンレス管から空気が出ているのを確認
・バスの水を抜き、オートサルを分解後セル内に水をステンレス管の穴の位置を確認したところ、かなりの数があるのが確認された。
・対処方法として、ハンダ付けと瞬間接着剤による補修を行い陸上で漏れがないことを確認した。
・船上では、バス内に水を入れ作動させようとしたところ、ヒーターが２本とも作動しないことが確認されたが、予備ヒーターが１本しかなかったため１本の交換を行った
・ヒーター分解の際、バスを分解したため同時にステンレス管のチェックを行い水漏れが確認されたため、ステンレス管の代わりにテフロンチューブに交換し、また併せて調子の悪かったエアーポンプの交換も行った。
・以上の作業を行っている際、不幸にも海水が電子基盤にかかり、目視で確認し海水を拭き取り乾燥させた後オートサルがほぼ正常に作動することを確認した。しかし、ダイアルを ZERO にしても表示がゼロにならなかったり、電子基盤内にあるスイッチをオンにし表示が 2000 になるところがならなかったこともあった。
・サブスタンダードでオートサルの調子をモニターし、セル内に試水を通し約１分 30 秒ぐらいバス内の温度となじませ、測定することにした。この方法で、航海中２回ほど調子をみて良好なのを確認した。
・また、フラッシュアウトのエアーの調子が悪かったため確認したところセル上部の４本の電極にエアーを導くチューブコネクター付近にエアーの漏れがあったため対処した。これにより回復した。
・サンプルを分析する前、サブスタンダードの 2K 値を確認したところ平均値±0.00001 になり、良好と判断しスタンダライズを行った。
・スタンダライズは、１本目の標準海水で 2K 値を合わせ２本目または３本目の標準海水でクロスチェックをする方法をとったが、2K の値が安定しなかった。

例を示すと 1.99971-1.99972-1.99688-1.99689 のように目標値から大きくずれ、何回セル内の海水を交換しても値は戻ることがなく、この症状がほとんどの標準海水の測定でみられた。（使用したのは８本）途中、JAMSTEC 安藤氏、MWJ 高尾氏にもオートサルの状態を確認していただいたところ同様な状態になったため、塩検は船上で行わず JAMSTEC にて事後行うことにした。

H10.09.29

Station No.		CTD Bottom	Auto-Sal Bottom	Diffrence (AUTOSAL-CTD)
C	1	34.5530	No Data	
C	2	34.5532	34.5558	0.0026
C	3	34.5605	34.5628	0.0023
C	4	34.5549	34.5564	0.0015
C	5	34.5512	34.5535	0.0023
C	6	34.5313	34.5347	0.0034
C	7	34.5527	34.5562	0.0035
C	8	34.5527	34.5586	0.0059
C	9	34.5568	34.5598	0.0030
C	10	34.5572	34.5604	0.0032
C	11	34.5560	34.5590	0.0030
C	12	34.5556	34.5577	0.0021
C	13	34.5550	34.5572	0.0022
C	14	34.5577	34.5599	0.0022
C	15	34.5586	34.5605	0.0019
C	16	34.5584	34.5623	0.0039
C	17	34.5536	34.5554	0.0018
C	18	34.5571	34.5592	0.0021
C	19	34.5557	34.5587	0.0030
C	20	34.5543	34.5574	0.0031
C	21	34.5558	34.5583	0.0025
C	22	34.5526	34.5552	0.0026
C	23	34.5484	34.5514	0.0030
C	24	34.5425	34.5460	0.0035
C	25	34.5496	34.5520	0.0024
C	26	34.5541	34.5563	0.0022
C	27	34.5554	34.5575	0.0021
C	28	34.5549	34.5577	0.0028
C	29	34.5576	34.5591	0.0015
C	30	34.5599	34.5621	0.0022
C	31	34.5562	34.5639	0.0077
C	32	34.5532	34.5547	0.0015
C	33	34.5598	34.5607	0.0009
C	34	34.5586	34.5603	0.0017
C	35	34.5542	34.5558	0.0016
C	36	34.5522	34.5531	0.0009


Bottom Layer
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0.0060
0.0040
0.0020
0.0000
-0.0020
-0.0040
Diff(Autosal-CTD)
0
5
10
15
20
25
30
35
40
Station No.