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R/V Mirai Cruise Report MR00-K07 (Leg 1 – 2)

October 18 – November 21, 2000
Tropical Ocean Climate Study (TOCS)

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1. Cruise name and code

Tropical Ocean Climate Study
MR00-K07 (Leg 1 and 2)
Ship: R/V MIRAI
Captain: Takaaki Hashimoto

2. Introduction and observation summary

2.1. Introduction

This cruise has two major purposes. One is to observe physical oceanographic conditions in the western tropical Pacific Ocean to achieve a better understanding of air-sea interaction affecting on the ENSO (El Nino/Southern Oscillation) phenomena and its related climate change.

The surface layer in the western tropical Pacific Ocean is characterized by high sea surface temperature, which plays major role in driving global atmospheric circulation. Especially, El Nino occurs when warm water migrates eastward, and causes short-term climate changes in the world dramatically. For example, the western Pacific area has very little rainfall when the "El Nino" occurred, as in 1997-98. This atmospheric and oceanic system is so complicated, and we still do not have enough knowledge about it.

The other purpose is to observe hydrographic and conditions and its variability in the eastern tropical Indian Ocean in order to understand the ocean response to Asia Monsoon and the nature of Dipole Mode variability. Asia Monsoon may play an important role as a trigger of El Nino in the Pacific Ocean. Also the Indian Ocean has basin-scale interannual variability independent to ENSO mentioned as Dipole Mode variability.

This climate system has the long time scale. To investigate the mechanism, we need precise and detailed data for the long period continuously. Therefore, ocean and atmosphere observing mooring array is effective to obtain such data set. The major mission of this cruise is to deploy TRITON buoys developed at JAMSTEC for the long term measurements of ocean and atmosphere in the western tropical Pacific Ocean, following a long-term measurements plan of the TRITON program. We also deployed an ADCP mooring buoy in the Pacific and tow in the Indian Ocean during this cruise.

The other purposes of this cruise are,

1) Particulate carbon dioxide flux and primary productivity measurements in the warm water pool using sediment trap by Kyushu University and Geological Survey of Japan.
2) Temperature and salinity measurement using ARGO floats by FORSGC.
3) Surface current measurement using drifters by FORSGC.
4) Optical measurement of properties of atmospheric aerosols by particle counter and sky radiometer by Hokkaido University.
5) Lidar back scatter measurements of lower atmosphere by National Institute of Environment of Japan, Tohoku Institute of Technology and CRI.
6) Cloud and rainfall measurement by Doppler radar for comparison with TRMM satellite by Meteorological Institute of Japan.

These measurements are also made successfully during this cruise.

2.2. Overview

2.2.1 Ship

R/V Mirai
Captain Takaaki Hashimoto
Total 35 crew members

2.2.2 Cruise code

MR00-K07

2.2.3 Project name

Tropical Ocean Climate Study

2.2.4 Undertaking institution

Japan Marine Science and Technology Center (JAMSTEC)
2-15, Natsushima, Yokosuka, 237, Japan

2.2.5 Chief scientist

Keisuke Mizuno (JAMSTEC)

2.2.6 Period

October 18 , 2000 – December 23, 2000

2.2.7 Research participants

Total 45 scientists and technical stuff participated from 9 different institutions, universities and companies including 8 foreign scientists and officers form Indonesia and Malaysia.

2.3 Observation summary

TRITON buoy deployment:	3 sites
ADCP subsurface buoy deployment:	3 sites
ADCP subsurface buoy recovery:	1 site
CTD (Salinity, Temperature, Depth):	20 casts down to 1000 or 2000m
XCTD (Salinity, Temperature, Depth):	87 times down to 1000m
Surface meteorology:	continuous
Atmospheric sounding:	44 times
ADCP measurements:	continuous
Doppler radar measurements:	continuous

Surface temperature, salinity measurements by intake method: continuous

Other specially designed observations have been carried out successfully.

Observed oceanic and atmospheric conditions

During this cruise period, SST in the tropical Pacific was generally normal. However, observed SST in the western tropical Pacific Ocean is 30C, which is warmer than normal, and at the upper layer thickness (depth of 20C) is deeper than normal by 30m or so at the sites of TRITON buoy deployment. Although, sea surface salinity is lower along a zonal band of 3-10N with a salinity of 34.0psu or so, observed salinity in this band is lower than normal with 33.5-7psu especially in the vicinity of 3-6N. Along 147E, eastward surface current larger than 1kt was observed between 3- (i.e. North equatorial current), and South Equatorial Current and Equatorial Under Current were observed in the vicinity of equator.

Trades were prevailing in a zone of 10-20N with 5-10m/sec wind speed, and westerlies (5-10m/sec) were prevailing in the vicinity of the equator.

Three TRITON buoys were deployed and one ADCP mooring system was recovered and re-deployed on the equatorial sites successfully. Since low transmission power problem was found for a satellite telecommunication unit of TRITON buoy shortly after deployment, we changed the unit at sea and solve the problem eventually.

November is in an inter-monsoon season in the Indian Ocean, westerlies are prevailing in the equatorial zone and strong eastward current (equatorial jet) is generated along the equator usually. However, the observed hydrographic condition is quite different from the normal seasonal pattern. No equatorial jet was found and northeasterly winds were prevailing east of equator and westerlies were prevailing south of equator and SST in the equatorial zone is cooler than normal, although the upper layer thickness is near normal.

We suspended scheduled two TRITON buoy deployments in the Indian Ocean in order to take more careful measures to meet the strong current situation, but two ADCP mooring system were newly deployed in the vicinity of TRITON mooring sites.

During the cruise, other recovery/deployment operations (sediment trap and surface/ subsurface drifters) and observation equipments (CTD, ship-board ADCP etc.) were mostly worked without significant problem.

3. Period, port of call, cruise log and cruise track

3.1 Period

October 18, 2000 – November 21, 2000

3.2 Ports of call

Sekinehama, Japan	(Departure; October 18, 2000)
Hachinohe, Japan	(October 19, 2000)
Singapore	(November 8 - 9, 2000)
Jakarta, Indonesia	(November 20 – 22, 2000)

3.3 Cruise log

SMT*	UTC	Event
Oct. 18 (Wed.)		
15:00	06:00	Departure from Sekinehama, Japan (SMT = UTC + 9)
Oct. 19 (Thu.)		
08:00	23:00	Arrival at Hachinohe, Japan
		Immigration for going aboard
15:00-	06:00-	Departure from Hachinohe
		Start of continuous observations except of surface seawater monitoring
16:45	07:45	Konpira-san
18:00-	09:00-	Start of continuous monitoring of surface seawater
Oct. 20 (Fri.)		
09:00	00:00	Meeting for the ARGO floats deployment, and for the CTD/XCTD observation accompanied with the float deployment
13:15-13:40	04:15-04:40	Boat drill
13:45-14:30	04:45-05:30	Instruction for safety life on R/V Mirai including the briefing of the piracy risk
15:02	06:02	X-01 (35-00.01 N, 143-21.66 E, 5503 m) XCTD observation
16:28	07:28	X-02 (34-40.01 N, 143-27.53 E, 5528 m)
17:51	08:51	X-03 (34-19.99 N, 143-31.64 E, 5677 m)
19:15	10:15	X-04 (34-00.00 N, 143-34.96 E, 5255 m)
20:41	11:41	X-05 (33-40.00 N, 143-38.91 E, 5593 m)
22:10	13:10	X-06 (33-20.01 N, 143-42.42 E, 5521 m)
23:41	14:41	X-07 (33-00.01 N, 143-46.44 E, 5417 m)
Oct. 21 (Sat.)		
01:11	16:11	X-08 (32-40.00 N, 143-50.71 E, 5514 m)
02:45	17:45	X-09 (32-19.96 N, 143-54.71 E, 5536 m)
04:25	19:25	X-10 (31-59.86 N, 143-59.86 E, 5621 m)
05:44	20:44	X-11 (31-40.00 N, 144-02.41 E, 5847 m)
07:09	22:09	X-12 (31-20.02 N, 144-05.54 E, 5860 m)
08:36	23:36	X-13 (31-00.05 N, 144-08.73 E, 5886 m)
10:04	01:04	X-14 (30-40.00 N, 144-12.56 E, 5839 m)

* SMT; Ship Mean Time

11:32	02:32	X-15 (30-19.85 N, 144-16.49 E, 5796 m)
13:00-14:17	04:00-05:17	C-01 (29-59.99 N, 144-19.93 E, 5707 m) CTD cast with water sampling at 12 layers, down to 2000 m depth
13:11	04:11	X-16 (29-59.80 N, 144-20.04 E, 5711 m) Start of the XCTD observation when the CTD down casting attains to 500 m depth
14:21	05:21	ARGO float (APEX) deployment (29-59.27 N, 144-20.67 E)
14:23	05:23	ARGO float (APEX) deployment (29-59.22 N, 144-20.69 E)
15:45	06:45	X-17 (29-40.00 N, 144-23.63 E, 5876 m)
17:08	08:08	X-18 (29-19.99 N, 144-26.80 E, 5931 m)
18:32	09:32	X-19 (29-00.00 N, 144-30.67 E, 5964 m)
19:58	10:58	X-20 (28-40.00 N, 144-34.16 E, 5964 m)
21:25	12:25	X-21 (28-20.00 N, 144-37.49 E, 5745 m)
22:51	13:51	X-22 (28-00.01 N, 144-40.82 E, 5723 m)
Oct. 22 (Sun.)		
00:15	15:15	X-23 (27-40.00 N, 144-44.42 E, 5564 m)
01:40	16:40	X-24 (27-19.99 N, 144-48.09 E, 5359 m)
03:05	18:05	X-25 (27-00.01 N, 144-51.01 E, 4070 m)
04:34	19:34	X-26 (26-40.00 N, 144-54.36 E, 5110 m)
06:01	21:01	X-27 (26-20.07 N, 144-58.55 E, 3275 m)
07:32	22:32	X-28 (26-00.02 N, 145-01.89 E, 4419 m)
08:58	23:58	X-29 (25-39.99 N, 145-04.99 E, 5201 m)
10:26	01:26	X-30 (25-19.99 N, 145-08.10 E, 5375 m)
11:55	02:55	X-31 (25-00.02 N, 145-12.31 E, 5372 m)
Oct. 23 (Mon.)		
09:00-11:00	00:00-02:00	Meeting for editing the cruise report
12:45-13:45	03:45-04:45	Emergency drill for the piracy
Oct. 24 (Tue.)		
11:00-13:00	02:00-04:00	Doppler radar test against the SHIP LOC system
Oct. 25 (Wed.)		
09:00-10:30	00:00-01:30	Meeting for the buoy deployment and recovery (TRITON, subsurface ADCP and Sediment trap)
09:00-	00:00-	Start of Doppler radar test against the SHIP LOC system
Oct. 26 (Thu.)		
-09:00	-00:00	Finish of Doppler radar test
Oct. 27 (Fri.)		
07:56-11:08	22:56-02:08	Deployment of TRITON buoy (00-03.72 N, 147-00.72 E, 4468 m)
16:12-16:44	07:12-07:44	Repair of TRITON buoy at 00-03.72 N, 147-00.72 E (ARGOS antenna swap)
Oct. 28 (Sat.)		

08:09-09:17	23:09-00:17	Repair of TRITON buoy at 00-03.72 N, 147-00.72 E (ARGOS PTT swap)
Oct. 30 (Mon.)		
08:25-11:09	23:25-02:09	Deployment of TRITON buoy (00-01.91 N, 137-52.96 E, 4370 m)
12:58-13:45	03:58-04:45	C-03 (00-00.91 N, 137-53.36 E, 4277 m) CTD cast with water sampling, down to 1000 m depth
14:03-15:02	05:03-06:02	Water sampling at 1500 m depth (00-00.73 N, 137-53.13 E, 4200 m)
Oct. 31 (Tue.)		
07:30-09:46	22:30-00:46	Recovery of the subsurface ADCP buoy (00-00.97 S, 138-01.85 E, 3909 m)
12:55-14:15	03:55-05:15	Deployment of the subsurface ADCP buoy (00-00.94 S, 138-01.82 E, 3930 m)
Nov. 1 (Wed.)		
08:24-10:59	23:24-01:59	Deployment of TRITON buoy (01-59.90 N, 138-06.21 E, 4331 m)
12:56-13:39	03:56-04:39	C-04 (01-59.07 N, 138-07.55 E, 4313 m) CTD cast with water sampling, down to 1000 m depth
Nov. 2 (Thu.)		
08:49-11:12	23:49-02:12	Recovery of sediment trap buoy (04-02.39 N, 135-00.00 E, 4750 m)
Nov. 5 (Sun.)		
22:00-	13:00-	Ship mean time adjustment (SMT = UTC + 8)
Nov. 8 (Wed.)		
11:10	03:10	Arrival at Singapore
Nov. 9 (Thu.)		
10:50	02:50	Departure from Singapore
Nov. 10 (Fri.)		
09:00-09:50	01:00-01:50	Meeting for leg 2 observation
13:00-13:10	05:00-05:10	Emergency drill for the piracy
22:00	14:00	Ship mean time adjustment (SMT = UTC + 7)
Nov. 11 (Sat.)		
00:54	17:54	X-32-1 (06-20.81 N, 094-59.93 E, 2168 m)
01:07	18:07	X-32-2 (06-21.83 N, 094-57.20 E, 2717 m)
02:46	19:46	X-33 (06-24.91 N, 094-29.94 E, 1559 m)
04:41	21:41	X-34 (06-29.09 N, 094-00.00 E, 1824 m)
07:03	00:03	X-35 (06-46.32 N, 093-30.00 E, 1174 m)
09:00-	02:00-	Start of Doppler radar observation
09:36	02:36	X-36 (07-14.10 N, 092-59.99 E, 2018 m)
12:11	05:11	X-37 (07-42.10 N, 092-30.00 E, 1606 m)
14:36	07:36	X-38 (08-09.49 N, 091-59.98 E, 2987 m)

17:09	10:09	X-39 (08-36.72 N, 091-29.97 E, 3767 m)
19:44	12:44	X-40 (09-05.24 N, 090-59.81 E, 3544 m)
22:16	15:16	X-41 (09-32.78 N, 090-29.95 E, 3363 m)
Nov. 12 (Sun.)		
00:51	17:51	X-42 (09-59.95 N, 089-59.95 E, 3313 m)
03:03	20:03	X-43 (09-30.01 N, 090-00.04 E, 3298 m)
05:06	22:06	X-44 (09-00.00 N, 090-00.22 E, 3063 m)
07:12	00:12	X-45 (08-29.99 N, 090-00.09 E, 2806 m)
09:15	02:15	X-46 (07-59.98 N, 089-59.89 E, 3243 m)
11:22	04:22	X-47 (07-29.98 N, 090-00.22 E, 2743 m)
13:25	06:25	X-48 (07-00.00 N, 089-59.81 E, 2622 m)
15:28	08:28	X-49 (06-29.99 N, 090-00.24 E, 2819 m)
17:32	10:32	X-50 (05-59.92 N, 089-59.96 E, 2851 m)
18:30	11:30	RS-01 (5.88 N, 89.95 E) Radiosonde observation
19:44	12:44	X-51 (05-30.01 N, 090-00.11 E, 2891 m)
21:44	14:44	RS-02 (5.09 N, 90.00 E)
22:00-23:24	15:00-16:24	C-05 (05-00.09 N, 090-00.00 E, 3444 m) CTD cast with water sampling, down to 2000 m depth
22:06	15:06	X-52-1 (05-00.11 N, 089-59.97 E, 2825 m)
22:12	15:12	X-52-2 (05-00.12 N, 089-59.98 E, 2825 m)
22:17	15:17	X-52-3 (05-00.11 N, 089-59.99 E, 2825 m)
22:31	15:31	X-52-4 (05-00.11 N, 089-59.88 E, 2825 m)
Nov. 13 (Mon.)		
00:38	17:38	RS-03 (4.85 N, 90.00 E)
01:31	18:31	X-53 (04-29.96 N, 090-00.16 E, 3247 m)
03:43	20:43	RS-04 (4.05 N, 90.00 E)
03:55-05:28	20:55-22:28	C-06 (04-00.28 N, 089-59.95 E, 2840 m)
06:30	23:30	RS-05 (3.87 N, 90.00 E)
07:49	00:49	X-54 (03-29.99 N, 089-59.91 E, 2458 m)
09:42	02:42	RS-06 (3.15 N, 90.00 E)
10:09-11:27	03:09-04:27	C-07 (03-00.16 N, 090-00.21 E, 2454 m)
11:33	04:33	Deployment of the surface float (03-00.27 N, 089-59.47 E)
12:30	05:30	RS-07 (2.87 N, 89.99 E)
13:42	06:42	X-55 (02-29.99 N, 089-59.85 E, 2718 m)
15:39	08:39	RS-08 (2.11 N, 90.00 E)
15:50-17:32	08:50-10:32	C-08 (01-59.95 N, 090-00.00 E, 2638 m)
18:29	11:29	RS-09 (1.84 N, 90.00 E)
19:31	12:31	X-56 (01-29.99 N, 090-00.07 E, 2300 m)
21:43	14:43	RS-10 (1.02 N, 90.00 E)
21:48-23:13	14:48-16:13	C-09 (00-59.96 N, 089-59.74 E, 2300 m)
23:21	16:21	Deployment of the surface float (00-58.74 N, 089-59.23 E)
Nov. 14 (Tue.)		
00:30	17:30	RS-11 (0.78 N, 89.93 E)
01:18	18:18	X-57 (00-29.99 N, 089-50.88 E, 3638 m)
02:53-11:35	19:53-04:35	Site survey using the SEABEAM at mooring point
04:22	21:22	RS-12 (0.15 N, 90.07 E)
06:11	23:11	RS-13 (0.10 N, 89.77 E)
09:36	02:36	RS-14 (0.00 N, 89.84 E)

11:54	04:54	RS-15 (0.00 S, 90.12 E)
13:13-14:32	06:13-07:32	Deployment of the subsurface ADCP buoy (00-00.33 N, 090-03.33 E, 4401 m)
15:30	08:30	RS-16 (0.00 N, 90.06 E)
15:40-17:00	08:40-10:00	C-10 (00-00.14 N, 089-59.77 E, 4204 m)
15:48	08:48	X-58-1 (00-00.14 N, 089-59.77 E, 4205 m)
16:02	09:02	X-58-2 (00-00.17 N, 089-59.79 E, 4201 m)
17:10	10:10	Deployment of the surface float (00-01.48 N, 089-59.79 E)
18:29	11:29	RS-17 (0.30 S, 90.00 E)
19:18	12:18	X-59 (00-29.87 S, 090-00.86 E, 3077 m)
21:51-23:13	14:51-16:13	C-11 (00-59.94 S, 090-00.10 E, 3131 m)
23:18	16:18	Deployment of the surface float (01-00.98 S, 090-00.28 E)

Nov. 15 (Wed.)

00:31	17:31	RS-18 (1.20 S, 90.00 E)
01:22	18:22	X-60 (01-30.01 S, 090-00.75 E, 4168 m)
03:50-05:29	20:50-22:29	C-12 (02-00.01 S, 090-00.09 E, 4740 m)
06:30	23:30	RS-19 (2.20 S, 90.01 E)
07:40	00:40	X-61 (02-30.00 S, 090-01.61 E, 3492 m)
09:54-11:10	02:54-04:10	C-13 (02-59.84 S, 090-00.02 E, 3335 m)
11:13	04:13	Deployment of the surface float (03-00.06 S, 090-00.59 E)
12:50	05:50	RS-20 (3.30 S, 90.00 E)
13:19	06:19	X-62 (03-30.00 S, 090-00.90 E, 3884 m)
15:49-17:09	08:49-10:09	C-14 (03-59.97 S, 089-59.98 E, 3141 m)
18:29	11:29	RS-21 (4.20 S, 90.00 E)
19:29	12:29	X-63 (04-30.02 S, 090-01.29 E, 4648 m)
21:51-23:15	14:51-16:15	C-15 (04-59.98 S, 090-00.04 E, 5009 m)
22:05	15:05	X-64-1 (04-59.90 S, 090-00.26 E, 5008 m)
22:18	15:18	X-64-2 (04-59.91 S, 090-00.46 E, 5011 m)

Nov. 16 (Thu.)

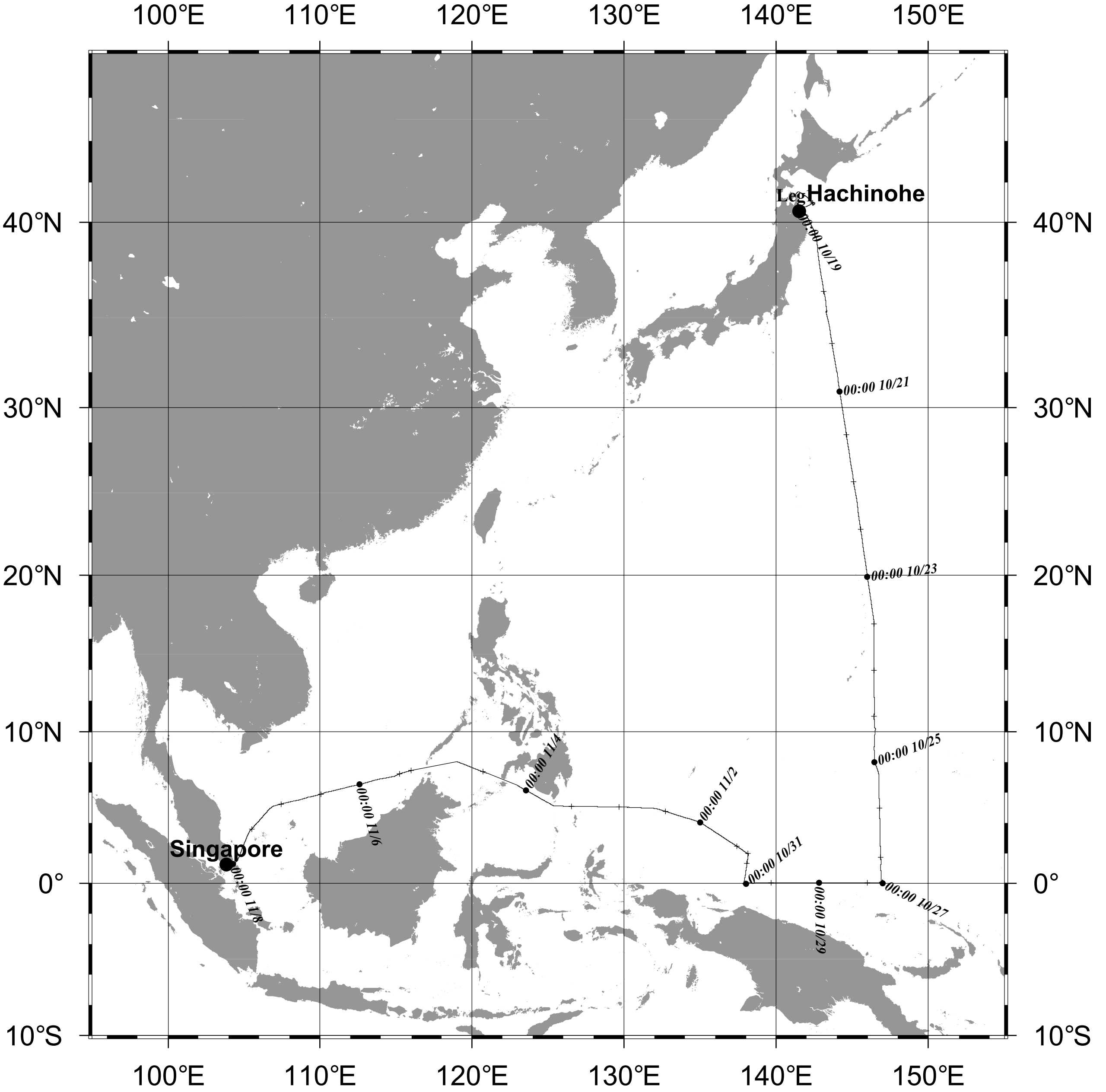
00:29	17:29	RS-22 (5.00 S, 90.23 E)
01:16	18:16	X-65 (04-59.99 S, 090-30.00 E, 5049 m)
03:40	20:40	RS-23 (5.00 S, 90.97 E)
03:55-05:15	20:55-22:15	C-16 (04-59.81 S, 091-00.11 E, 4988 m)
06:29	23:29	RS-24 (5.00 S, 91.22 E)
07:22	00:22	X-66 (04-59.96 S, 091-30.04 E, 5012 m)
09:39	02:39	RS-25 (5.00 S, 91.97 E)
09:47-11:08	02:47-04:08	C-17 (04-59.84 S, 091-59.92 E, 5012 m)
12:29	05:29	RS-26 (5.00 S, 92.26 E)
13:15	06:15	X-67 (04-59.54 S, 092-30.99 E, 5006 m)
15:38	08:38	RS-27 (5.00 S, 92.98 E)
15:48-17:09	08:48-10:09	C-18 (05-00.14 S, 092-59.94 E, 4619 m)
17:29	10:29	RS-28 (5.00 S, 93.27 E)
19:10	12:10	X-68 (04-58.96 S, 093-30.03 E, 4793 m)
21:29	14:29	RS-29 (5.00 S, 94.00 E)
21:30-22:50	14:30-15:50	C-19 (04-59.99 S, 093-59.87 E, 4973 m)

Nov. 17 (Fri.)

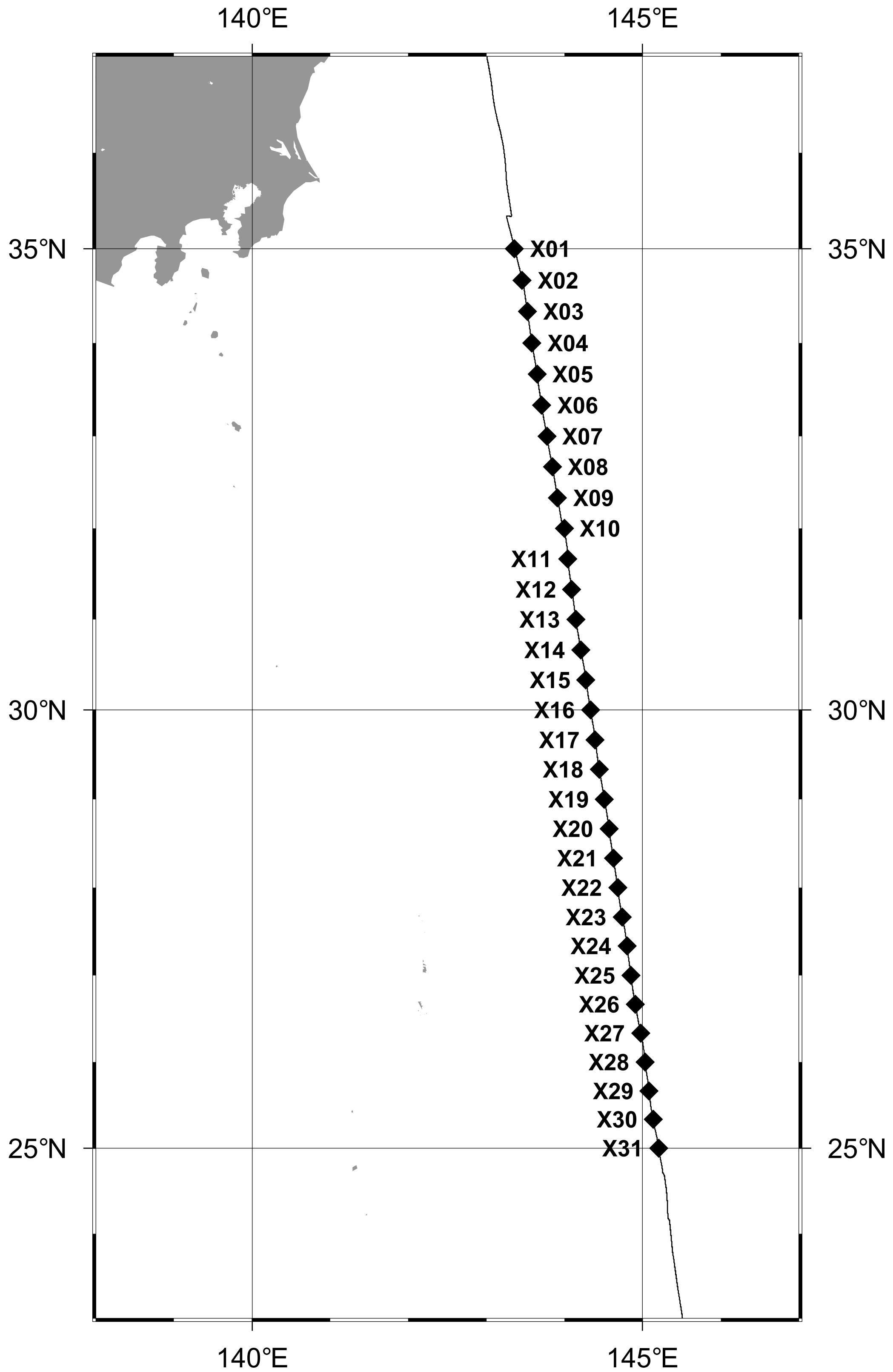
00:30	17:30	RS-30 (4.90 S, 94.34 E)
00:57	17:57	X-69 (04-53.50 S, 094-30.01 E, 4984 m)

02:18-07:40	19:18-00:40	Site survey using the SEABEAM at mooring point
03:34	20:34	RS-31 (4.90 S, 95.10 E)
06:59	23:59	RS-32 (5.00 S, 95.17 E)
09:29	02:29	RS-33 (5.00 S, 95.02 E)
09:45-11:12	02:45-04:12	Deployment of the subsurface ADCP buoy (04-59.87 S, 095-03.02 E, 5027 m)
12:30	05:30	RS-34 (5.00 S, 95.01 E)
12:59-14:33	05:59-07:33	C-20 (04-59.93 S, 095-00.83 E, 5009 m)
13:05	06:05	X-70 (04-59.90 S, 095-00.11 E, 5009 m)
15:29	08:29	RS-35 (5.00 S, 95.01 E)
15:30	08:30	Deployment of the surface float (04-59.49 S, 095-00.39 E)
15:49-17:54	08:49-10:54	Site survey using the SEABEAM at mooring point
18:29	11:29	RS-36 (5.00 S, 95.09 E)
21:30	14:30	RS-37 (5.00 S, 94.91 E)
Nov. 18 (Sat.)		
00:30	17:30	RS-38 (5.00 S, 94.90 E)
03:30	20:30	RS-39 (5.10 S, 94.88 E)
06:29	23:29	RS-40 (5.10 S, 95.33 E)
07:15	00:15	X-71 (05-11.00 S, 095-30.02 E, 5020 m)
09:19	02:19	RS-41 (5.30 S, 95.91 E)
09:33	02:33	X-72 (05-16.83 S, 096-00.02 E, 5016 m)
11:50	04:50	X-73 (05-24.04 S, 096-30.19 E, 5218 m)
12:30	05:30	RS-42 (5.40 S, 96.58 E)
14:09	07:09	X-74 (05-25.63 S, 097-00.00 E, 4539 m)
15:30	08:30	RS-43 (5.50 S, 97.24 E)
16:24	09:24	X-75 (05-28.77 S, 097-30.06 E, 4818 m)
18:19	11:19	RS-44 (5.50 S, 97.89 E)
18:44	11:44	X-76 (05-33.90 S, 097-59.94 E, 5194 m)
20:57	13:57	X-77 (05-38.98 S, 098-30.08 E, 5266 m)
23:06	16:06	X-78 (05-42.92 S, 099-00.01 E, 5605 m)
Nov. 19 (Sun.)		
01:17	18:17	X-79 (05-47.74 S, 099-30.06 E, 5174 m)
03:27	20:27	X-80 (05-53.02 S, 100-00.05 E, 5288 m)
05:34	22:34	X-81 (05-58.51 S, 100-30.05 E, 4929 m)
07:45	00:45	X-82 (06-03.66 S, 101-00.02 E, 5544 m)
10:01	03:01	X-83 (06-10.22 S, 101-30.02 E, 6153 m)
12:17	05:17	X-84 (06-14.14 S, 102-00.01 E, 3804 m)
14:28	07:28	X-85 (06-19.34 S, 102-30.01 E, 3051 m)
16:36	09:36	X-86 (06-24.69 S, 103-00.02 E, 1728 m)
18:39	11:39	Deployment of the surface float (06-29.94 S, 103-29.71 E)
18:41	11:41	X-87 (06-30.01 S, 103-30.02 E, 1024 m)
20:52	13:52	X-88 (06-26.97 S, 104-00.05 E, 1933 m)
22:59	15:59	X-89 (06-24.23 S, 104-30.03 E, 1060 m)
Nov. 20 (Mon.)		
11:30	04:30	Arrival at Jakarta, Indonesia

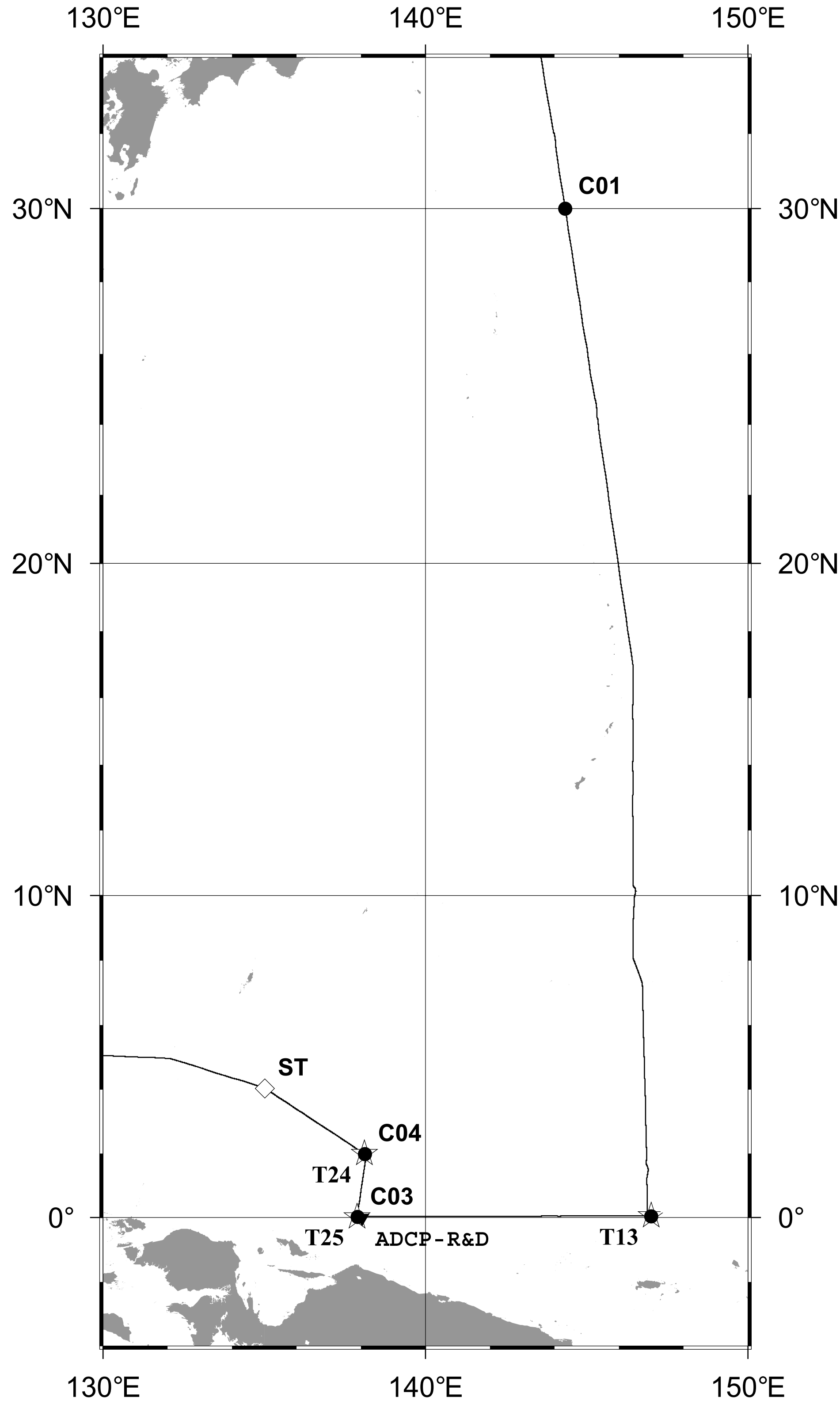
3.4 Cruise track



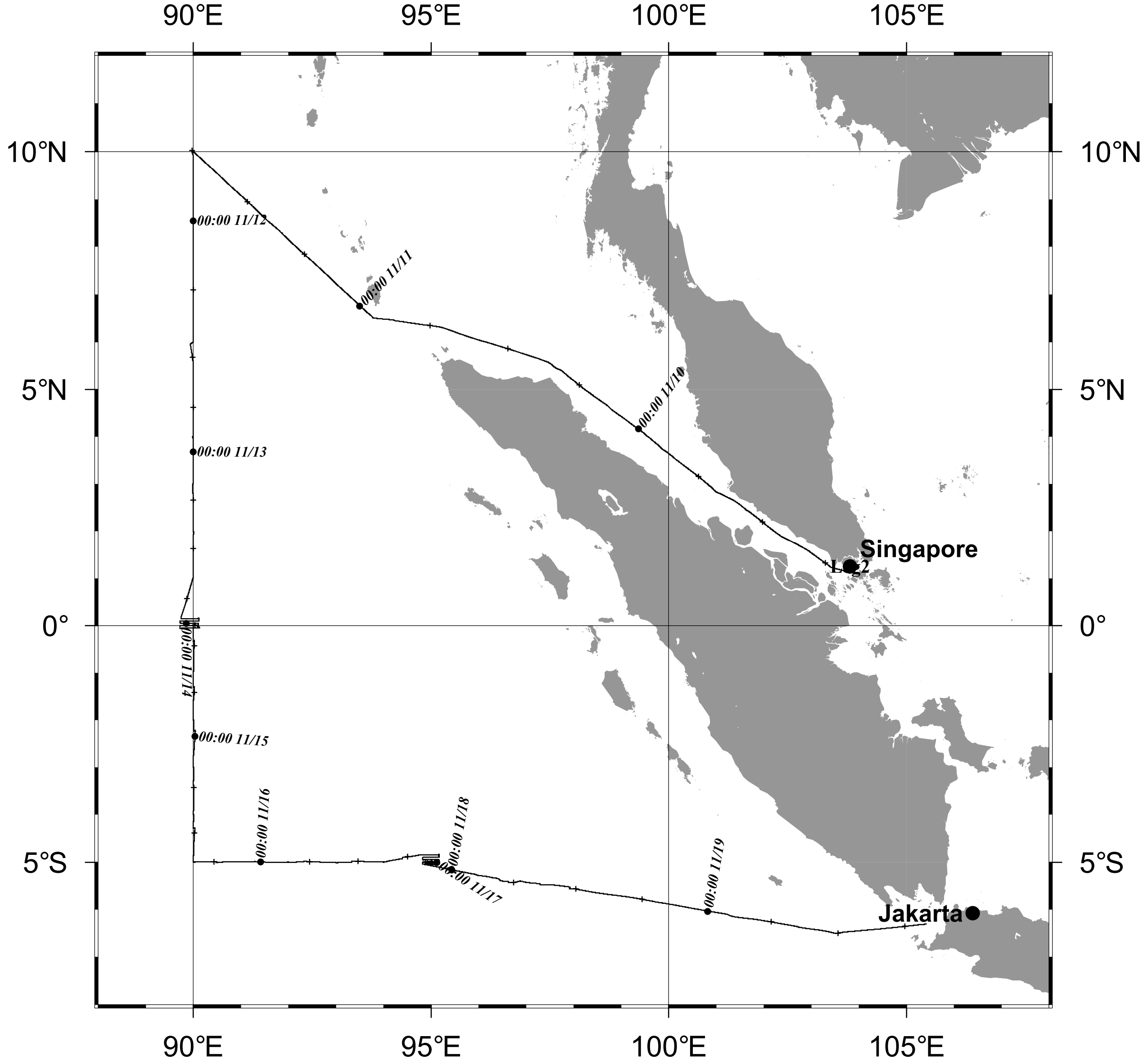
Cruise Track (MR00-K07 Leg.1)


140°E
145°E
35°N
30°N
25°N
X01
X02
X03
X04
X05
X06
X07
X08
X09
X10
X11
X12
X13
X14
X15
X16
X17
X18
X19
X20
X21
X22
X23
X24
X25
X26
X27
X28
X29
X30
X31

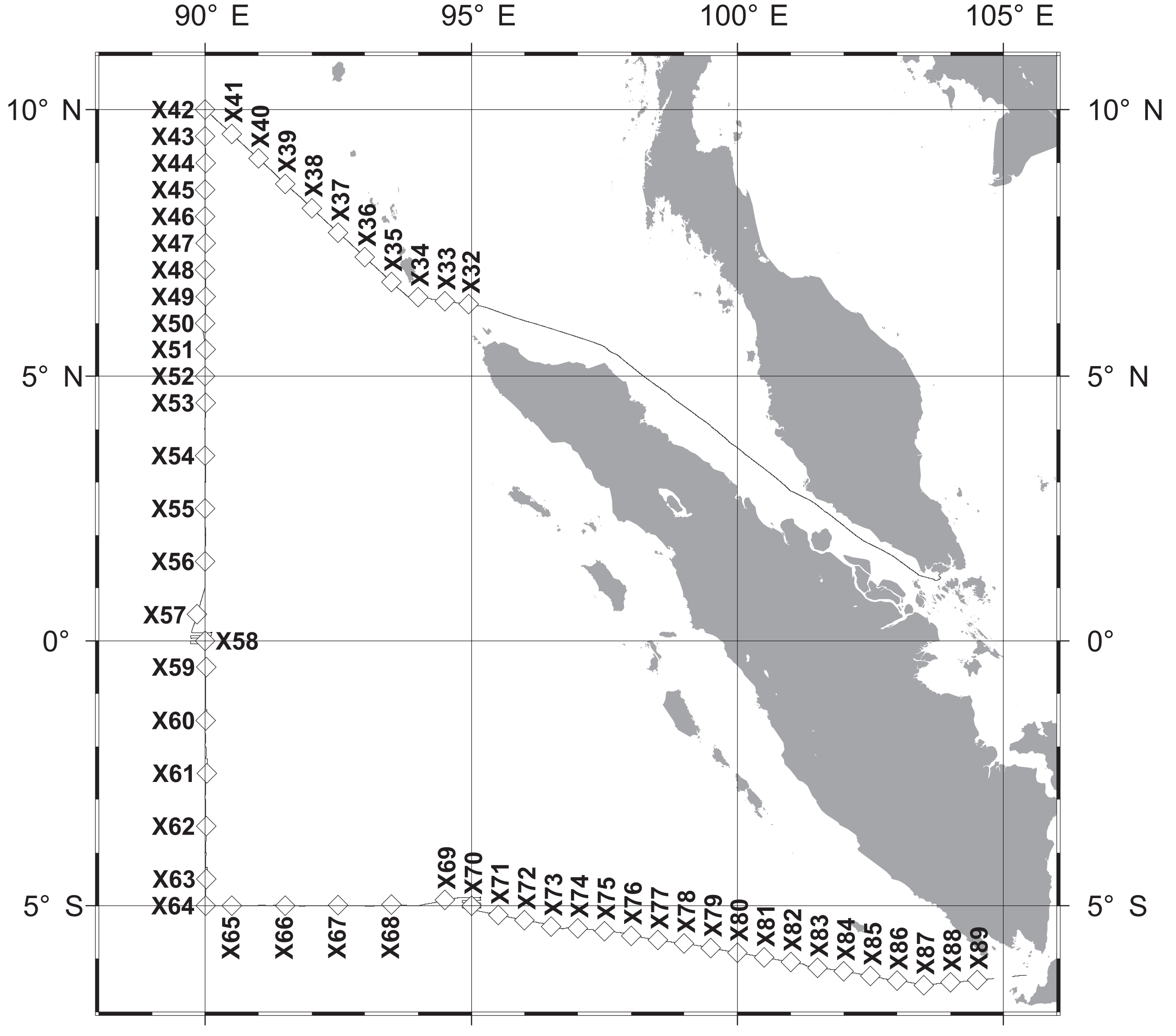
XCTD X01-X31



TRITON T13 T24 T25 ADCP Recovery & Deployment
CTD C01-C04 SEDIEMENT TRAP Recovery



Cruise Track (MR00-K07 Leg.2)


90° E
95° E
100° E
105° E
10° N
5° N
0°
5° S
X32
X33
X34
X35
X36
X37
X38
X39
X40
X41
X42
X43
X44
X45
X46
X47
X48
X49
X50
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X54
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X82
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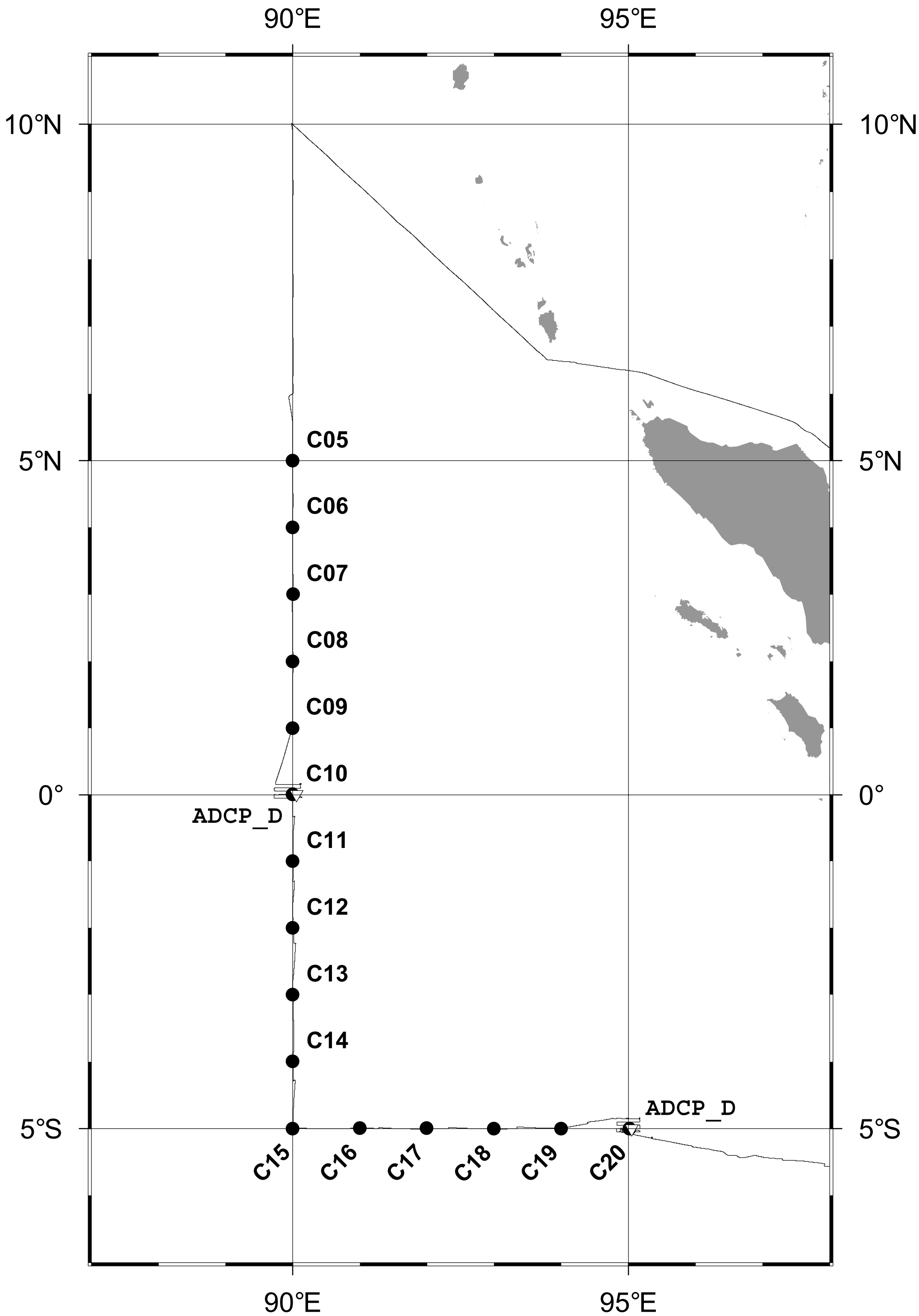
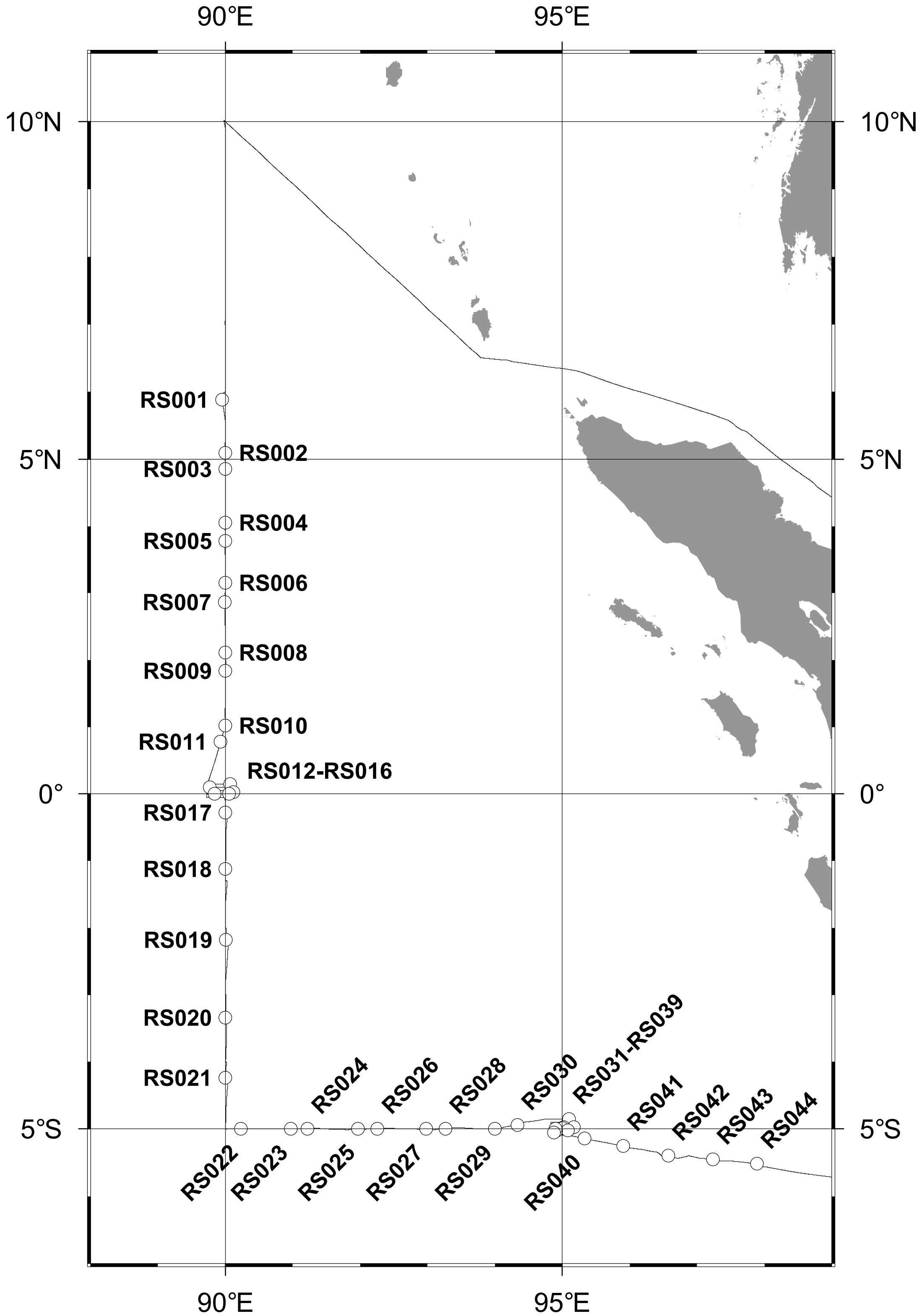
X86
X87
X88
X89

XCTD X32-X89



CTD C05-C20
ADCP Deployment



Radio Sonde RS001-RS044

4. Chief scientist

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First Officer	Yuji Shibata
Second Officer	Haruhiko Inoue
Third Officer	Takeshi Isohi
Chief Engineer	Yoichiro Watanabe
First Engineer	Minoru Ikeda
Second Engineer	Hiroaki Narumi
Third Engineer	Katunori Kajiyama
Chief RadioOfficer	Kaiichirou Shishido
Second RadioOfficer	Naoto Morioka
Boatswain	Tadao Suzuki
Able Seaman	Hisashi Naruo
Able Seaman	Hirokazu Kinoshita
Able Seaman	Seiichiro Kawata
Able Seaman	Kazunori Horita
Able Seaman	Hisao Oguni
Able Seaman	Yuji Inoue
Able Seaman	Masaru Suzuki
Able Seaman	Tsuyoshi Sato
Able Seaman	Tsuyoshi Monzawa
Able Seaman	Masashige Okada
Able Seaman	Shuji Komata
No.1 Oiler	Sadanori Honda
Oiler	Toshimi Yoshikawa
Oiler	Yukitoshi Horiuchi
Oiler	Fumio Inoue
Oiler	Takashi Miyazaki
Oiler	Daisuke Taniguchi
Chief Steward	Yasuaki Koga
Cook	Yasutaka Kurita
Cook	Takayuki Akita
Cook	Hitoshi Ota
Cook	Tatsuya Hamabe
Cook	Kanjuro Murakami

6.1 Meteorological Observations

6.1.1 Surface Meteorological Observations

(1) Personnel

Masaki Katsumata (JAMSTEC): Principal Investigator - Leg 1
Fumitaka Yoshiura (GODI): Operation Leader - Leg 1, 2 -
Satoshi Okumura (GODI) - Leg 1
Wataru Tokunaga (GODI) - Leg 1, 2 -

(2) Objective

The surface meteorological parameters are observed as a basic dataset of the meteorology. These parameters bring us the information about temporal variation of the meteorological condition surrounding the ship.

(3) Methods

The surface meteorological parameters were observed throughout MR00-K07 cruise from the departure of Sekinehama on 18 October 2000 to the arrival of Jakarta on 20 November 2000.

This cruise, we used 3 systems for the surface meteorological observation.

1. Mirai meteorological observation system
2. Shipboard Oceanographic and Atmospheric Radiation (SOAR) system
3. Total Sky Imager (TSI)

The measured parameters of each system are listed in Table 6.1.1-1, 6.1.1-2, 6.1.1-3, 6.1.1-4 and 6.1.1-5.

(3-1) Mirai meteorological observation system

Instruments and archived parameters of Mirai met system are listed in the table below. Data was collected and processed by KOAC-7800 weather data processor made by Koshin Denki, Japan. The data set has 6-second averaged every 6-second record and 10-minute averaged every 10-minute record.

Table 6.1.1-1: Instrument installation locations of Mirai met system

Sensors	type	Manufacturer	location (altitude from surface)
Anemometer	KE-500	Koshin Denki, Japan	foremast (24m)
Thermometer	FT	Koshin Denki, Japan	compass deck (21m)
Dewpoint meter	DW-1	Koshin Denki, Japan	compass deck (21m)
Barometer	F451	Yokogawa, Japan	captain deck (13m)
	weather station	room (tubing outside)	
Rain gauge	50202	R. M. Young, USA	compass deck (19m)
Optical rain gauge	ORG-115DR	SCTI, USA	compass deck (19m)
Radiometer (short wave)	MS-801	Eiko Seiki, Japan	radar mast (28m)
Radiometer (long wave)	MS-200	Eiko Seiki, Japan	radar mast (28m)
Wave height meter	MW-2	Tsurumi-seiki, Japan	Bow

Table 6.1.1-2: Parameters of Mirai meteorological observation system

	Parameters	units	remarks
1	Latitude	degree	
2	Longitude	degree	
3	ship's speed	knot	Mirai log
4	ship's heading	degree	Mirai gyro
5	relative wind speed	m/s	6 sec. / 10 min. averaged
6	relative wind direction	degree	6 sec. / 10 min. averaged
7	true wind speed	m/s	6 sec. / 10 min. averaged
8	true wind direction	degree	6 sec. / 10 min. averaged
9	barometric pressure	hPa	adjusted to the sea surface level 6 sec. / 10 min. averaged
10	air temperature (starboard side)	degC	6 sec. / 10 min. averaged
11	air temperature (port side)	degC	6 sec. / 10 min. averaged
12	dewpoint temperature (stbd side)	degC	6 sec. / 10 min. averaged
13	dewpoint temperature (port side)	degC	6 sec. / 10 min. averaged
14	relative humidity (starboard side)	%	6 sec. / 10 min. averaged
15	relative humidity (port side)	%	6 sec. / 10 min. averaged
16	rain rate (optical rain gauge)	mm/hr	1hr / 12hr accumulated
17	rain rate (capacitive rain gauge)	mm/hr	1hr / 12hr accumulated
18	down welling shortwave radiometer	W/m^2	Momentary / 12 hr accumulated
19	down welling infra-red radiometer	W/m^2	Momentary / 12 hr accumulated
20	sea surface temperature	degC	-5m
21	significant wave height (fore)	m	3 hourly
22	significant wave height (aft)	m	3 hourly
23	significant wave period (fore)	second	3 hourly
24	significant wave period (aft)	second	3 hourly

(3-2) Shipboard Oceanographic and Atmospheric Radiation (SOAR) system

SOAR system, designed by BNL (Brookhaven National Laboratory, USA), is consisted of 3 parts.

1. Portable Radiation Package (PRP) designed by BNL – short and long wave down welling radiation
2. Zeno meteorological system designed by BNL – wind, Tair/RH, pressure and rainfall measurement
3. Scientific Computer System (SCS) designed by NOAA (National Oceanographic and Atmospheric Administration, USA) – centralized data acquisition and logging of all data sets

SCS recorded PRP data every 6.5 seconds and Zeno met data every 10 seconds.

Instruments and their locations are listed in Table 6.1.1-3. The archived parameters are in Table 6.1.1-4.

Table 6.1.1-3: Instrument installation locations of SOAR system

Sensors	Type	Manufacturer	location (altitude from surface)
Anemometer	05106	R. M. Young, USA	foremast (24m)
Tair/RH	HMP45A	Vaisala, USA	foremast (24m)
	with 43408 Gill aspirated radiation shield (R. M. Young)		
Barometer	61201	R. M. Young, USA	foremast (24m)
	with 61002 Gill pressure port (R. M. Young)		
Rain gauge	50202	R. M. Young, USA	foremast (24m)
Optical rain gauge	ORG-115DA	ScTi, USA	foremast (24m)
Radiometer (short wave)	PSP	Eppley labs, USA	foremast (24m)
Radiometer (long wave)	PIR	Eppley labs, USA	foremast (24m)
Fast rotating shadowband radiometer		Yankee, USA	foremast (24m)

Table 6.1.1-4: Parameters of SOAR System

	Parameters	units	Remarks
1	Latitude	degree	
2	Longitude	degree	
3	Sog	knot	
4	Cog	degree	
5	Relative wind speed	m/s	
6	Relative wind direction	degree	
7	Barometric pressure	hPa	
8	Air temperature	degC	
9	Relative humidity	%	
10	Rain rate (optical rain gauge)	mm/hr	
11	Precipitation (capacitive rain gauge)	mm	reset at 50mm
12	Down welling shortwave radiation	W/m^2	
13	Down welling infra-red radiation	W/m^2	
14	Defuse irradiation	W/m^2	

(3-3)Total Sky Imager

The Total Sky Imager (TSI) was installed at the top deck midship, altitude of 17m from sea level. TSI was developed jointly by Penn State University, BNL and Yankee Environmental System, Inc. (YES Inc.) and manufactured by YES Inc. . TSI recorded every 5 minutes from dawn to sunset. The archived parameters are in Table 6.1.1-5.

Table 6.1.1-5: Parameters of TSI system

	parameters	units
1	opaque cloud cover	%
2	thin cloud cover	%

(4) Preliminary results

Wind (converted to U, V component), Air Temperature, RH and surface pressure observed during the cruise from Mirai Met system via navigation system are shown in from Fig 6.1.1-1, to Fig 6.1.1-5. Table of 3-hourly summary data from Mirai Met system is shown in Table 6.1.1-6.

The daytime cloud cover ratio obtained from TSI during the cruise from 18 October 2000 to 17

November 2000 is shown in Fig.6.1.1-6.

(5) Data archives

These raw data will be submitted to the Data Management Office (DMO) in JAMSTEC just after the cruise.

Remarks concerning about data quality are as follows;

1. Radiometers for the upwelling radiation measurement of Mirai met system were not installed during this cruise.
2. PRP had a trouble in pre-amp of PSP and PIR whole of the cruise. So we could not measure parameters of these sensors.
3. PRP stopped from 2254 UTC 21 October to 0144 UTC 22 October caused by software trouble.
4. PRP was not installed from 9 November to 20 November.

Table 6.1.1-6

Time				Position		Weather	P	T	RH	WD	WS	R	Wv.Ht.	Wv.Pd.
UTC		Ship		Lat.	Log.		(hPa)	(deg-C)	(%)	(deg)	(m/s)	(mm/h)	(m)	(sec)
18-Oct	9:00	18-Oct	18:00	41- 18 N	141- 57 E	o	1018.5	7.9	53	311	11.7	0.0	4.3	24
	12:00		21:00	40- 59 N	142- 24 E	o	1018.3	9.4	58	282	17.7	1.0	3.3	7
	15:00	19-Oct	0:00	40- 53 N	142- 27 E	o	1019.4	10.5	56	297	14.0	1.0	3.3	8
	18:00		3:00	40- 55 N	142- 16 E	o	1020.0	10.7	57	316	13.4	0.0	2.5	9
	21:00		6:00	40- 40 N	141- 37 E	bc	1023.4	10.1	58	269	10.2	0.0	1.3	11
19-Oct	0:00		9:00	40- 33 N	141- 30 E	bc	1023.9	12.3	45	278	3.1	0.0	0.3	4
	3:00		12:00	40- 33 N	141- 30 E	bc	1022.5	15.9	41	228	1.5	0.0	0.2	6
	6:00		15:00	40- 33 N	141- 32 E	bc	1022.8	15.3	46	69	3.3	0.0	0.2	7
	9:00		18:00	40- 9 N	142- 8 E	bc	1023.3	14.9	59	180	2.7	0.0	1.0	10
	12:00		21:00	39- 24 N	142- 32 E	bc	1024.0	15.7	56	150	6.5	0.0	1.1	19
	15:00	20-Oct	0:00	38- 42 N	142- 43 E	bc	1024.5	16.1	56	180	4.8	0.0	0.9	15
	18:00		3:00	37- 58 N	142- 49 E	bc	1025.2	15.8	61	191	4.1	0.0	1.1	15
	21:00		6:00	37- 12 N	142- 57 E	bc	1025.4	16.7	62	151	4.9	0.0	1.2	15
20-Oct	0:00		9:00	36- 25 N	143- 7 E	c	1024.0	19.3	70	107	8.5	0.0	1.3	15
	3:00		12:00	35- 39 N	143- 16 E	c	1021.4	22.3	55	147	11.0	0.0	1.4	11
	6:00		15:00	35- 0 N	143- 22 E	o	1019.8	22.8	57	155	10.3	0.0	1.2	8
	9:00		18:00	34- 18 N	143- 32 E	o	1017.6	24.3	56	152	11.4	0.0	1.5	7
	12:00		21:00	33- 36 N	143- 39 E	o	1016.6	25.4	62	153	12.6	0.0	1.6	6
	15:00	21-Oct	0:00	32- 57 N	143- 47 E	o	1014.6	25.1	77	161	14.0	0.0	1.9	7
	18:00		3:00	32- 17 N	143- 55 E	o	1012.8	25.7	82	164	13.8	0.0	2.3	7
	21:00		6:00	31- 36 N	144- 3 E	o	1013.1	25.4	93	170	6.0	0.0	2.3	8
21-Oct	0:00		9:00	30- 55 N	144- 10 E	bc	1013.8	27.0	88	226	6.7	0.0	2.5	8
	3:00		12:00	30- 14 N	144- 18 E	bc	1012.7	27.1	88	249	9.1	0.0	2.0	8
	6:00		15:00	29- 51 N	144- 22 E	bc	1012.7	27.1	80	332	4.3	0.0	1.8	7
	9:00		18:00	29- 8 N	144- 29 E	bc	1013.9	27.1	83	272	2.6	0.0	1.6	8
	12:00		21:00	28- 26 N	144- 37 E	bc	1014.4	27.0	83	193	4.1	0.4	1.6	8
	15:00	22-Oct	0:00	27- 43 N	144- 44 E	bc	1014.0	27.0	79	159	3.9	0.0	1.7	8
	18:00		3:00	27- 1 N	144- 51 E	bc	1013.7	27.2	71	123	4.5	0.0	1.9	8
	21:00		6:00	26- 20 N	144- 58 E	bc	1014.1	27.6	81	98	8.4	0.0	1.9	9
22-Oct	0:00		9:00	25- 40 N	145- 5 E	bc	1014.3	28.2	82	106	11.4	0.0	2.0	9
	3:00		12:00	24- 59 N	145- 12 E	bc/p	1012.2	28.0	82	124	8.6	0.2	1.8	8
	6:00		15:00	24- 16 N	145- 19 E	bc	1012.2	28.1	80	129	6.0	0.0	1.8	8
	9:00		18:00	23- 33 N	145- 25 E	bc	1013.5	27.9	79	130	6.6	0.0	1.6	8
	12:00		21:00	22- 49 N	145- 33 E	bc	1014.1	27.9	83	131	7.5	0.0	1.9	9
	15:00	23-Oct	0:00	22- 4 N	145- 40 E	bc	1013.2	28.0	81	138	6.3	0.0	1.7	9
	18:00		3:00	21- 21 N	145- 45 E	bc	1011.9	28.1	79	111	7.1	0.0	1.5	10
	21:00		6:00	20- 37 N	145- 53 E	bc	1013.3	28.1	81	101	8.4	0.0	1.6	10
23-Oct	0:00		9:00	19- 53 N	145- 60 E	bc	1013.8	28.8	72	94	9.8	0.0	1.6	10
	3:00		12:00	19- 8 N	146- 6 E	bc	1011.5	28.9	72	82	9.3	0.0	1.7	9
	6:00		15:00	18- 25 N	146- 13 E	bc	1010.2	28.9	73	77	8.9	0.2	1.8	10
	9:00		18:00	17- 40 N	146- 20 E	bc	1011.2	28.6	79	76	8.1	0.0	1.6	10
	12:00		21:00	16- 56 N	146- 26 E	bc	1012.2	29.1	71	100	9.6	0.0	1.8	10
	15:00	24-Oct	0:00	16- 12 N	146- 26 E	bc	1011.2	28.9	72	91	8.6	0.0	1.9	10

	21:00		6:00	14-	44 N	146-	26 E	bc	1010.9	28.9	72	88	9.0	0.0	2.1	10
24-Oct	0:00		9:00	13-	59 N	146-	25 E	bc	1011.3	28.3	75	86	6.7	0.0	2.0	12
	3:00		12:00	13-	15 N	146-	26 E	bc	1008.7	29.3	77	98	8.4	0.0	1.9	10
	6:00		15:00	12-	31 N	146-	26 E	bc	1008.3	29.4	76	95	8.3	0.0	1.9	11
	9:00		18:00	11-	45 N	146-	26 E	bc	1010.1	29.0	76	110	7.4	0.0	1.9	11
	12:00		21:00	10-	60 N	146-	26 E	bc	1011.1	29.2	74	106	8.4	0.0	1.8	12
	15:00	25-Oct	0:00	10-	15 N	146-	29 E	bc/p	1010.1	26.8	84	192	9.9	0.0	1.6	8
	18:00		3:00	09-	29 N	146-	27 E	bc	1009.3	27.7	82	187	3.7	0.0	1.7	10
	21:00		6:00	08-	44 N	146-	26 E	c	1010.7	28.1	79	107	7.9	0.0	1.4	8
25-Oct	0:00		9:00	07-	59 N	146-	28 E	c	1011.5	28.0	81	83	7.9	0.0	1.4	9
	3:00		12:00	07-	18 N	146-	43 E	bc	1009.1	28.3	76	96	5.7	0.0	1.5	10
	6:00		15:00	06-	32 N	146-	45 E	bc	1008.0	28.2	78	169	1.9	0.0	1.7	14
	9:00		18:00	05-	46 N	146-	46 E	bc	1009.8	28.1	80	351	2.2	0.0	1.2	12
	12:00		21:00	04-	59 N	146-	47 E	bc	1010.5	28.8	74	288	3.8	0.0	1.3	12
	15:00	26-Oct	0:00	04-	11 N	146-	48 E	bc	1009.6	27.8	81	281	3.2	0.0	1.2	14
	18:00		3:00	03-	23 N	146-	50 E	bc/p	1008.5	25.7	88	270	3.9	0.5	1.2	15
	21:00		6:00	02-	34 N	146-	50 E	c	1010.4	27.9	75	7	5.7	0.0	1.4	15
26-Oct	0:00		9:00	01-	44 N	146-	51 E	c/p	1011.0	27.2	83	306	6.0	1.4	1.4	16
	3:00		12:00	00-	56 N	146-	52 E	c/p	1009.1	26.2	86	253	4.2	0.8	1.4	15
	6:00		15:00	00-	7 N	146-	53 E	o	1008.1	26.0	87	280	6.4	0.4	1.3	17
	9:00		18:00	00-	0 N	147-	3 E	o	1009.5	27.0	80	257	4.3	0.0	1.4	16
	12:00		21:00	00-	6 N	146-	59 E	o	1010.9	27.5	79	273	5.2	0.0	1.3	12
	15:00	27-Oct	0:00	00-	4 N	147-	1 E	o	1009.6	28.2	75	321	4.2	0.0	0.9	7
	18:00		3:00	00-	2 N	147-	0 E	o	1008.5	27.1	81	336	7.5	0.0	1.2	6
	21:00		6:00	00-	1 S	147-	0 E	c	1009.7	27.6	82	298	4.7	0.0	1.1	6
27-Oct	0:00		9:00	00-	1 N	146-	59 E	c	1011.5	28.5	72	341	3.6	0.0	1.0	6
	3:00		12:00	00-	3 N	147-	0 E	c	1008.4	28.4	75	307	3.5	0.0	1.1	7
	6:00		15:00	00-	4 N	146-	50 E	bc	1006.7	28.7	68	285	3.8	0.0	0.9	8
	9:00		18:00	00-	3 N	147-	0 E	bc	1008.4	28.3	77	251	4.0	0.0	0.9	7
	12:00		21:00	00-	3 N	147-	0 E	bc	1010.0	28.4	78	217	3.1	0.0	1.0	7
	15:00	28-Oct	0:00	00-	3 N	147-	0 E	bc/p	1008.3	27.2	85	331	1.6	2.6	0.9	6
	18:00		3:00	00-	3 N	147-	0 E	bc	1007.3	26.4	88	275	2.5	0.8	0.9	6
	21:00		6:00	00-	3 N	147-	0 E	o	1009.5	26.6	89	216	4.3	0.9	0.9	6
28-Oct	0:00		9:00	00-	3 N	147-	1 E	o	1010.3	27.1	87	249	5.9	0.0	1.0	6
	3:00		12:00	00-	3 N	147-	1 E	o/p	1008.0	26.6	79	222	9.1	1.1	1.0	6
	6:00		15:00	00-	3 N	147-	1 E	o	1006.8	27.1	78	244	10.0	0.1	1.1	5
	9:00		18:00	00-	3 N	146-	47 E	o	1007.9	27.7	76	220	5.7	0.0	1.1	5
	12:00		21:00	00-	4 N	145-	59 E	o	1008.9	28.0	79	237	6.3	0.0	0.9	5
	15:00	29-Oct	0:00	00-	3 N	145-	12 E	o	1007.5	28.4	72	234	7.7	0.0	1.1	4
	18:00		3:00	00-	3 N	144-	25 E	o	1006.3	27.4	83	270	5.4	0.0	1.0	5
	21:00		6:00	00-	3 N	143-	36 E	o	1007.7	27.8	79	300	8.4	0.0	1.1	6
29-Oct	0:00		9:00	00-	3 N	142-	48 E	o	1008.8	28.3	77	288	6.2	0.0	1.1	5
	3:00		12:00	00-	2 N	142-	0 E	o	1007.8	27.6	78	296	4.4	0.0	1.2	6
	6:00		15:00	00-	3 N	141-	13 E	r	1006.9	26.6	89	237	7.1	0.6	1.2	5
	9:00		18:00	00-	3 N	140-	26 E	o	1008.2	24.8	87	317	8.0	1.7	1.4	5
	12:00		21:00	00-	3 N	139-	40 E	o	1009.1	28.2	74	316	8.0	0.0	1.4	6

	18:00		3:00	00-	2 N	138-	7 E	o	1006.4	28.2	79	270	5.0	0.0	0.9	7
	21:00		6:00	00-	1 N	137-	57 E	c	1008.0	28.8	78	262	6.5	0.0	1.1	12
30-Oct	0:00		9:00	00-	2 S	137-	56 E	c	1009.6	29.2	78	270	8.6	0.0	1.0	6
	3:00		12:00	00-	2 N	137-	53 E	c	1008.5	28.3	83	319	11.1	0.0	1.4	5
	6:00		15:00	00-	0 N	137-	53 E	bc	1006.1	27.9	83	303	10.2	0.0	1.4	6
	9:00		18:00	00-	1 S	138-	1 E	bc	1006.6	28.1	80	299	7.5	0.0	1.5	6
	12:00		21:00	00-	0 N	137-	60 E	bc	1008.6	28.4	83	299	6.4	0.0	1.4	6
	15:00	31-Oct	0:00	00-	2 S	138-	2 E	bc	1008.4	28.4	82	273	5.4	0.0	1.4	6
	18:00		3:00	00-	1 N	137-	59 E	bc	1007.3	28.4	80	278	5.1	0.0	1.1	7
	21:00		6:00	00-	0 S	138-	2 E	bc	1008.9	28.6	81	275	2.1	0.0	1.2	7
31-Oct	0:00		9:00	00-	1 S	138-	1 E	bc	1010.3	29.4	73	284	2.4	0.0	1.0	7
	3:00		12:00	00-	3 S	138-	4 E	bc	1008.6	30.8	68	253	4.9	0.0	1.1	7
	6:00		15:00	00-	1 S	138-	2 E	bc	1006.5	29.8	71	265	5.2	0.0	1.0	7
	9:00		18:00	00-	34 N	137-	58 E	bc	1008.1	28.6	82	344	3.6	0.0	0.9	6
	12:00		21:00	01-	20 N	138-	4 E	bc	1009.6	28.2	82	315	1.1	0.0	0.9	6
	15:00	1-Nov	0:00	01-	59 N	138-	5 E	bc	1008.8	27.8	82	254	0.9	0.0	0.9	7
	18:00		3:00	01-	59 N	138-	7 E	bc	1008.8	28.9	76	230	0.7	0.0	0.8	7
	21:00		6:00	01-	59 N	138-	9 E	bc	1008.9	27.9	84	185	0.4	0.0	0.9	8
1-Nov	0:00		9:00	01-	59 N	138-	8 E	bc	1010.5	29.2	76	208	1.5	0.0	0.9	7
	3:00		12:00	01-	59 N	138-	7 E	bc	1008.8	29.1	75	327	0.6	0.0	0.9	8
	6:00		15:00	01-	59 N	138-	8 E	bc	1007.1	29.6	71	266	2.2	0.0	0.9	7
	9:00		18:00	02-	2 N	138-	1 E	bc	1008.6	29.4	71	16	1.6	0.0	0.9	6
	12:00		21:00	02-	27 N	137-	25 E	bc	1010.3	29.2	72	11	3.2	0.0	0.8	5
	15:00	2-Nov	0:00	02-	52 N	136-	47 E	bc	1009.3	28.5	78	9	1.6	0.0	0.8	7
	18:00		3:00	03-	17 N	136-	10 E	bc	1007.9	28.4	77	359	4.0	0.0	0.9	8
	21:00		6:00	03-	41 N	135-	34 E	bc	1010.0	28.5	78	341	1.9	0.0	0.9	8
2-Nov	0:00		9:00	04-	2 N	135-	1 E	bc	1011.4	27.8	85	284	0.7	0.8	1.0	8
	3:00		12:00	04-	6 N	134-	50 E	bc	1009.4	29.0	76	287	3.1	0.0	0.9	9
	6:00		15:00	04-	19 N	134-	9 E	bc	1007.7	29.0	75	270	3.0	0.0	1.0	8
	9:00		18:00	04-	32 N	133-	26 E	bc	1008.7	29.0	74	250	0.6	0.0	1.1	7
	12:00		21:00	04-	47 N	132-	42 E	bc	1010.5	28.9	76	222	1.3	0.0	1.0	6
	15:00	3-Nov	0:00	04-	58 N	131-	57 E	bc	1010.5	28.7	78	52	1.6	0.0	1.1	5
	18:00		3:00	05-	0 N	131-	11 E	bc	1009.2	28.5	76	149	1.0	0.0	0.8	7
	21:00		6:00	05-	2 N	130-	26 E	bc	1010.0	28.5	76	143	1.1	0.0	0.9	9
3-Nov	0:00		9:00	05-	3 N	129-	40 E	bc	1011.5	28.3	79	90	3.1	0.0	1.2	14
	3:00		12:00	05-	4 N	128-	54 E	bc	1010.0	29.3	75	162	2.9	0.0	1.2	12
	6:00		15:00	05-	5 N	128-	7 E	p/c	1008.6	26.9	73	18	2.3	1.2	1.1	12
	9:00		18:00	05-	6 N	127-	19 E	c	1009.2	28.7	75	241	3.1	0.0	1.0	13
		4-Nov														
	18:00		3:00	05-	22 N	124-	56 E	bc	1009.7	28.4	78	355	2.8	0.0	0.4	9
	21:00		6:00	05-	47 N	124-	13 E	o	1010.8	27.9	82	359	2.0	0.1	0.2	6
4-Nov																

5-Nov

5-Nov

	6:00		15:00	07-	35 N	116-	30 E	bc	1008.8	26.8	80	238	4.5	0.0	1.0	7
	9:00		18:00	07-	25 N	115-	50 E	o	1008.0	27.1	80	237	4.2	0.0	1.2	7
	12:00		21:00	07-	14 N	115-	12 E	o	1009.4	26.9	80	199	3.9	0.2	1.3	10
	15:00		23:00	07-	1 N	114-	33 E	o	1009.9	26.9	83	249	1.1	0.0	1.0	8
	18:00	6-Nov	2:00	06-	54 N	113-	54 E	bc	1008.8	27.4	76	343	4.7	0.0	0.9	8
	21:00		5:00	06-	44 N	113-	15 E	bc	1008.5	27.4	75	0	5.7	0.0	1.2	9
6-Nov	0:00		8:00	06-	33 N	112-	36 E	bc	1010.4	27.7	71	0	3.5	0.0	1.5	11
	3:00		11:00	06-	24 N	111-	57 E	bc	1010.2	28.0	70	13	4.4	0.0	1.6	11
	6:00		14:00	06-	14 N	111-	18 E	bc	1008.0	28.2	72	24	5.4	0.0	1.6	11
	9:00		17:00	06-	5 N	110-	40 E	o	1007.2	28.1	74	40	6.8	0.0	1.7	12
	12:00		20:00	05-	54 N	110-	2 E	c	1009.0	28.1	74	42	7.0	0.0	2.2	12
	15:00		23:00	05-	44 N	109-	22 E	bc	1010.1	27.2	82	13	4.1	0.0	2.6	14
	18:00	7-Nov	2:00	05-	33 N	108-	44 E	bc	1009.6	27.1	82	46	3.7	0.0	1.2	12
	21:00		5:00	05-	25 N	108-	4 E	bc	1008.9	27.0	82	68	5.4	0.0	1.2	14
7-Nov	0:00		8:00	05-	15 N	107-	26 E	bc	1010.6	27.0	83	46	6.0	0.0	1.5	16
	3:00		11:00	05-	2 N	106-	49 E	c	1011.3	28.1	79	63	5.7	0.0	1.1	16
	6:00		14:00	04-	35 N	106-	22 E	c	1009.0	28.8	75	63	6.2	0.0	1.1	17
	9:00		17:00	04-	6 N	105-	56 E	c	1007.4	29.4	73	47	6.1	0.0	1.0	17
	12:00		20:00	03-	36 N	105-	30 E	bc	1009.1	28.4	77	56	5.7	0.0	1.0	17
	15:00		23:00	03-	1 N	105-	10 E	bc	1010.1	28.5	76	57	6.0	0.0	1.1	18
	18:00	8-Nov	2:00	02-	25 N	104-	55 E	bc	1009.0	28.2	77	90	2.2	0.0	0.7	16
	21:00		5:00	01-	49 N	104-	41 E	c	1008.3	27.7	81	121	3.6	0.0	0.8	15

8-Nov

9-Nov

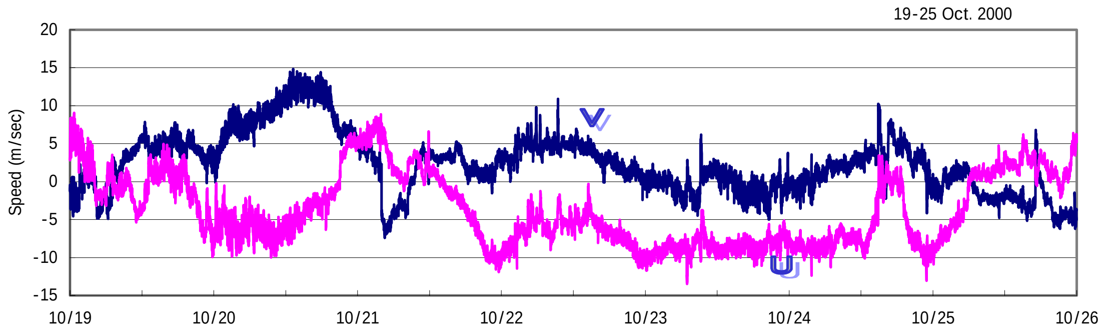
9-Nov

	18:00	10-Nov	2:00	03-	9 N	100-	38 E	r	1009.2	26.9	85	97	6.2	1.1	0.4	4
	21:00		5:00	03-	38 N	100-	1 E	o	1008.9	25.0	83	289	3.7	0.0	0.6	8
10-Nov	0:00		8:00	04-	10 N	099-	22 E	o	1010.8	26.0	82	13	2.8	0.0	0.4	4
	3:00		11:00	04-	39 N	098-	43 E	c	1011.9	27.3	82	14	0.7	0.0	0.6	5
	6:00		14:00	05-	6 N	098-	7 E	c	1010.0	28.8	67	64	7.4	0.0	1.0	9

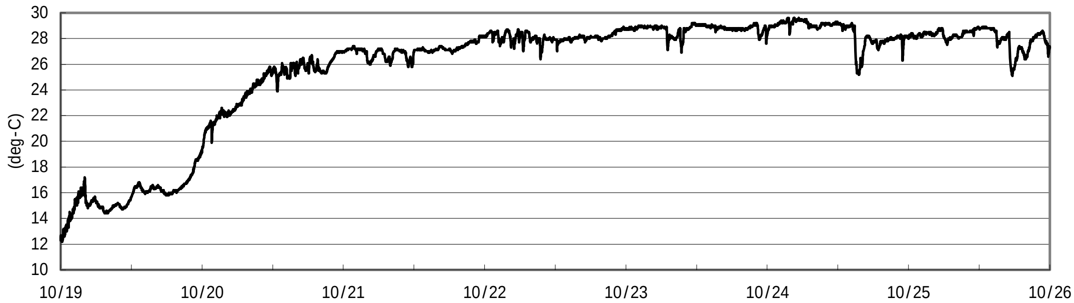
	12:00		20:00	05-	52 N	096-	37 E	c	1009.4	28.1	79	58	7.0	0.0	0.9	13
	15:00		22:00	06-	6 N	095-	48 E	bc	1011.7	28.4	71	71	6.9	0.0	0.8	13
	18:00	11-Nov	1:00	06-	21 N	094-	59 E	c	1010.9	28.0	74	59	5.8	0.0	1.4	11
	21:00		4:00	06-	28 N	094-	11 E	bc	1009.5	27.6	78	67	6.9	0.0	2.0	15
11-Nov	0:00		7:00	06-	46 N	093-	31 E	bc	1010.5	27.5	80	47	7.2	0.0	1.9	18
	3:00		10:00	07-	18 N	092-	56 E	bc	1011.8	28.0	74	60	9.4	0.0	1.8	13
	6:00		13:00	07-	51 N	092-	20 E	bc	1010.4	28.0	70	48	10.2	0.0	1.9	16
	9:00		16:00	08-	24 N	091-	44 E	bc	1008.6	28.2	66	57	9.4	0.0	1.9	15
	12:00		19:00	08-	57 N	091-	9 E	bc	1009.7	28.3	64	65	8.7	0.0	2.3	18
	15:00		22:00	09-	30 N	090-	33 E	bc	1011.3	28.1	69	68	9.3	0.0	2.2	18
	18:00	12-Nov	1:00	10-	1 N	089-	59 E	bc	1011.0	28.0	69	70	5.3	0.0	2.2	17
	21:00		4:00	09-	17 N	090-	0 E	bc	1008.7	27.8	72	63	7.1	0.0	1.8	11
12-Nov	0:00		7:00	08-	33 N	090-	0 E	bc	1009.0	27.8	72	84	7.7	0.0	1.9	12
	3:00		10:00	07-	50 N	090-	0 E	bc	1011.1	28.0	69	78	7.9	0.0	1.9	11
	6:00		13:00	07-	6 N	089-	60 E	bc	1009.9	28.4	67	62	5.8	0.0	1.8	10
	9:00		16:00	06-	23 N	090-	0 E	bc	1007.5	28.4	68	46	6.4	0.0	1.8	10
	12:00		19:00	05-	41 N	089-	59 E	c	1007.6	28.1	68	31	5.7	0.0	1.9	10
	15:00		22:00	05-	0 N	089-	60 E	c	1008.9	27.1	82	62	4.8	0.0	1.8	10
	18:00	13-Nov	1:00	04-	38 N	090-	0 E	bc	1008.0	27.9	74	34	6.2	0.0	1.6	11
	21:00		4:00	04-	0 N	089-	60 E	bc	1005.7	27.8	75	25	5.3	0.0	1.6	11
13-Nov	0:00		7:00	03-	41 N	089-	60 E	bc	1006.3	27.9	75	24	5.2	0.0	1.6	11
	3:00		10:00	03-	0 N	090-	0 E	bc	1008.4	28.7	71	18	4.9	0.0	1.6	11
	6:00		13:00	02-	40 N	089-	60 E	bc	1006.5	29.4	70	22	7.1	0.0	1.6	11
	9:00		16:00	01-	60 N	090-	0 E	o	1005.1	25.0	88	55	3.3	2.8	1.6	11
	12:00		19:00	01-	38 N	089-	60 E	o	1005.5	26.3	85	43	5.3	0.0	1.5	9
	15:00		22:00	00-	60 N	089-	60 E	o	1008.4	27.6	79	52	5.0	0.0	1.6	8
	18:00	14-Nov	1:00	00-	34 N	089-	52 E	o	1007.6	27.7	77	73	4.1	0.0	1.4	7
	21:00		4:00	00-	9 N	090-	3 E	c	1005.5	27.7	74	138	3.8	0.0	1.5	12
14-Nov	0:00		7:00	00-	3 N	089-	52 E	o	1005.9	27.2	81	199	8.3	0.0	1.6	12
	3:00		10:00	00-	3 S	089-	45 E	bc	1008.3	27.9	78	217	5.1	0.0	1.5	7
	6:00		13:00	00-	1 N	090-	1 E	bc	1007.1	28.1	77	230	4.2	0.0	1.5	7
	9:00		16:00	00-	0 N	089-	60 E	bc	1005.4	28.8	75	273	2.2	0.0	1.4	8
	12:00		19:00	00-	26 S	090-	1 E	bc	1006	28.2	74	233	3.8	0.0	1.3	7
	15:00		22:00	00-	60 S	090-	0 E	bc	1007.9	28	81	259	5.3	0.0	1.3	7
	18:00	15-Nov	1:00	01-	25 S	090-	1 E	bc	1007	27.1	83	272	9.2	0.0	1.3	7
	21:00		4:00	02-	0 S	090-	0 E	bc	1005.6	27.6	79	244	5.6	0.0	1.6	8
15-Nov	0:00		7:00	02-	20 S	090-	2 E	c	1006.5	27.1	82	288	6.7	0.0	1.6	7
	3:00		10:00	02-	60 S	090-	0 E	bc	1008.4	28.2	78	299	5.8	0.0	1.8	7
	6:00		13:00	03-	25 S	090-	1 E	c/p	1006.8	26.6	87	284	3.9	10.7	1.8	8
	9:00		16:00	03-	60 S	090-	0 E	c	1005.1	27.7	82	218	2.2	0.0	2.2	7
	12:00		19:00	04-	23 S	090-	2 E	o	1006.5	27.5	86	166	5.7	0.0	2.0	8
	15:00		22:00	04-	60 S	090-	0 E	c	1009	27.3	83	156	3.6	0.0	2.5	8
	18:00	16-Nov	1:00	04-	60 S	090-	26 E	o	1008.3	25.8	86	318	8.3	0.0	2.8	19
	21:00		4:00	04-	60 S	091-	0 E	o	1006.4	26.6	83	289	6.4	0.0	2.1	9
16-Nov	0:00		7:00	04-	60 S	091-	25 E	o	1007.8	27.2	81	267	4.4	0.0	2.6	18
	3:00		10:00	04-	60 S	092-	0 E	c/p	1008.9	26.9	82	231	4.7	0.0	1.8	9

	9:00		16:00	05-	0 S	092-	60 E	o	1006.1	26.6	81	190	5	0.0	1.5	8
	12:00		19:00	04-	59 S	093-	28 E	c	1007.3	27.1	82	189	4.7	0.0	1.7	19
	15:00		22:00	05-	0 S	094-	0 E	o	1008.6	28.2	77	177	5.5	0.0	1.5	8
	18:00	17-Nov	1:00	04-	53 S	094-	31 E	o	1007.4	28.1	76	158	6.8	0.0	1.6	13
	21:00		4:00	04-	54 S	095-	8 E	o	1006.8	26.9	86	91	7	0.7	1.3	8
17-Nov	0:00		7:00	05-	0 S	095-	8 E	o	1007.6	28	82	129	7.2	0.0	1.6	10
	3:00		10:00	04-	58 S	095-	1 E	bc	1008.4	28.5	78	130	5.1	0.0	1.7	10
	6:00		13:00	04-	60 S	095-	0 E	bc	1006.9	28.7	78	115	4.9	0.0	1.5	10
	9:00		16:00	05-	0 S	094-	54 E	bc	1006	28.8	78	88	4.1	0.0	1.8	11
	12:00		19:00	05-	0 S	094-	55 E	bc	1006.1	28.5	76	101	3.2	0.0	2.0	12
	15:00		22:00	05-	2 S	094-	55 E	bc	1007.7	28.4	77	129	4.4	0.0	2.3	12
	18:00	18-Nov	1:00	04-	60 S	094-	53 E	bc	1007.1	28.2	80	90	2.5	0.0	2.6	13
	21:00		4:00	05-	3 S	094-	52 E	bc	1006.3	27.6	84	89	5.8	0.0	2.4	12
18-Nov	0:00		7:00	05-	10 S	095-	27 E	bc	1007.2	28.1	79	83	3.8	0.0	2.3	16

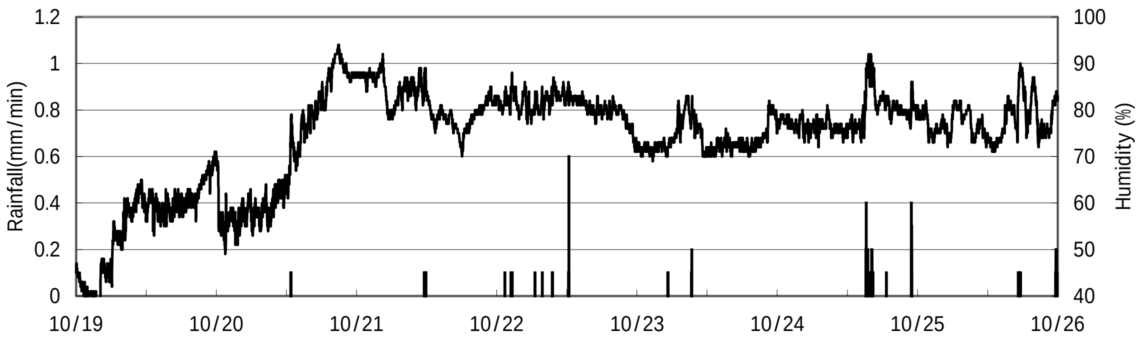
Wind Speed (U and V)



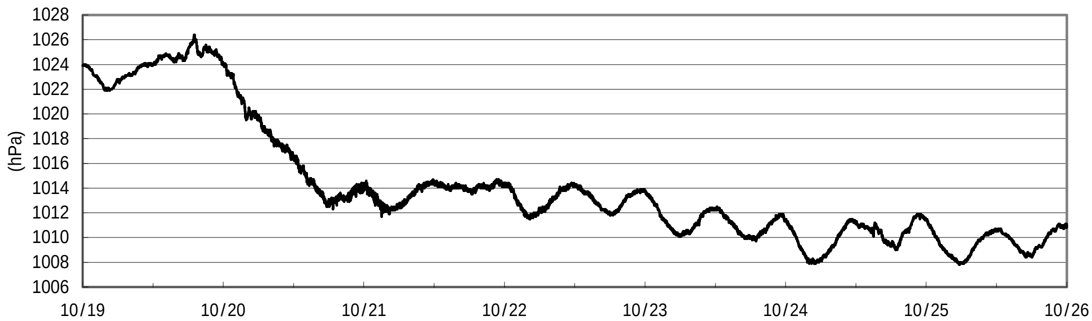
Air Temperature



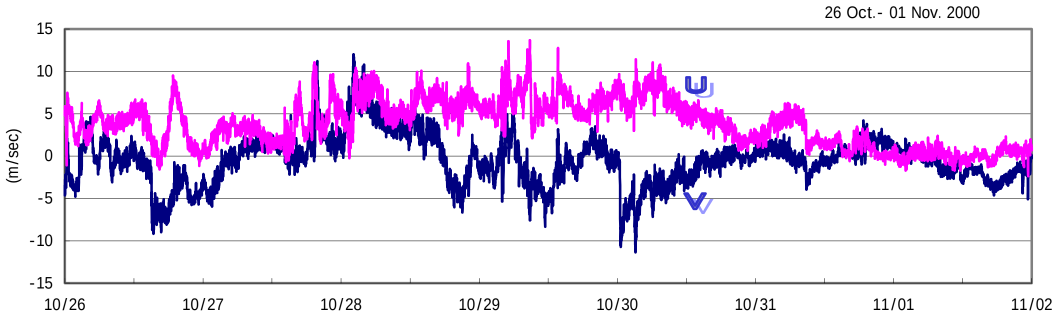
Relative Humidity



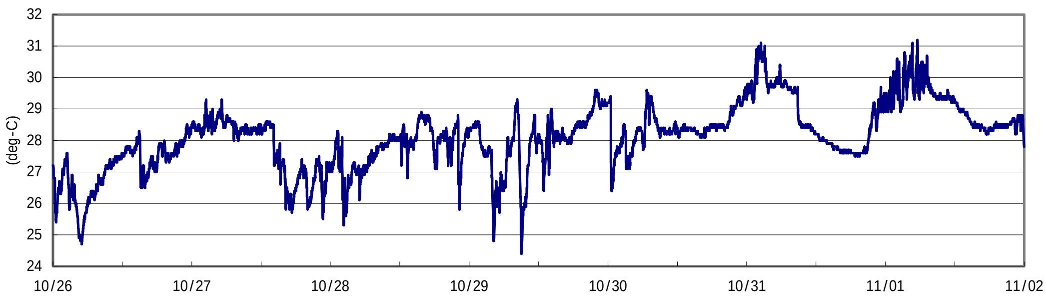
Surface Pressure



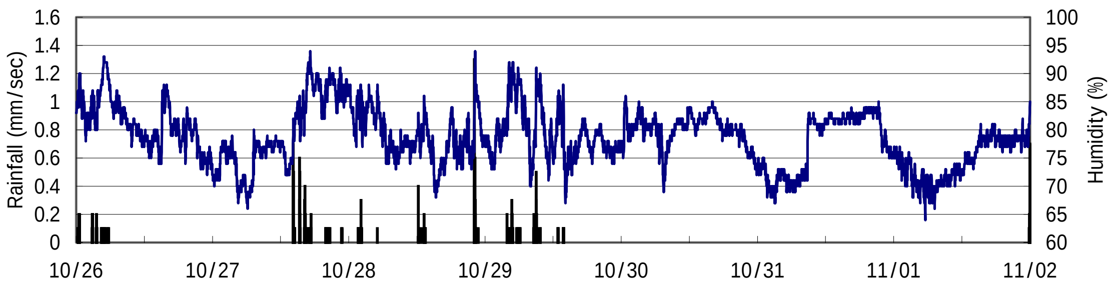
Wind Speed (U and V)



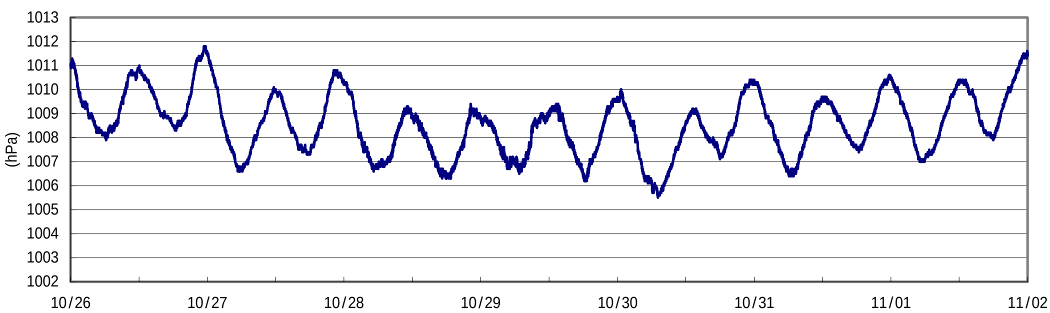
Air Temperature

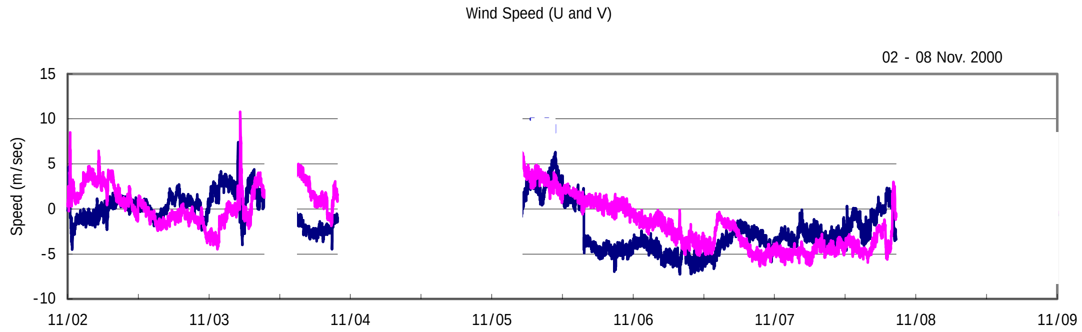


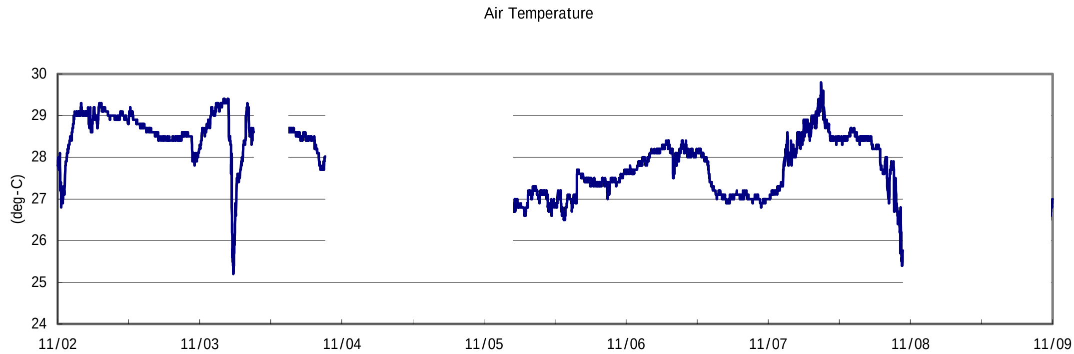
Relative Humidity and Rainfall

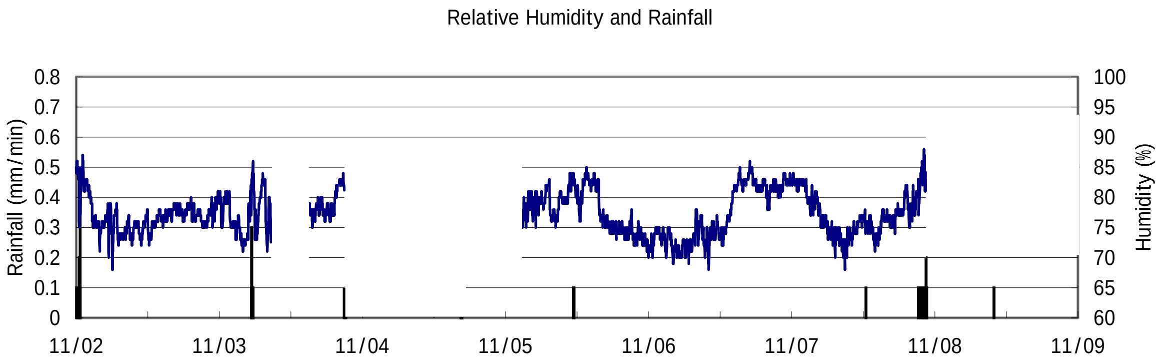


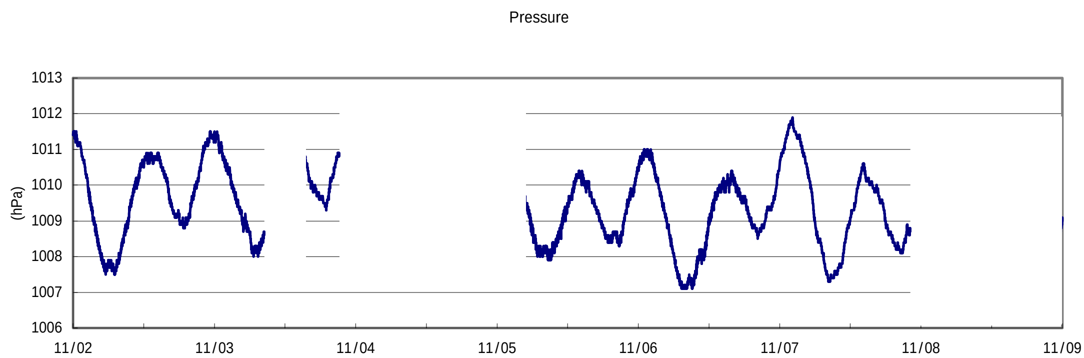
Pressure



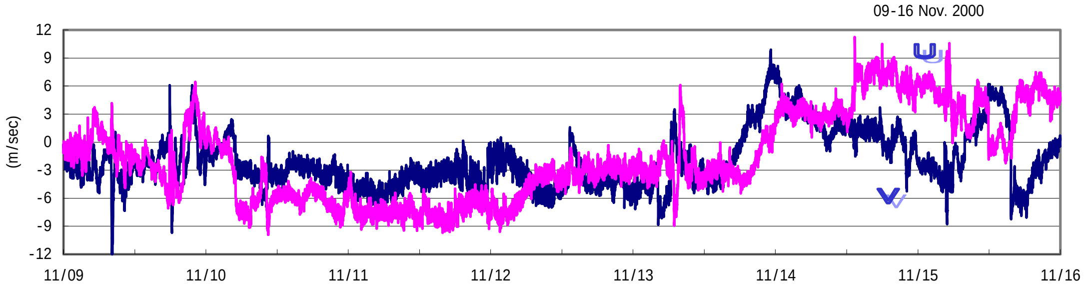

Wind Speed (U and V)
02 - 08 Nov. 2000
Speed (m/sec)
15
10
5
0
-5
-10
11/02
11/03
11/04
11/05
11/06
11/07
11/08
11/09


Air Temperature
(deg-C)
30
29
28
27
26
25
24
11/02
11/03
11/04
11/05
11/06
11/07
11/08
11/09

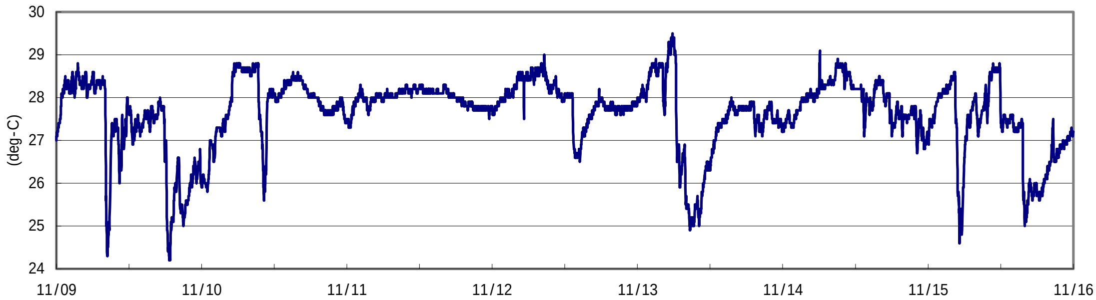

Relative Humidity and Rainfall
Rainfall (mm/min)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Humidity (%)
100
95
90
85
80
75
70
65
60
11/02
11/03
11/04
11/05
11/06
11/07
11/08
11/09


Pressure
(hPa)
1013
1012
1011
1010
1009
1008
1007
1006
11/02
11/03
11/04
11/05
11/06
11/07
11/08
11/09

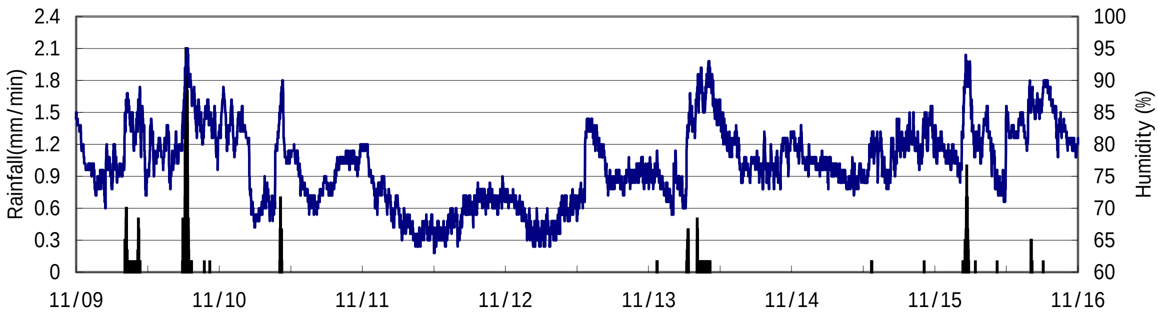
Wind Speed (U and V)



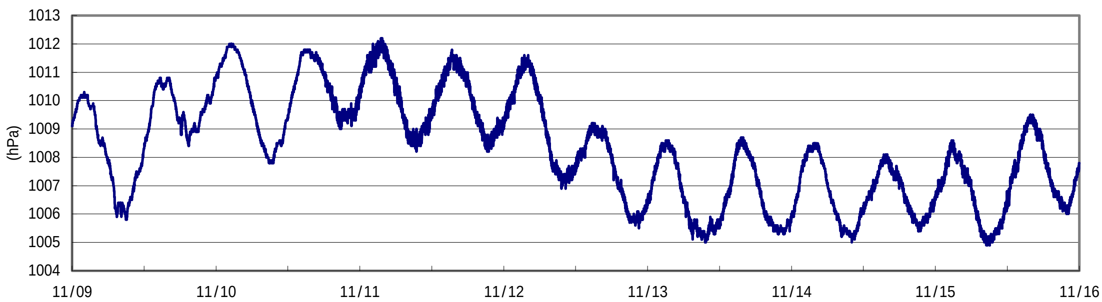
Air Temperature

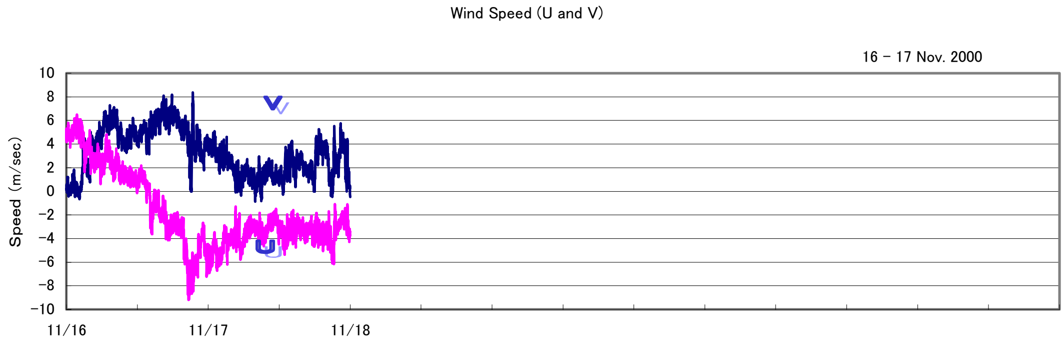


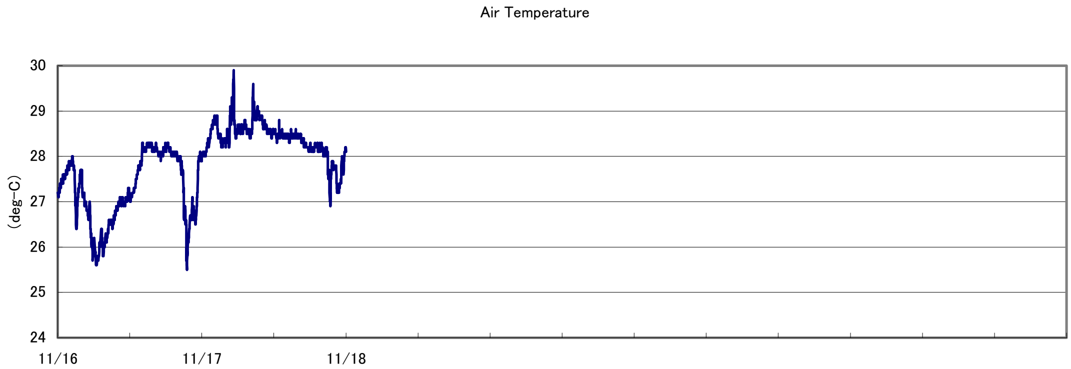
Relative Humidity and Rainfall

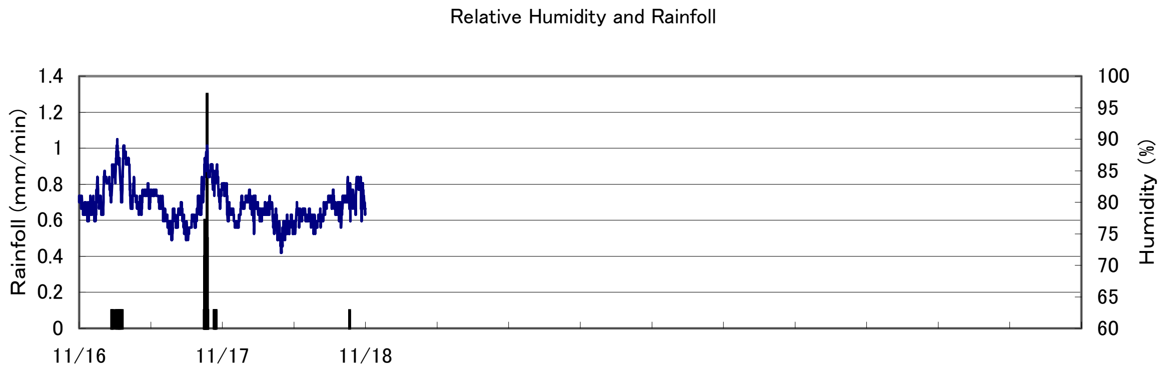


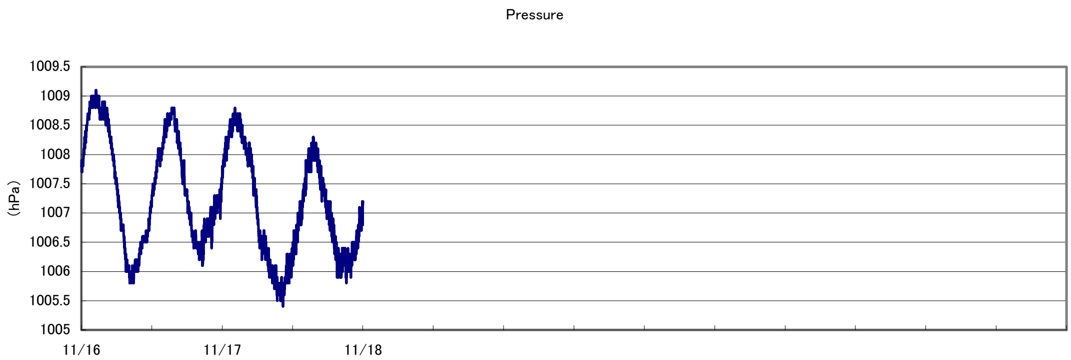
Pressure




Wind Speed (U and V)
16 - 17 Nov. 2000
Speed (m/sec)
10
8
6
4
2
0
-2
-4
-6
-8
-10
11/16
11/17
11/18
V
U


Air Temperature
(deg-C)
30
29
28
27
26
25
24
11/16
11/17
11/18


Relative Humidity and Rainfoll
Rainfoll (mm/min)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Humidity (%)
100
95
90
85
80
75
70
65
60
11/16
11/17
11/18


Pressure
(hPa)
1009.5
1009
1008.5
1008
1007.5
1007
1006.5
1006
1005.5
1005
11/16
11/17
11/18

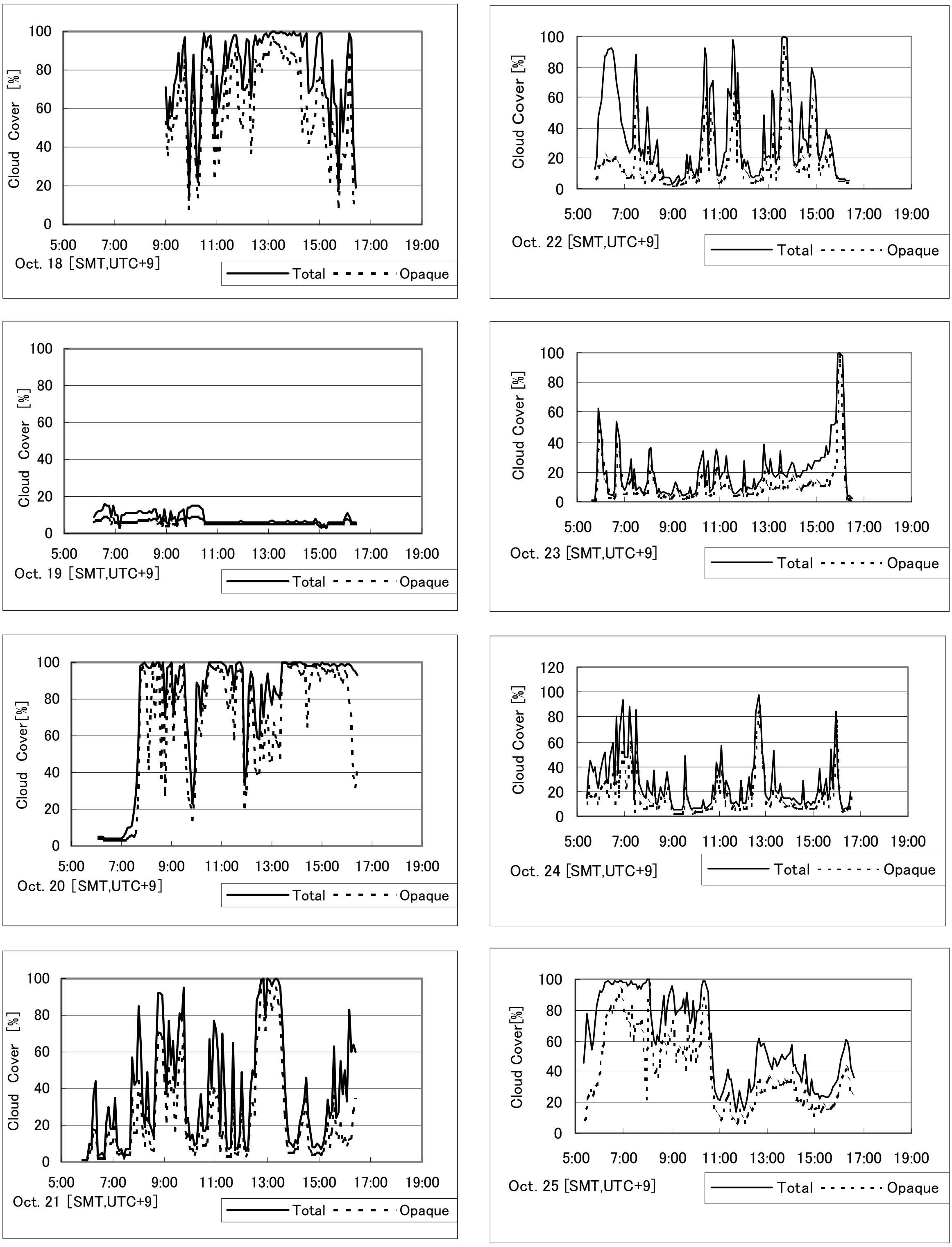


Fig. 6.1.1-6 Daytime cloud cover ratio from TSI (1/4)

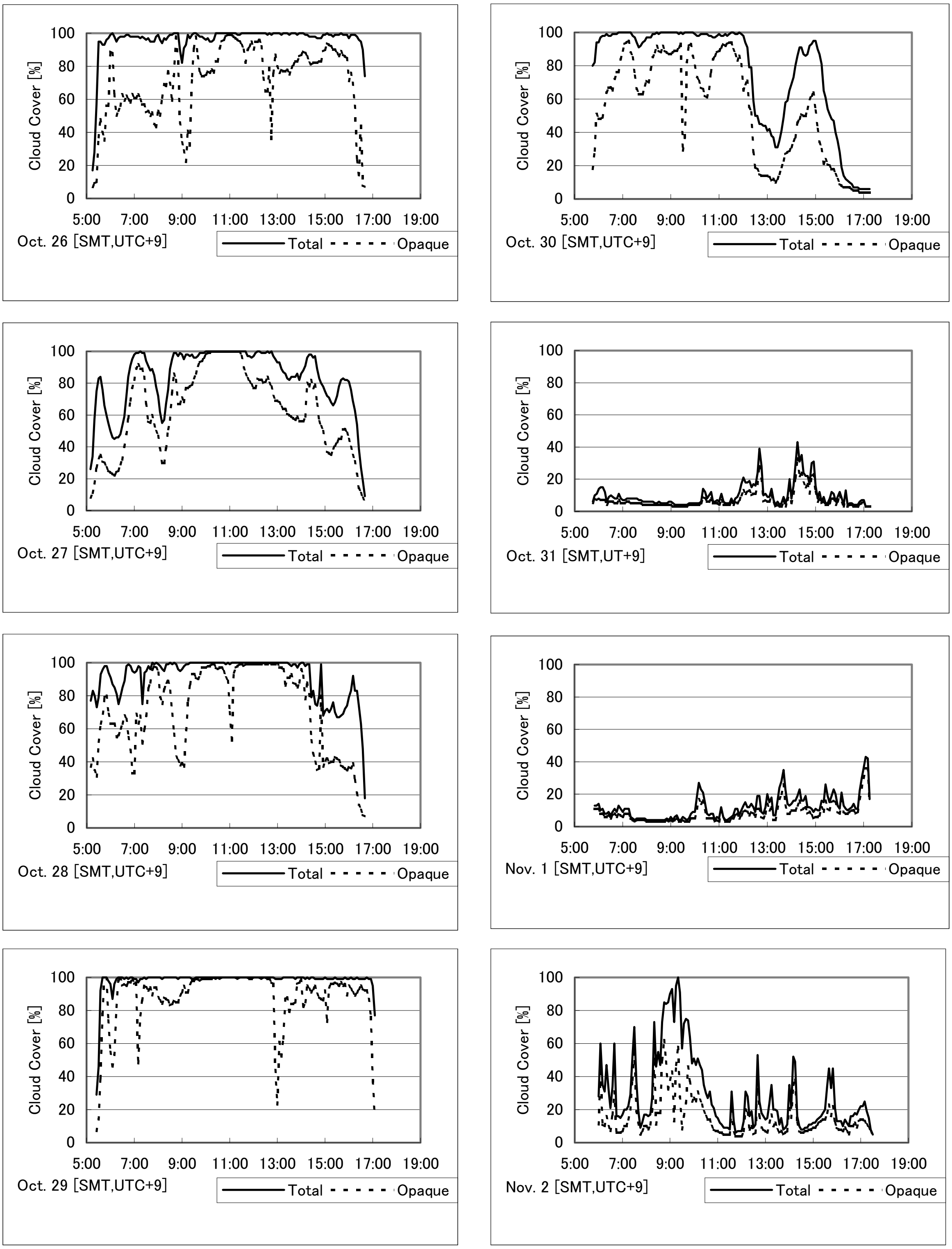


Fig. 6.1.1-6 Daytime cloud cover ratio from TSI (2/4)

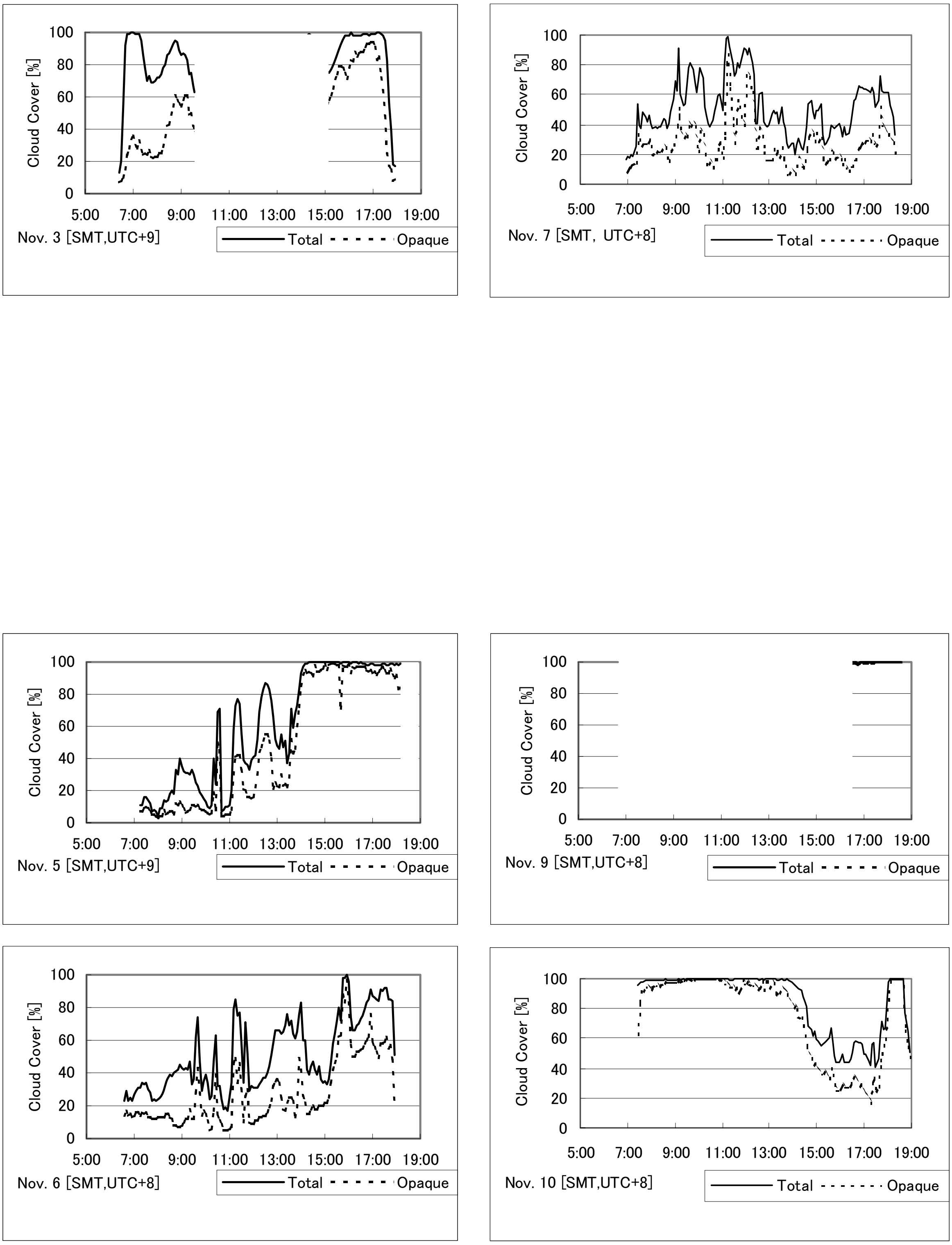


Fig. 6.1.1-6 Daytime cloud cover ratio from TSI (3/4)

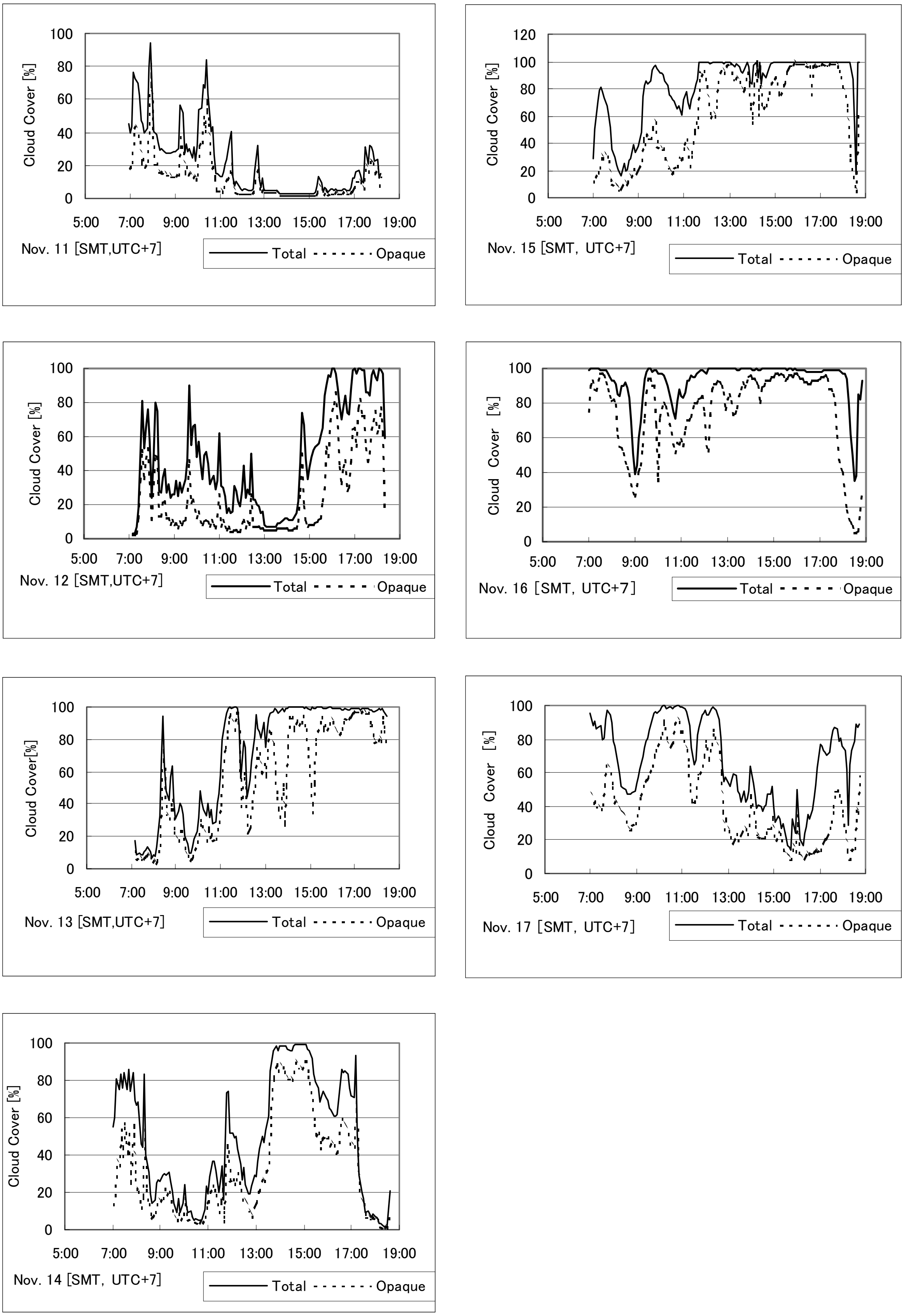


Fig. 6.1.1-6 Daytime cloud cover ratio from TSI (4/4)

6.1.2. Atmospheric sounding

(1) Personnel

Masaki Katsumata (JAMSTEC): Principal investigator
Fumitaka Yoshiura (GODI): Operator leader
Wataru Tokunaga (GODI): Operator

(2) Objectives

The radiosonde observation was carried out to understand the air-sea interaction in the eastern Indian Ocean, by obtain the environmental condition of convective systems in the active phase of intraseasonal oscillation.

(3) Parameters

The range and accuracy of parameters measured by the radiosonde are as follows:

Parameter	Range	Accuracy
Pressure	3 - 1060 hPa	0.5 hPa
Temperature	-90 - +60 deg.C	0.2 deg.C
Relative humidity	0 - 100 %	3 %
Wind speed	0 - 180 m/s	0.5 m/s

(4) Methods

We observed vertical profiles of pressure, temperature, relative humidity, and wind speed / direction using VAISALA DigiCORA MW 11 semi-automatic radiosonde System. The system consists of main processor (MW11), GPS antenna (GA20), UHF telemetry antenna (RB21), personal computer (TOSHIBA Dynabook 430CDT), printer (EPSON LX-1050), balloon launcher (ASAP JAMSTEC) and radiosonde sensor (VAISALA RS80-15GH).

Each sensor were calibrated before launch by using the digital barometer (VAISALA PTB220 Class A) and the humidity calibrator (VAPORPAK H-31, Digilog Instruments). The surface values were measured by the digital barometer, portable humidity / temperature sensor (VAISALA HMP 41/45) and anemometer (KOSHIN KC1570A).

The 3-hourly observation was carried out for two period, from 12Z on 12 November 2000 to 12Z on 14 November 2000, and from 18Z on 15 November 2000 to 12Z on 18 November 2000. Between these two periods, from 12Z on 14 November 2000 to 18Z on 15 November 2000, the 6 hourly observation (at 00Z, 06Z, 12Z and 18Z) was carried out. We obtained 44 profiles during the cruise. Table 6.1.2-1 shows radiosonde launch log.

Table 6.1.2-1: Logs for radiosonde observation in MR00-K07 Leg.2.

No	Launch Time (UTC)				Position		Surface States					Maximum Altitude		Clouds	
	YYYY	MM	DD	HH	Lon.N. (deg.)	Lat.E. (deg.)	P (hPa)	T (deg.C)	RH (%)	WD (deg.)	WS (m/s)	(hPa)	(m)	Amt	Type
1	2000	11	12	12	89.95	5.88	1005.1	26.6	78	48	6.5	31.9	23205	7	Cu,Sc,Ac
2	2000	11	12	15	90.00	5.09	1006.9	25.7	87	59	4.7	36.6	22385	8	Ci,Ac
3	2000	11	12	18	90.00	4.85	1006.1	26.8	80	37	6.3	26.6	24352	8	Cu,Ac
4	2000	11	12	21	90.00	4.05	1003.8	26.5	80	25	6.2	34.8	22657	3	Cu,Ac
5	2000	11	13	00	90.00	3.87	1003.9	27.5	78	22	6.9	32.8	23043	3	Cu,As,Cs
6	2000	11	13	03	90.00	3.15	1006.2	30.0	67	45	6.7	25.6	24593	4	Ci,Cu,Cb,As
7	2000	11	13	06	89.99	2.87	1004.8	30.7	68	4	6.9	28.3	23998	8	Cu,As,Cb,Ci
8	2000	11	13	09	90.00	2.11	1003.2	25.4	91	32	2.9	586.6	4548	10	Cu,Su,As
9	2000	11	13	12	90.00	1.84	1003.4	26.0	84	59	4.8	43.8	21293	10	As,Cu,St
10	2000	11	13	15	90.00	1.02	1005.9	27.0	82	12	3.7	31.6	23317	10	St,As
11	2000	11	13	18	89.93	0.78	1005.8	27.5	79	85	2.9	33.4	22966	9	Cu,St,Ac
12	2000	11	13	21	90.07	0.15	1003.3	27.2	81	172	1.8	99.1	16598	10	Cu,St,Ac
13	2000	11	14	00	89.77	0.10	1003.4	27.3	84	181	9.7	26.1	24446	9	Cu,Ns,As
14	2000	11	14	03	89.84	0.00	1006.0	27.2	79	215	5.4	55.6	19893	4	St,Ci,As
15	2000	11	14	06	90.12	-0.03	1006.0	28.9	73	219	4.8	30.8	23437	5	As,Ac,Sc,Ci
16	2000	11	14	09	90.06	0.00	1003.2	29.4	73	256	2.9	24.5	24830	6	Cu,Si,Ci,As
17	2000	11	14	12	90.00	-0.28	1003.9	28.0	80	256	2.4	28.3	23946	3	Cu,Ac,Ci
18	2000	11	14	18	90.00	-1.21	1004.9	28.0	77	256	6.9	113.2	15908	6	Cu,Cb,Ac
19	2000	11	15	00	90.01	-2.18	1004.3	26.9	86	284	3.9	31.2	23356	8	Cu,Cb,As,Ci
20	2000	11	15	06	90.00	-3.34	1004.9	27.5	78	353	3.7	32.4	23146	9	Sc,Cb,Ac
21	2000	11	15	12	90.00	-4.24	1004.0	28.4	76	229	5.0	43.6	21337	10	Cu,Cb,As
22	2000	11	15	18	90.23	-5.00	1006.6	25.8	89	320	8.9	58.0	19640	10	Cu,St
23	2000	11	15	21	90.97	-5.00	1004.5	26.7	82	294	7.7	38.0	22159	10	Sc,As
24	2000	11	16	00	91.22	-5.00	1005.1	26.8	82	284	5.6	34.3	22794	10-	Cu,As
25	2000	11	16	03	91.97	-5.00	1006.9	29.2	72	248	5.3	24.3	24968	8	Cb,Cu,Ci,St,Sc
26	2000	11	16	06	92.26	-5.00	1005.8	25.8	90	222	5.1	33.5	22957	9	Cu,Sc,Cb,As
27	2000	11	16	09	92.98	-5.00	1003.8	27.2	76	202	6.4	35.4	22587	9	As,St,Sc,Cb
28	2000	11	16	12	93.27	-5.00	1004.7	26.8	85	193	4.6	37.6	22229	8	As,Cu,Cb
29	2000	11	16	15	94.00	-5.00	1006.2	27.9	81	147	6.4	59.9	19474	8	As,Ci,St
30	2000	11	16	18	94.34	-4.94	1005.4	27.8	80	147	6.1	40.2	21823	8	Sc,Ac
31	2000	11	16	21	95.10	-4.85	1004.1	27.5	84	123	9.1	37.7	22198	10	Cu,Cb,Sc,Ac
32	2000	11	17	00	95.17	-4.97	1005.5	27.8	82	123	6.4	29.9	23617	9	As,Ac,Cu
33	2000	11	17	03	95.02	-4.97	1006.4	29.8	71	123	5.3	34.4	22773	7	Cu,Cb,Sc,As,Ci
34	2000	11	17	06	95.01	-5.00	1005.2	31.2	74	104	5.1	27.7	24084	6	Sc,Cu,Ac,Ci
35	2000	11	17	09	95.01	-4.99	1003.8	30.0	77	101	4.3	106.1	16220	8	Sc,Cu,Cb,As,Ci
36	2000	11	17	12	95.09	-5.02	1003.8	28.4	79	119	2.6	32.6	23093	6	Cu,Ci,As,Cb
37	2000	11	17	15	94.91	-5.03	1005.6	28.5	77	123	3.6	31.3	23352	3	St
38	2000	11	17	18	94.90	-5.00	1005.1	27.8	83	121	3.2	41.1	21657	2	Cu
39	2000	11	17	21	94.88	-5.05	1003.9	27.8	84	100	2.9	37.6	22201	10	Sc,St,Cu,Cb
40	2000	11	18	00	95.33	-5.14	1004.6	27.6	84	132	3.0	30.3	23507	9	Cu,As,Cb
41	2000	11	18	03	95.91	-5.25	1005.9	28.6	77	89	6.4	31.2	23320	4	Sc,Cu,As
42	2000	11	18	06	96.58	-5.40	1005.1	27.7	83	71	4.8	24.8	24784	8	Cu,Cb,Sc,As,Ci
43	2000	11	18	09	97.24	-5.45	1003.4	28.6	78	107	3.9	44.2	21225	9	Cu,Sc,Cb,As,Ci
44	2000	11	18	12	97.89	-5.52	1004.4	28.1	77	151	3.2	33.0	22985	6	Cb,Cu,As

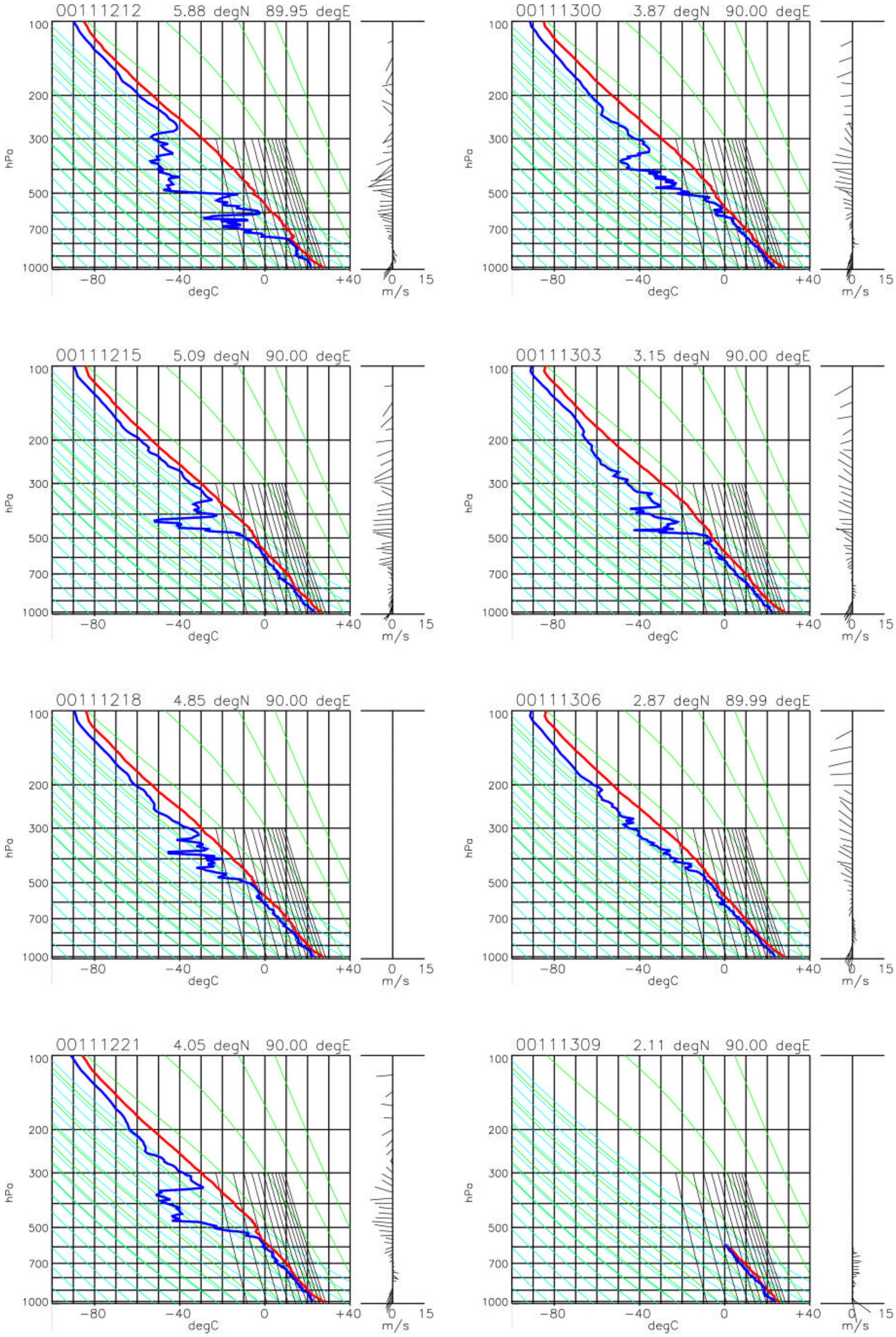


Fig.6.1.2-1: Observed atmospheric profiles.

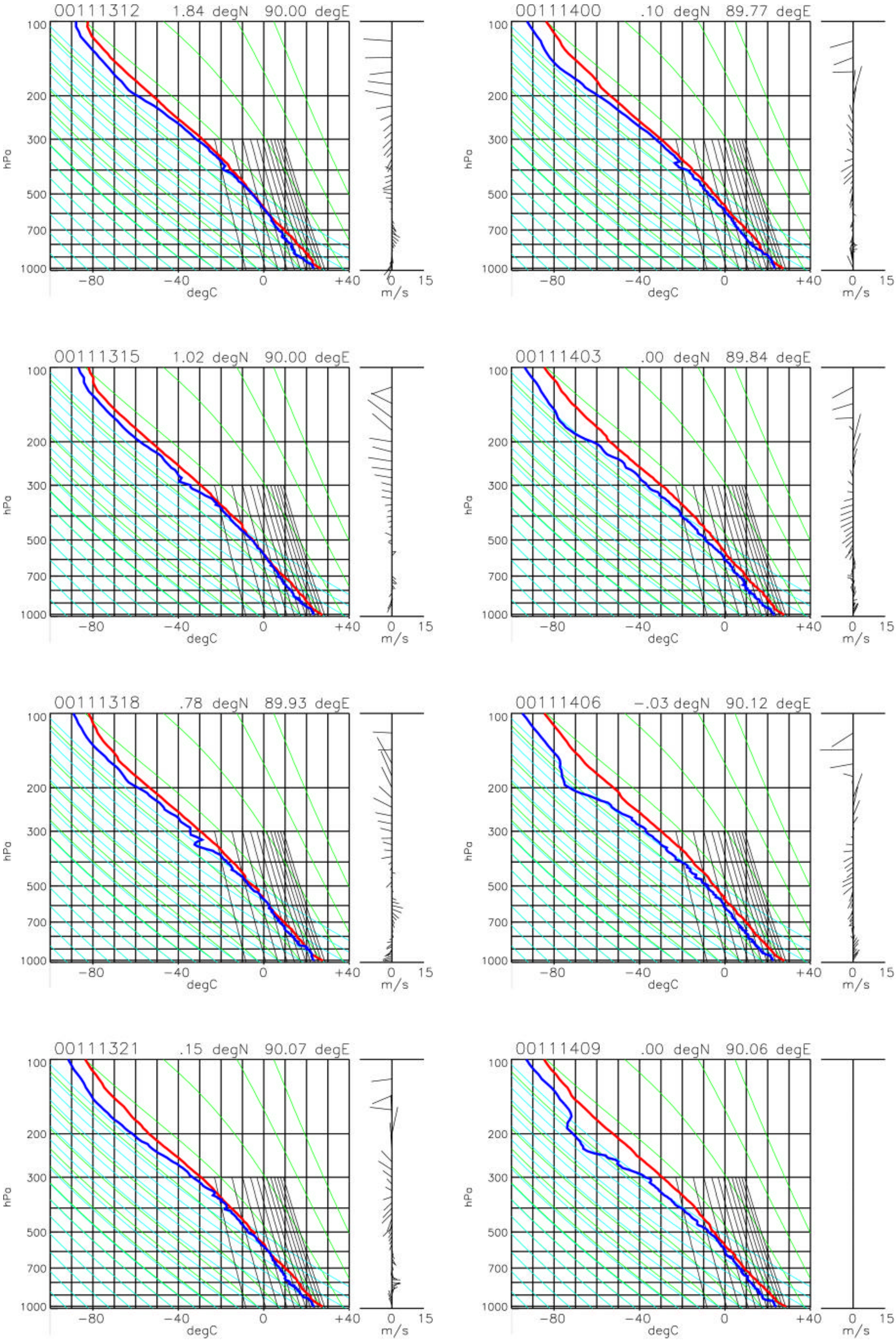
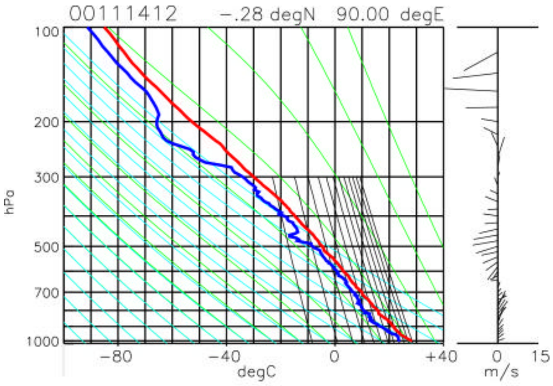
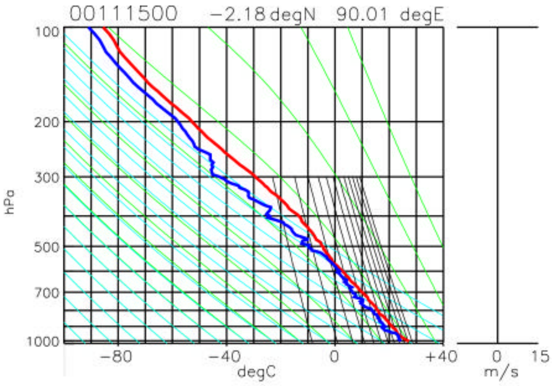
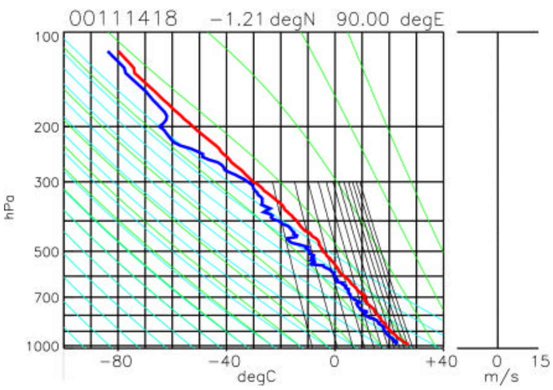


Fig.6.1.2-1 (continue)







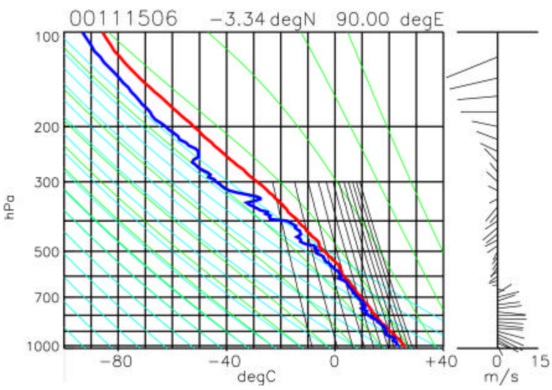


Fig.6.1.2-1 (continue)

1

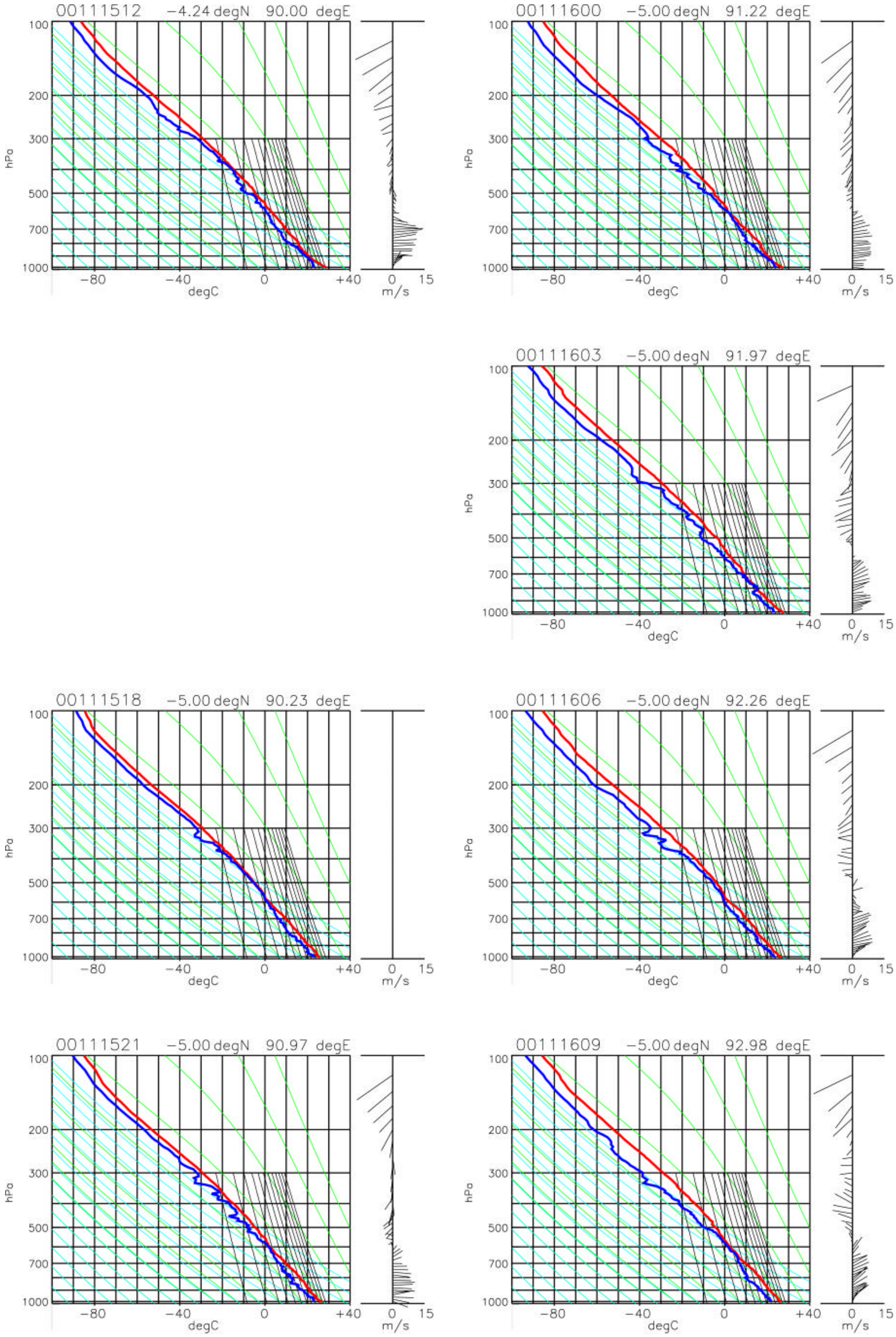


Fig.6.1.2-1 (continue)

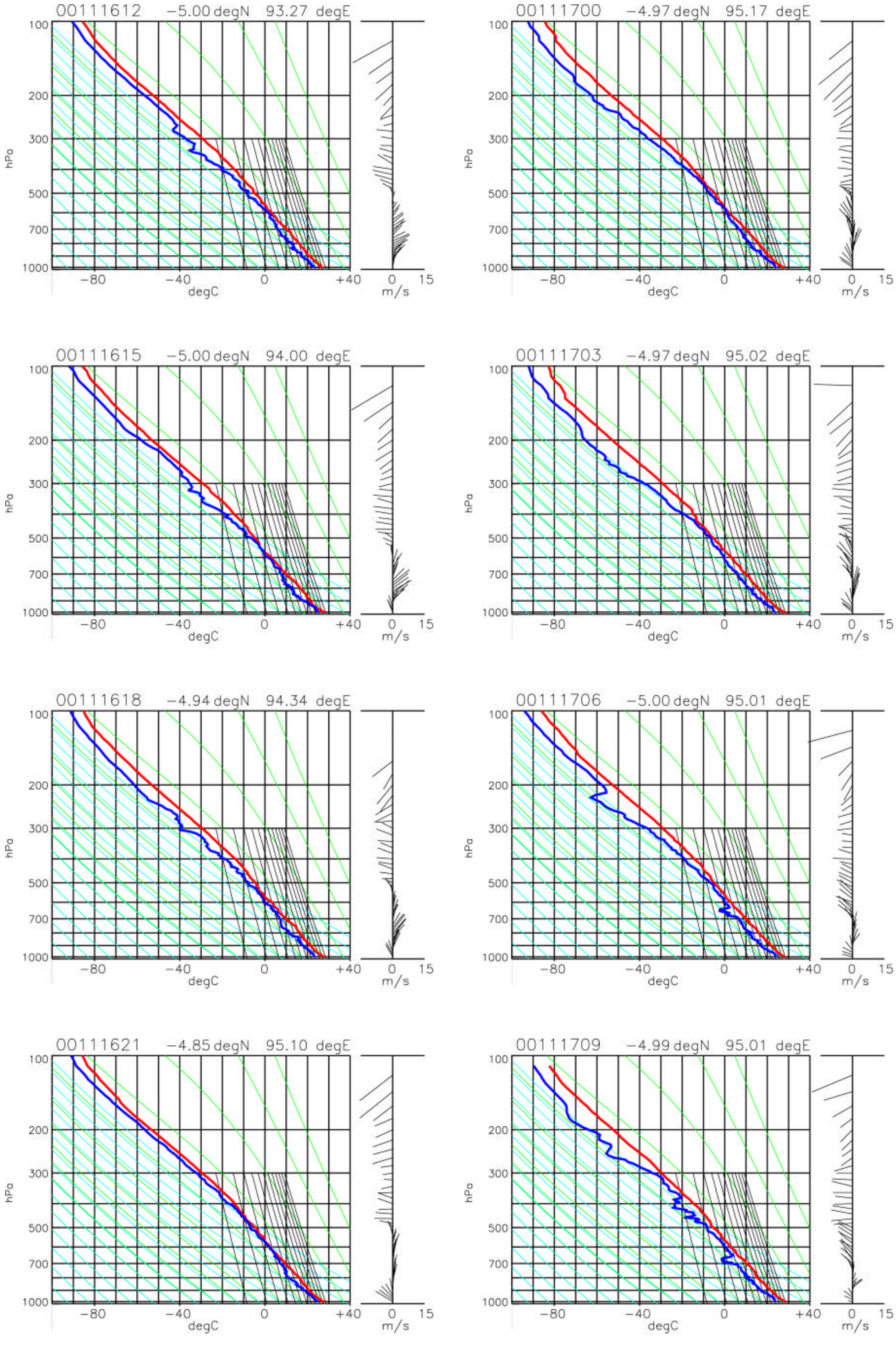


Fig.6.1.2-1 (continue)

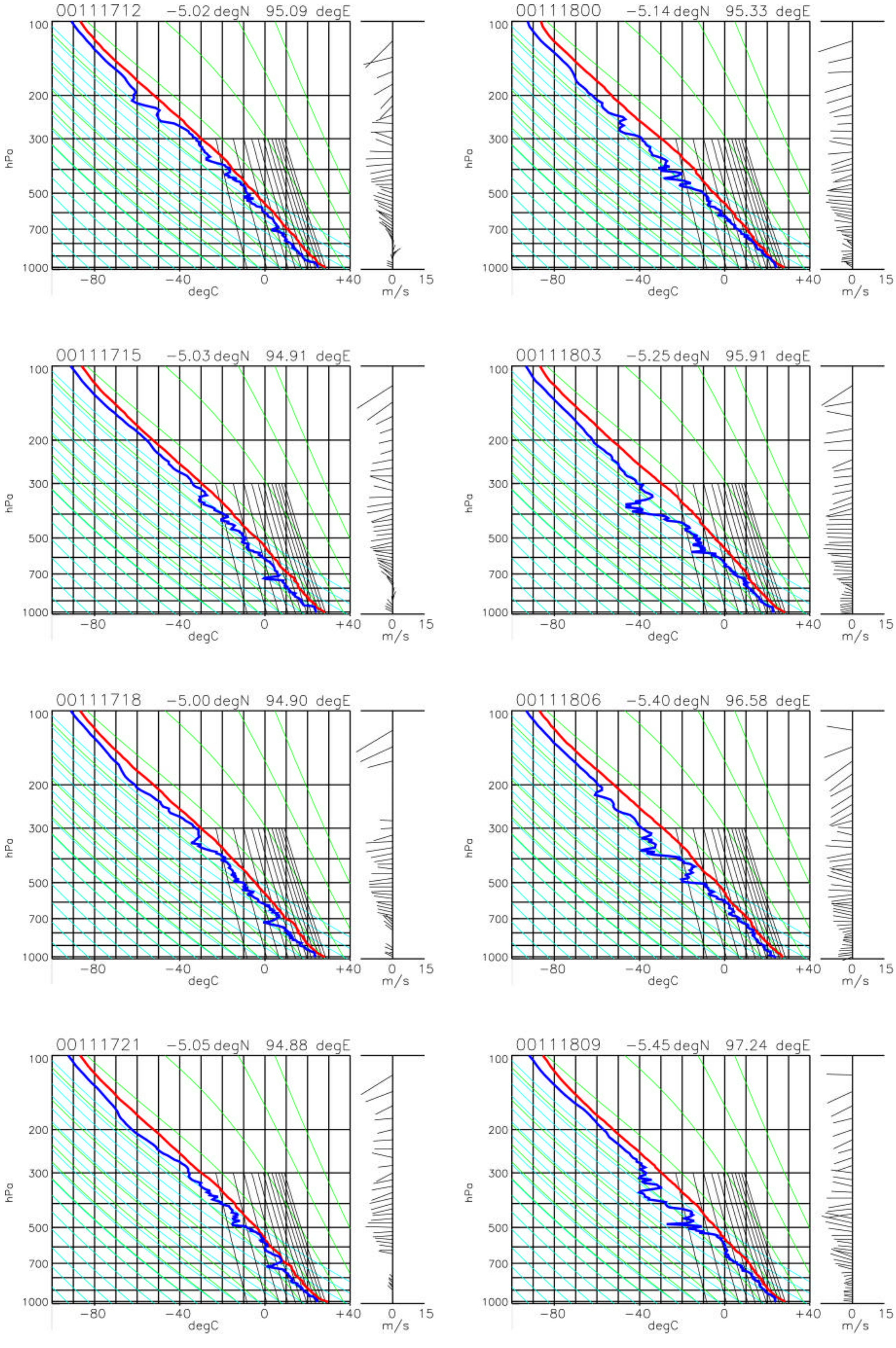


Fig.6.1.2-1 (continue)

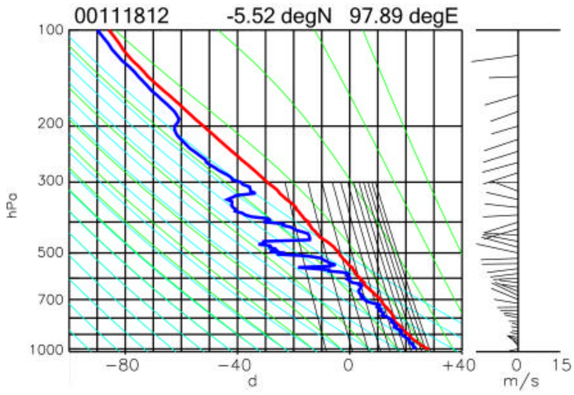


Fig.6.1.2-1 (continue)

(5) Preliminary result

The all observed profiles are shown in Fig. 6.1.2-1.

On the first 3-hourly observation period (for 48 hours from 12Z on 12 Nov. to 12Z on 14 Nov.), relatively dry layer in the middle troposphere were found in the first 24 hours. This layer was not found after 09Z on 13 Nov., when the precipitating system came over the ship. The similar profile continues next 24 hours (from 12Z on 13 Nov), though the precipitating system had gone and wind changed from northeasterly to southwesterly.

On the intermediate 6-hourly observation period (for 30 hours from 12Z on 14 Nov.) and the beginning of second 3-hourly observation period (for 66 hours from 18Z on 15 Nov.), the wind below 600 hPa turned to strong westerly. This westerly layer keep for about three days. Finally the wind turned to easterly.

The more detailed and integrated analyses with the other observed data are the future works.

(6) Data archive

All sounding data have been sent through GTS to meteorological agencies in the world. Raw data are stored in ASCII format and available through JAMSTEC DMO (Data Management Office).

6.1.3 Ceilometer Observations

(1) Personnel

Masaki Katsumata (JAMSTEC):	Principal Investigator - Leg 2 -
Fumitaka Yoshiura (GODI):	Operation Leader - Leg 1, 2 -
Satoshi Okumura (GODI)	- Leg 1-
Wataru Tokunaga (GODI)	- Leg 1, 2 -

(2) Objective

The information of the cloud base height and the liquid water amount around cloud base is important to understand the processes on the formation the cloud. As one of the methods to measure them, the ceilometer observation was carried out.

(3) Methods

We measured cloud base height and backscatter profiles using CT-25K ceilometer (Vaisala, Finland) throughout MR00-K07 cruise from the departure of Sekinehama on 18 October to the arrival of Jakarta on 20 November 2000.

Major parameters for the measurement configuration are as follows;

Laser source:	Indium Gallium Arsenide (InGaAs) Diode Laser
Transmitting wave length:	905 +/- 5 nm at 25 deg-C
Transmitting average power:	8.9 mW
Repetition rate:	5.57 kHz
Detector:	Silicon avalanche photodiode (APD)
	Responsibility at 905 nm: 65 A/W
Measurement range:	0 – 7.5 km
Resolution:	50 ft in full range
Sampling rate:	60 sec.

On the archived dataset, cloud base height and backscatter profile are recorded with the resolution of 30 m (100 ft).

(4) Preliminary results

The results will be public after the analysis.

(5) Data archives

These raw data will be submitted to the Data Management Office (DMO) in JAMSTEC just after the cruise.

Remarks concerning about data quality are as follows;

1. We found the following records missing (mmddhhmm in UTC). The occasional missing might be caused by some communication failure. We used modem line between the ceilometer and the logging PC. We have no idea about the continuous record missing;

10190725, 10191035, 10191036, 10191037, 10201936, 10231811, 10241726, 10241727, 10250256, 10250257, 10250258, 10271001, 10282117, 10282321, 10292221, 10300131, 10310401, 10310402, 11011332, 11011333, 11011345, 11020006, 11020007, 11021436, 11032139,
11051655, 11051655, 11062314, 11070101,
11100542, 11101025, 11101026, 11101421, 11120928,
11121424, 11150326, 11150603, 11150604, 11150605

6.2.1 CTD

(1) Personnel

Keisuke Mizuno	(JAMSTEC): Principal Investigator
Hideaki Hase	(JAMSTEC): Investigator
Atsuo Ito	(MWJ)
Masayuki Fujisaki	(MWJ)
Takeo Matsumoto	(MWJ)
Hiroshi Matsunaga	(MWJ)
Yutaka Matsuura	(MWJ)
Kei Suminaga	(MWJ)
Kentaro Shiraishi	(MWJ)
Masaki Furuhata	(MWJ)
Shinji Narita	(MWJ)
Nakahito Nishikawa	(MWJ)

(2) Objective

Investigation of oceanic structure.

(3) Parameters

Temperature
Conductivity
Pressure
Dissolved Oxygen

(4) Methods

CTD/Carousel Water Sampling System which is a 12-position Calousel water sampler with Sea-Bird Electronics Inc. CTD (SBE9plus) was used during this cruise. 12-litters Niskin Bottles were used for sampling seawater. The sensors attached on CTD were two temperature sensors, two conductivity sensors, pressure sensor, dissolved oxygen sensor, and altimeter. Salinity was calculated by measurement valued of pressure, conductivity and temperature. The CTD/CWS was deployed from star-board on working deck.

The CTD raw data were acquired on real time by using the SEASAVE utility from the SEASOFT software (ver.4.232) provided by SBE and stored on the hard disk of a personal computer. Seawater was sampled during up-cast by sending a fire command from the personal computer. We sampled seawater from 12 layers to calibrate salinity data during at all the stations (except St.C03 2^{nd} cast). In Indian ocean, we sampled seawater at 12 layers for chemical analysis(Table 6.1.2-(1)).

The CTD raw data was processed by using SEASOFT (ver.4.232). Data processing procedures and used utilities of SEASOFT were as follows:

DATCNV: Converts the binary raw data to output on physical units.
This utility selects the CTD data when bottles closed to output on another file.

ALIGNCTD: ALIGNCTD aligns oxygen measurements in time relative to pressure.
Oxygen sensor relative to pressure = 3.0 seconds

DERIVE: DERIVE calculates oxygen data after run ALIGNCTD.

SECTION: Remove the unnecessary data.

WILDEDIT: Obtain an accurate estimate of the true standard deviation of the data.
Std deviation for pass 1: 2
Std deviation for pass 2: 2
Point per block: 100

BINAVG: Calculates the averaged in every 1 db.
ROSSUM: Edits the data of water sampled to output a summary file.
SPLIT: Splits the data made in CNV files into up-cast and down-cast files.

Specifications of the sensors are listed below.
CTD: SBE911plis CTD system

Under water unit: CTD 9plus (S/N 09P21746-0575, Sea-bird Electronics, Inc.).
Temperature sensors:
SBE3-04/F Primary sensor (S/N 031359, Sea-bird Electronics, Inc.).
Calibrated Date: 22 Aug. 2000
SBE3-04/F Secondary sensor (S/N 031523, Sea-bird Electronics, Inc.).
Calibrated Date: 19 Feb. 2000
Conductivity sensors:
SBE4-04/F Primary sensor (S/N 041088, Sea-bird Electronics, Inc.).
Calibrated Date: 22 Aug. 2000
SBE4-04/F Secondary sensor (S/N 041148, Sea-bird Electronics, Inc.).
Calibrated Date: 02 Mar. 2000
Pressure sensor: Digiquartz pressure sensor (S/N 79492).
Calibrated date: 27 Oct. 2000
Deadweight test date: Apr. 2000
Oxygen sensor: SBE13-04 (S/N 130540).
Calibrated date: 06 Jun. 2000
Altimeter: Benthos 2110-2 (S/N 228).
Deck unit: SBE11 (S/N 11P8010-308, Sea-bird Electronics, Inc.).
Carousel water sampler: SBE32 (S/N 3222295-0171, Sea-bird Electronics, Inc.).

(5) Preliminary result

See the attached figures(Fig.6.2.1-(1) – Fig.6.2.1-(10)).

(6) Other remarks

We eliminated spike data which there were at St.C03 (1st cast), St.C04 and St.C05.
At St.C19, We used oxygen data of up-cast, so we acquired bad oxygen data during down cast .

(7) Data archive

All raw and processed CTD data files were copied onto magnet-optical disk (MO) and will be submitted to JAMSTEC Data Management Office (DMO) and will be opened to public via “R/V MIRAI Data Web Post” in JAMSTEC home page under their control.

Stn.	Date(UTC) mm/dd/yy	Time(UTC)		Start Position		Raw data file name	Water Sampling for	Remarks
		Start	End	Latitude	Longitude			
C01	10/21/00	03:58	05:20	29-59.99N	144-19.93E	C01S01.dat	Salinity	
C03	10/30/00	03:58	04:45	00-00.91N	137-53.36E	C03S01.dat	Salinity	after deployment TRITON buoy
C03	10/30/00	05:03	06:02	00-00.73N	137-53.13E	C03S02.dat	Sub standard of salinity measurement	
C04	11/01/00	03:56	04:39	01-59.07N	138-07.55E	C04S01.dat	salinity	after deployment TRITON buoy
C05	11/12/00	15:00	16:24	05-00.09N	090-00.00E	C05S01.dat	D.O. Salinity	
C06	11/12/00	20:55	22:28	04-00.28N	089-59.95E	C06S01.dat	D.O. Salinity	
C07	11/13/00	03:09	04:27	03-00.16N	90-00.21E	C07S01.dat	D.O. Salinity	
C08	11/13/00	08:50	10:32	01-59.95N	090-00.00E	C08S01.dat	D.O. Salinity	
C09	11/13/00	14:48	16:13	00-59.96N	089-59.74E	C09S01.dat	D.O. Salinity	
C10	11/14/00	08:40	10:00	00-00.14N	089-59.77E	C10S01.dat	D.O. Salinity	
C11	11/14/00	14:51	16:13	00-59.94S	090-00.10E	C11S01.dat	D.O. Salinity	
C12	11/14/00	20:50	22:29	02-00.01S	090-00.09E	C12S01.dat	D.O. Salinity	
C13	11/15/00	02:54	04:10	02-59.84S	090-00.02E	C13S01.dat	D.O. Salinity	
C14	11/15/00	08:49	10:09	03-59.97S	089-59.98E	C14S01.dat	D.O. Salinity	
C15	11/15/00	14:51	16:15	04-59.98S	090-00.04E	C15S01.dat	D.O. Salinity	
C16	11/15/00	20:55	22:15	04-59.81S	091-00.11E	C16S01.dat	D.O. Salinity	
C17	11/16/00	02:47	04:08	04-59.84S	091-59.92E	C17S01.dat	D.O. Salinity	
C18	11/16/00	08:48	10:09	05-00.14S	092-59.94E	C18S01.dat	D.O. Salinity	
C19	11/16/00	14:30	15:50	04-59.99S	093-59.87E	C19S01.dat	D.O. Salinity	invalid data: D.O. data(down-cast)
C20	11/17/00	05:57	07:33	04-59.93S	095-00.83E	C20S01.dat	D.O. Salinity	

Table 6.2.1-(1) CTD cast table

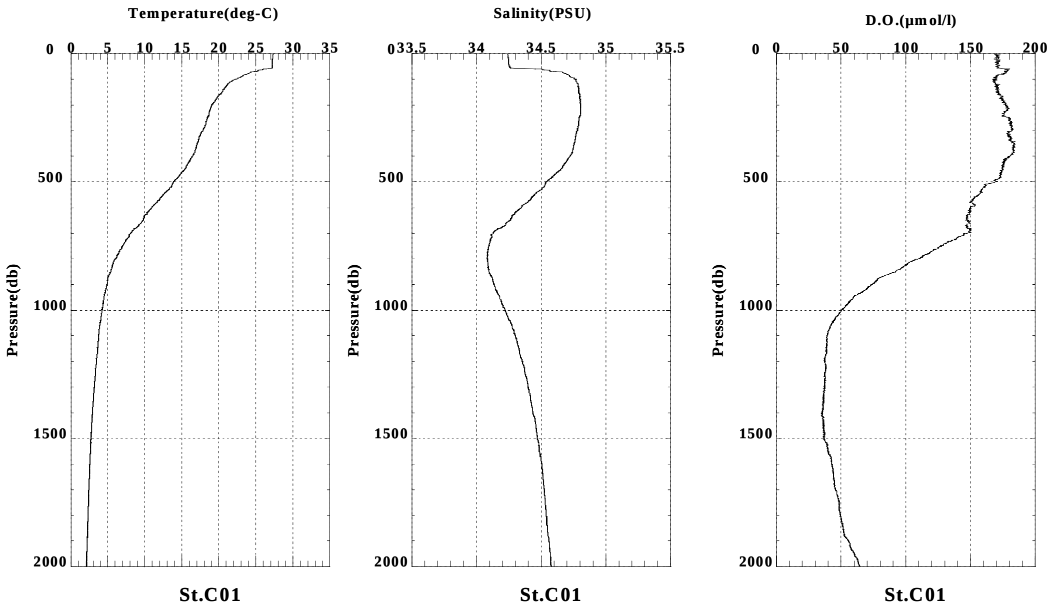

Temperature(deg-C)
0 5 10 15 20 25 30 35
Pressure(db)
0
500
1000
1500
2000
St.C01
Salinity(PSU)
33.5 34 34.5 35 35.5
St.C01
D.O.(μmol/l)
0 50 100 150 200
St.C01

Fig. 6.2.1-(1)

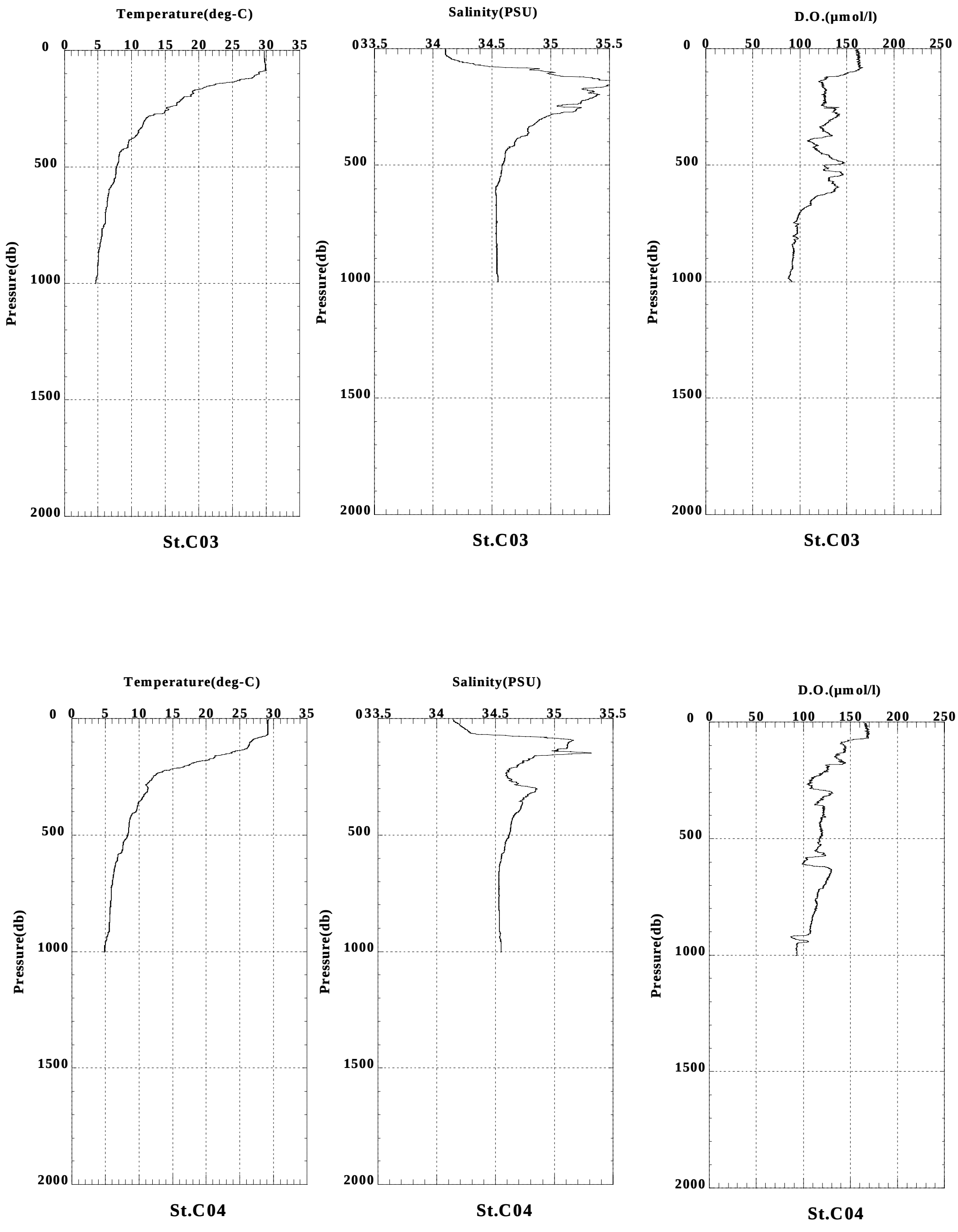

Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C03
St.C03
St.C03
Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C04
St.C04
St.C04

Fig. 6.2.1-(2)

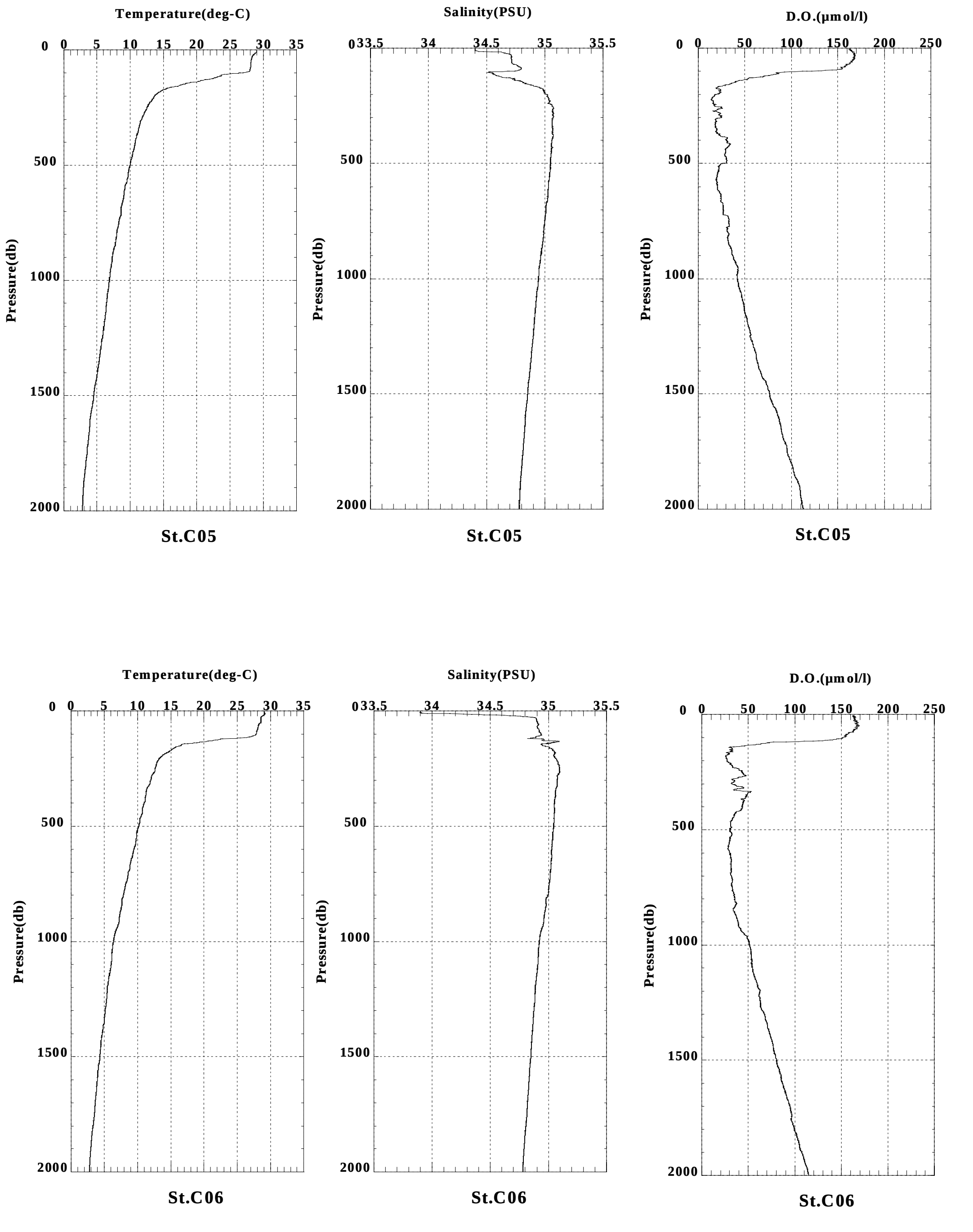

Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C05
St.C05
St.C05
Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C06
St.C06
St.C06

Fig. 6.2.1-(3)

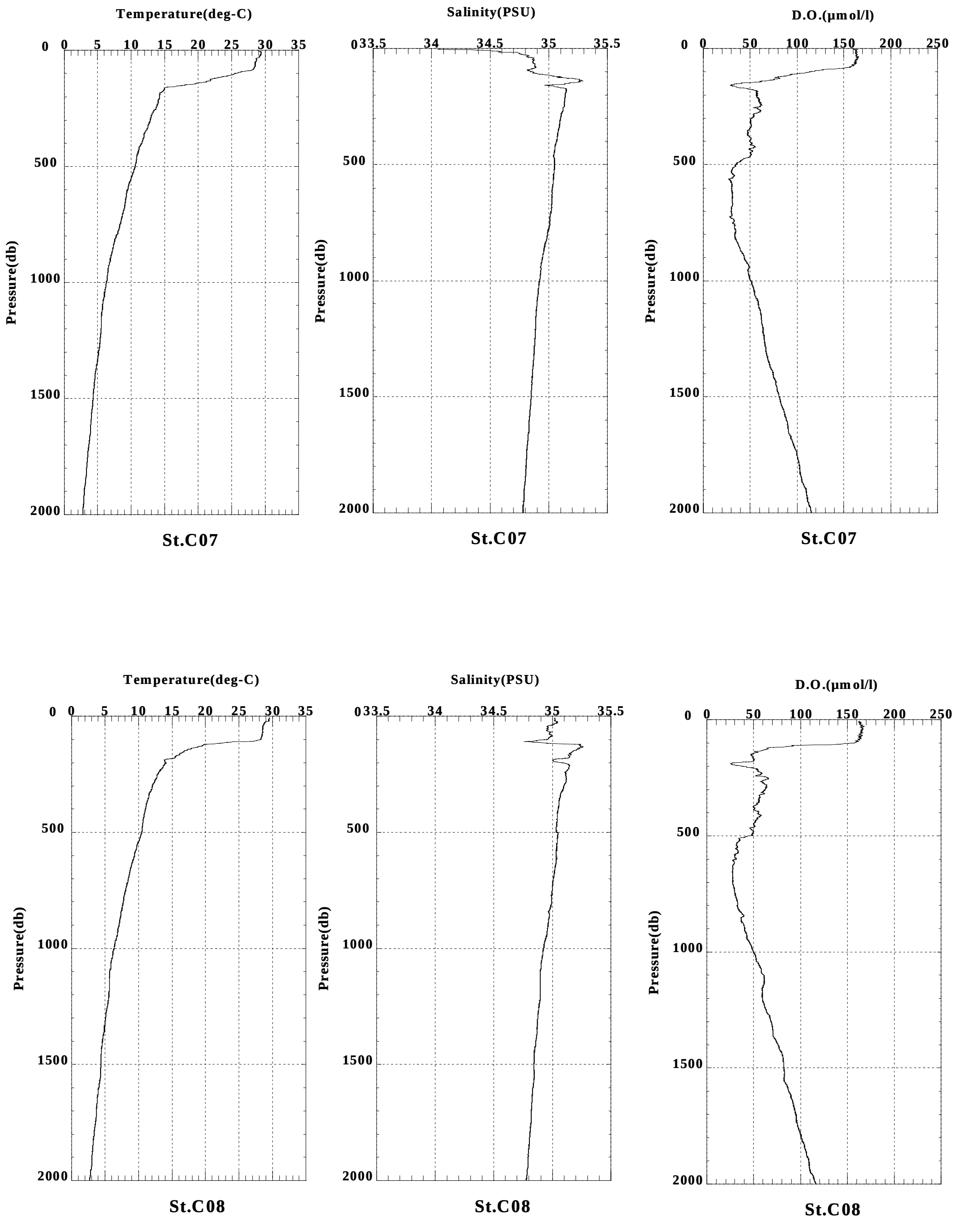

Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
0
500
1000
1500
2000
0 5 10 15 20 25 30 35
33.5 34 34.5 35 35.5
0 50 100 150 200 250
St.C07
St.C08

Fig. 6.2.1-(4)

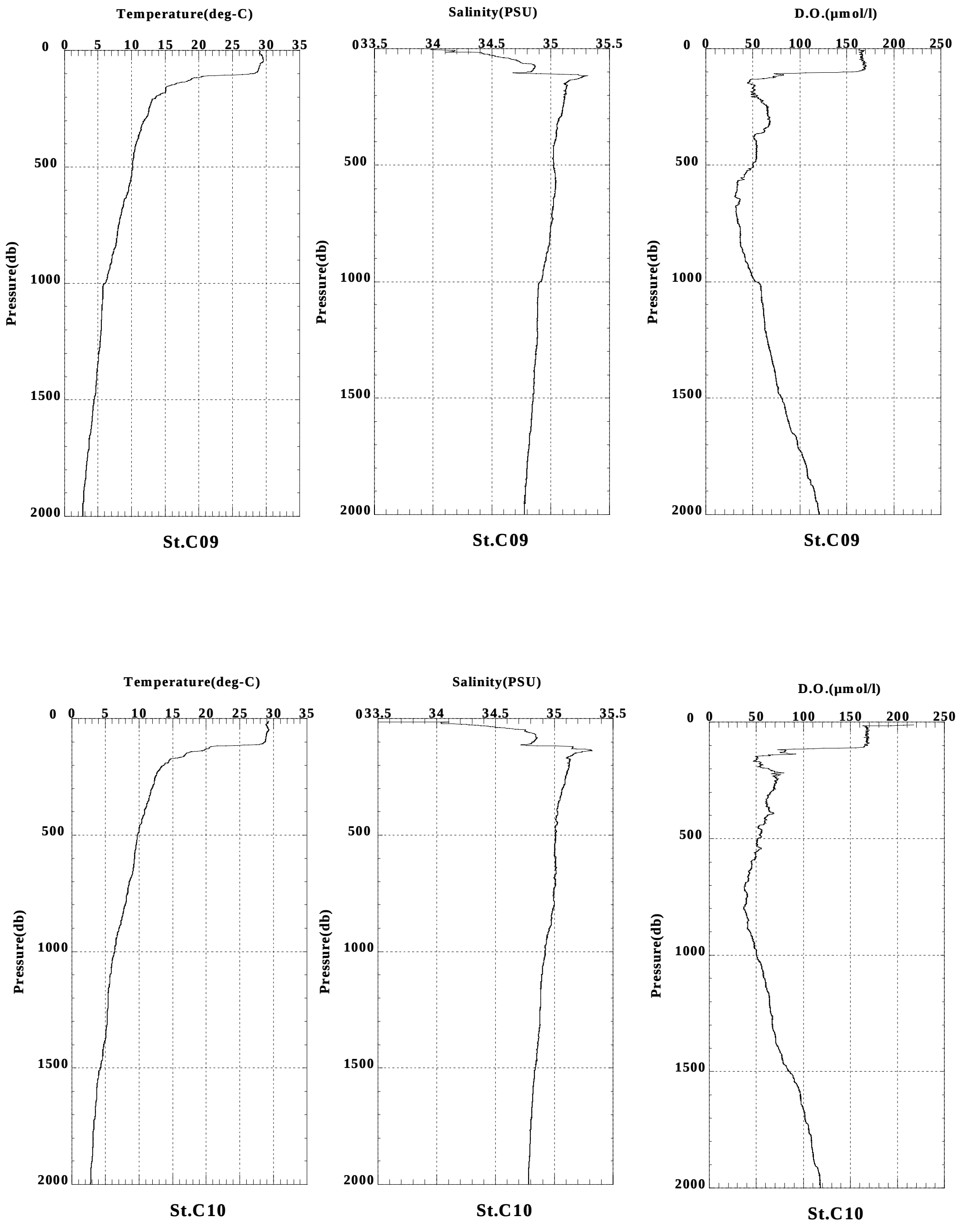

Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C09
St.C10

Fig. 6.2.1-(5)

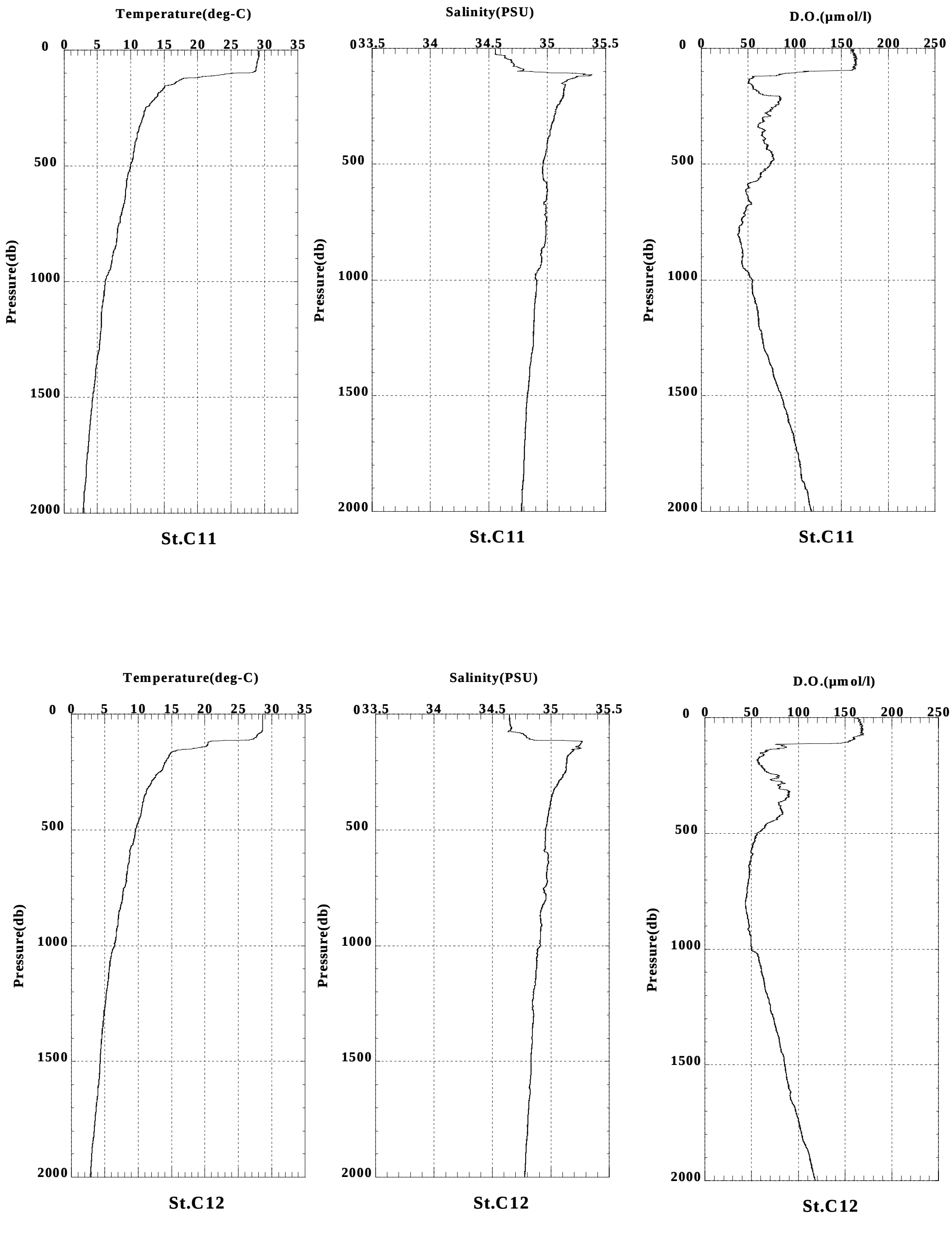

Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
0
500
1000
1500
2000
0 5 10 15 20 25 30 35
33.5 34 34.5 35 35.5
0 50 100 150 200 250
St.C11
St.C11
St.C11
St.C12
St.C12
St.C12

Fig. 6.2.1-(6)

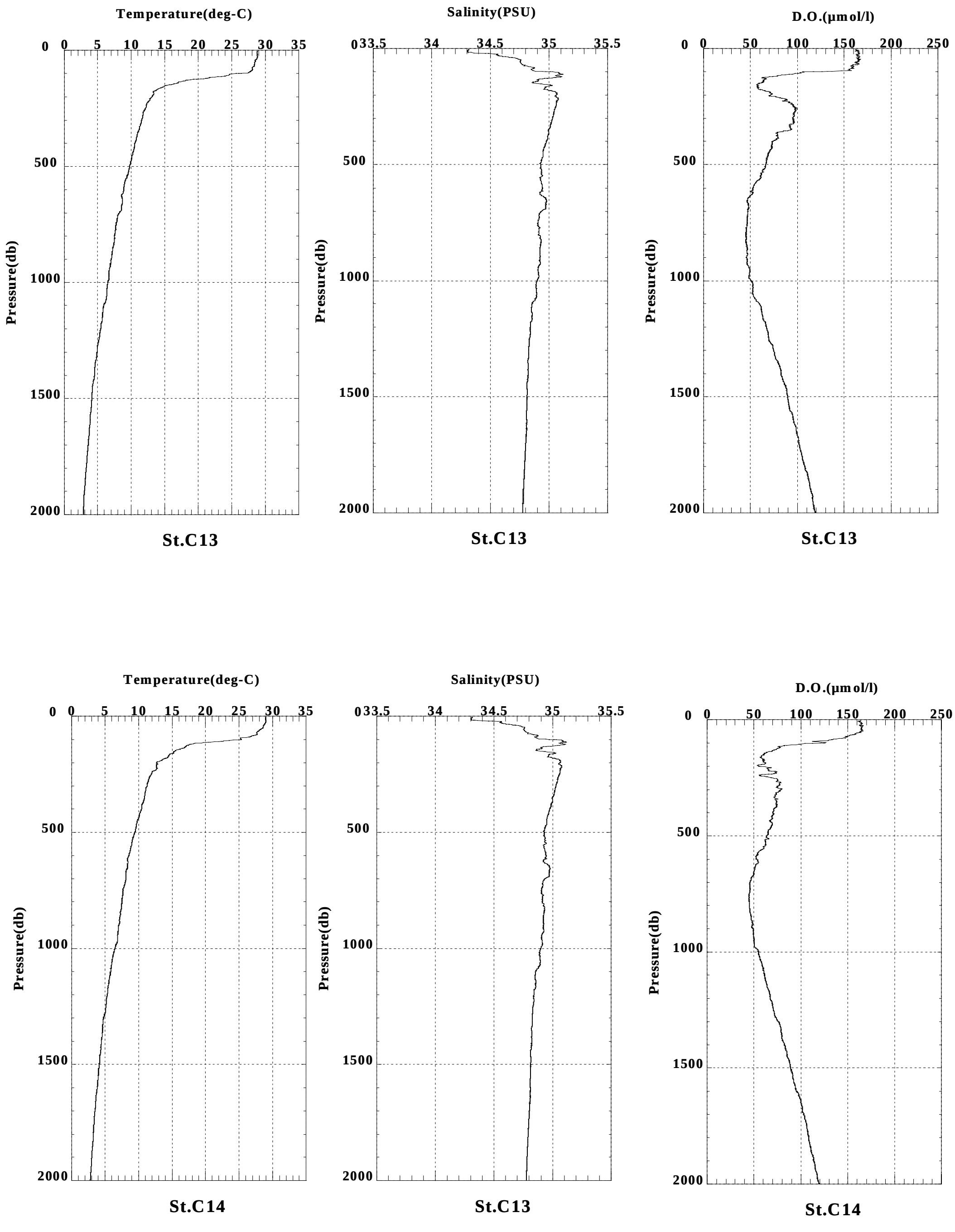

Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C13
St.C13
St.C13
Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C14
St.C13
St.C14

Fig. 6.2.1-(7)

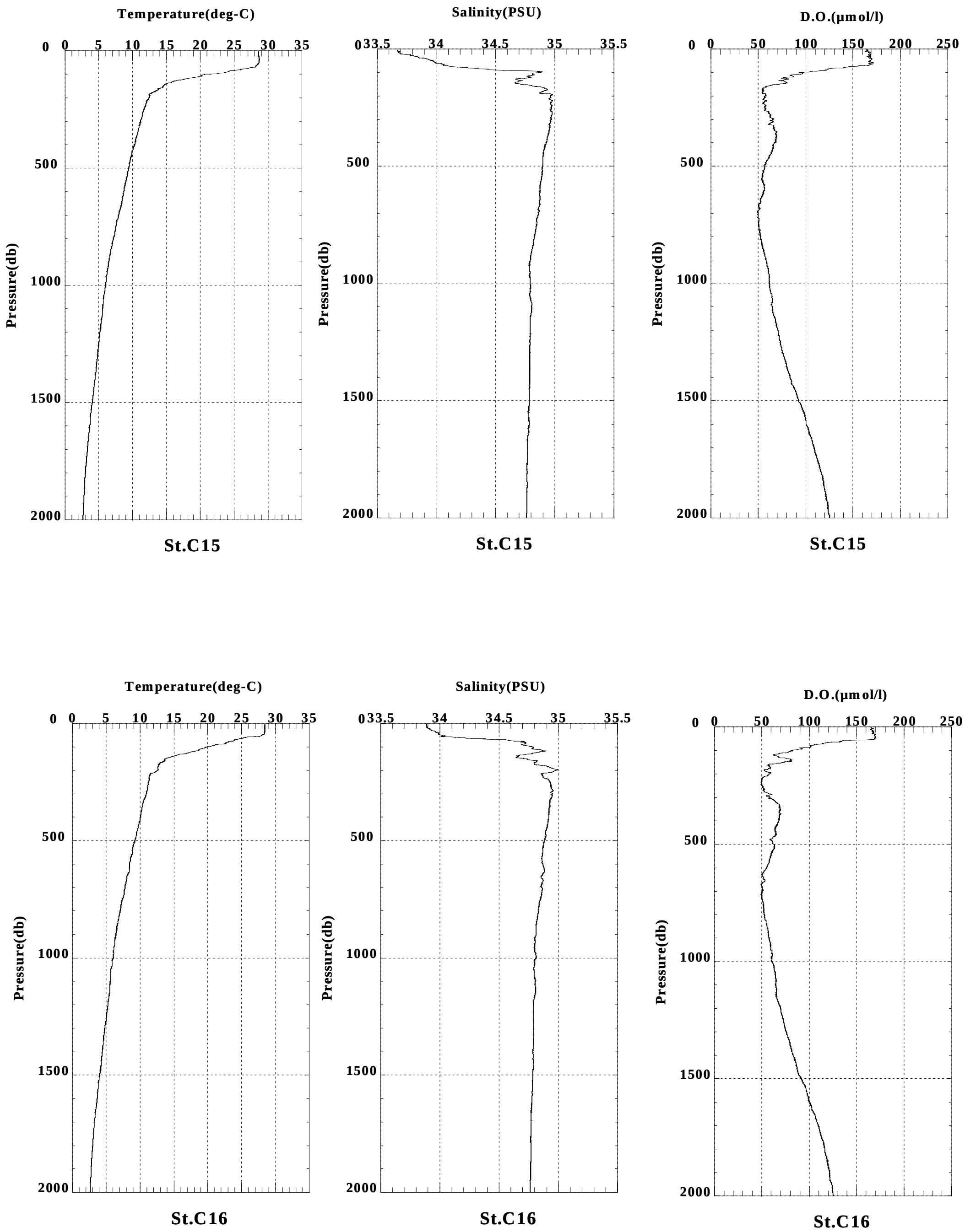
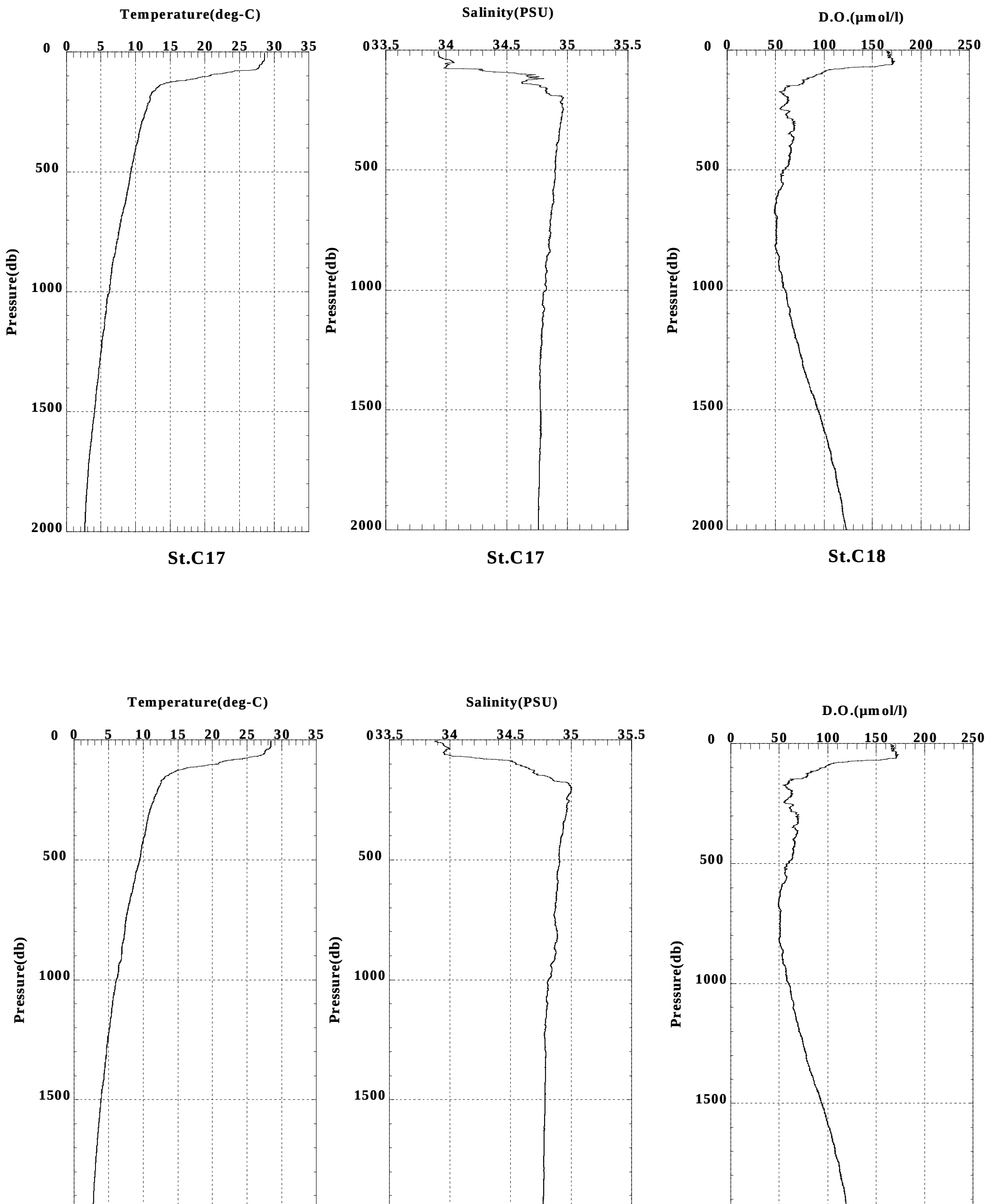

Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
0 5 10 15 20 25 30 35
33.5 34 34.5 35 35.5
0 50 100 150 200 250
0 500 1000 1500 2000
St.C15
St.C15
St.C15
St.C16
St.C16
St.C16

Fig. 6.2.1-(8)



Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C17
St.C17
St.C18
Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C18
St.C18
St.C18

Fig. 6.2.1-(9)

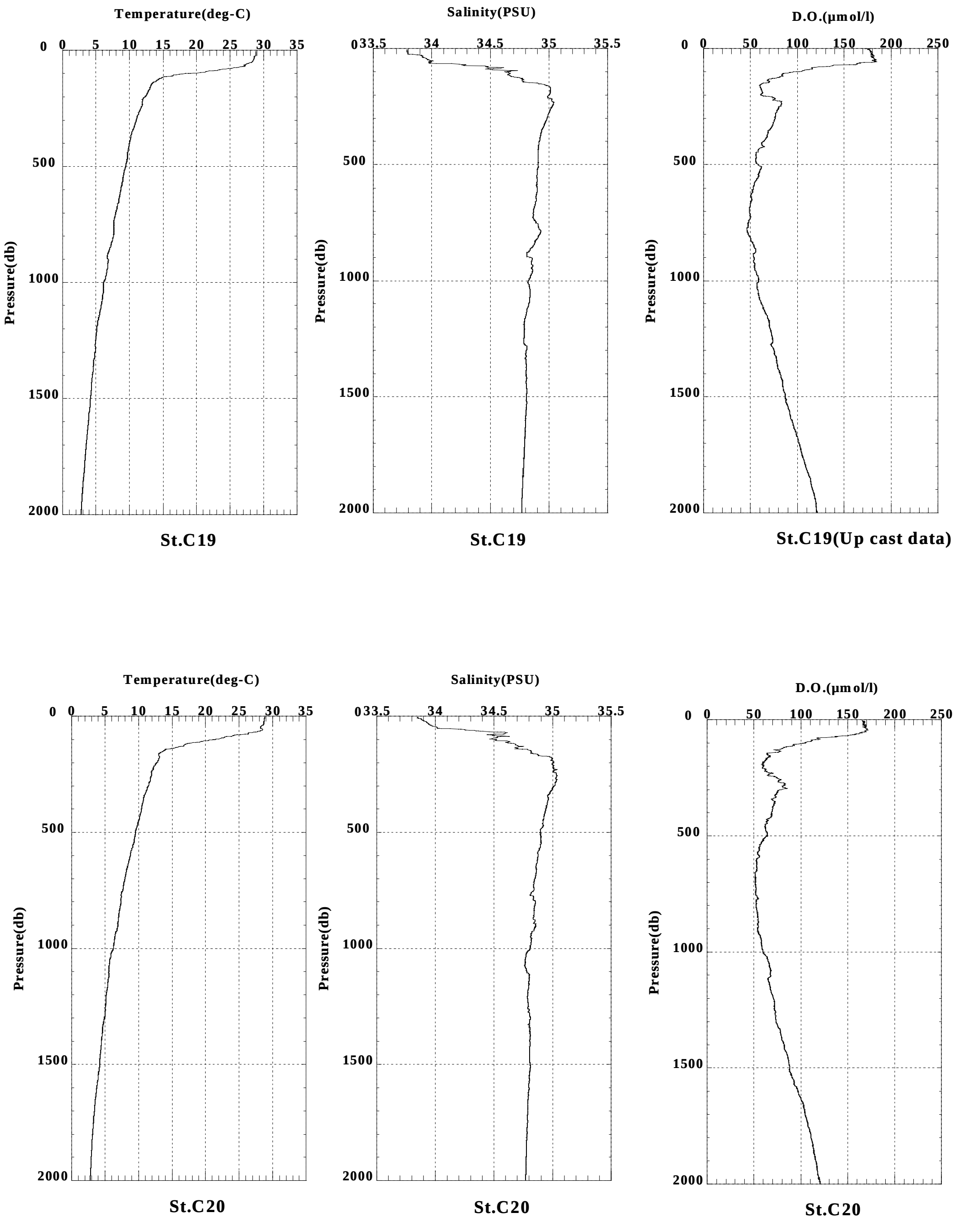

Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C19
St.C19
St.C19(Up cast data)
Temperature(deg-C)
Salinity(PSU)
D.O.(μmol/l)
Pressure(db)
St.C20
St.C20
St.C20

Fig. 6.2.1-(10)

6.2.2. XCTD obserevation

(1) Personnel

Eitaro Oka (FORSGC) : Principal Investigator -Leg1-
Hiroshi Matsuura (FORSGC) -Leg1-
Sumio Masumot (FORSG): Principal Investigator -Leg2-
Keisuke Mizuno (JAMSTEC) -Leg1,2-
Hideaki Hase (JAMSTEC) -Leg1,2-
Masaki Katsumata (JAMSTEC) -Leg2-
Norihumi Ushizima (JAMSTEC) -Leg2-
Fumitaka Yoshiura (GODI) -Leg1,2-
Satoshi Okumura（GODI） -Leg1-
Wataru Tokunaga(GODI) -Leg1,2-
Handoko MANOTO (BPPT) -Leg2-
Sidik MULYONO (BPPT) -Leg2-
Keiichiro Shishido (R/V Mirai Crew) -Leg1,2-
Naoto Morioka (R/V Mirai Crew) -Leg1,2-

(2) Objectives

Investigation of oceanic structure.

(3) Parameters

According to the manufacturer's information, the range and accuracy of parameters measured by the XCTD (eXpendable Conductivity, Temperature & Depth profiler) are as follows;

Parameter	Range	Accuracy
Conductivity	0 – 70 mS/cm	+/ 0.03 mS/cm
Temperature	2 – +35 deg-C	+/ 0.02 deg-C
Depth	0 – 1000 m	

(4) Methods

We observed the vertical profiles of the sea water temperature and salinity measured by the XCTD-1 manufactured by Tsurumi-Seiki Co.. The signal was converted by MK-100, Tsurumi-Seiki Co. and was recorded by WinXCTD software (Ver.1.03) made by Tsurumi-Seiki Co.. We dropped 31 probes (X01-X31) by using hand launcher or automatic launcher.

Table 6.2.2-1 XCTD observation log.

Station	Date	Time	Lat.	Log.	SST	SSS	MD	WD	Probe S/N
X01	2000/10/20	6:02	35-00.01N	143-21.66E	25.4	34.349	1100	5503	00092610
X02	2000/10/20	7:27	34-40.01N	143-27.53E	25.5	34.387	1100	5528	00092615
X03	2000/10/20	8:51	34-19.99N	143-31.63E	25.5	34.399	1100	5677	00092609
X04	2000/10/20	10:14	34-00.00N	143-34.96E	25.9	34.404	1026	5525	00092612
X05	2000/10/20	11:41	33-40.00N	143-38.91E	26.3	34.437	1085	5593	00092608
X06	2000/10/20	13:10	33-20.01N	143-42.42E	25.9	34.427	966	5521	00092611
X07	2000/10/20	14:41	33-00.01N	143-46.44E	26.0	34.439	1017	5417	00092616
X08	2000/10/20	16:11	32-40.00N	143-50.71E	26.0	34.458	1045	5514	00092617
X09	2000/10/20	17:45	32-19.96N	143-54.71E	25.8	34.439	1099	5536	00092618

X10	2000/10/20	19:25	31-59.86N	143-59.86E	26.0	34.505	980	5621	00092621
X11	2000/10/20	20:44	31-40.00N	144-02.41E	25.9	34.434	1100	5847	00092620
X12	2000/10/20	22:09	31-20.02N	144-05.54E	25.9	34.402	1100	5860	00092619
X13	2000/10/20	23:36	31-00.05N	144-08.73E	27.2	34.588	1100	5886	00092758
X14	2000/10/21	1:04	30-40.00N	144-12.56E	27.3	34.640	1100	5839	00092757
X15	2000/10/21	2:32	30-19.85N	144-16.49E	27.4	34.393	1100	5796	00092756
X16	2000/10/21	4:11	29-59.80N	144-20.04E	27.3	34.246	1100	5711	00092749
X17	2000/10/21	6:45	29-40.00N	144-23.63E	27.3	34.286	1100	5876	00092752
X18	2000/10/21	8:08	29-19.99N	144-26.80E	27.5	34.231	1100	5931	00092751
X19	2000/10/21	9:32	29-00.00N	144-30.67E	27.6	34.341	1100	5964	00092753
X20	2000/10/21	10:58	28-40.00N	144-34.16E	27.5	34.300	1100	5964	00092748
X21	2000/10/21	12:25	28-20.00N	144-37.49E	27.9	34.664	1100	5754	00092750
X22	2000/10/21	13:51	28-00.01N	144-40.82E	28.1	34.754	1100	5723	00092747
X23	2000/10/21	15:15	27-40.00N	144-44.42E	27.9	34.496	1100	5564	00092746
X24	2000/10/21	16:40	27-19.99N	144-48.09E	28.2	34.687	1100	5359	00092745
X25	2000/10/21	18:05	27-00.01N	144-51.01E	28.3	34.826	1100	4070	00092694
X26	2000/10/21	19:34	26-40.00N	144-54.36E	28.4	34.796	1100	5110	00092691
X27	2000/10/21	21:01	26-20.07N	144-58.55E	28.4	34.947	1100	3275	00092695
X28	2000/10/21	22:32	26-00.02N	145-01.89E	28.5	35.028	1100	4419	00092696
X29	2000/10/21	23:58	25-39.99N	145-04.99E	28.5	34.728	1046	5201	00092687
X30	2000/10/22	1:26	25-19.99N	145-08.10E	28.6	34.731	1100	5375	00092692
X31	2000/10/22	2:55	25-00.02N	145-12.31E	28.5	34.771	1100	5372	00092693
X32_1	2000/11/10	17:54	06-20.81N	094-59.93E	28.36	32.077	1038	2168	00092685
X32_2	2000/11/10	18:07	06-21.18N	094-57.20E	28.30	32.128	1033	2717	00092688
X33	2000/11/10	19:46	06-24.91N	094-29.94E	28.30	32.642	1035	1559	00092689
X34	2000/11/10	21:41	06-29.08N	094-00.00E	28.60	33.459	1035	1824	00092684
X35	2000/11/11	0:03	06-46.32N	093-30.00E	28.76	33.904	1030	1174	00092686
X36	2000/11/11	2:36	07-14.19N	092-59.99E	28.45	33.680	1100	N/A	00092744
X37	2000/11/11	5:11	07-42.10N	092-30.00E	28.49	33.176	1100	N/A	00092741
X38	2000/11/11	7:36	08-09.49N	091-59.98E	28.50	33.168	1100	2987	00092739
X39	2000/11/11	10:09	08-36.72N	091-29.97E	28.48	33.315	1100	3767	00092734
X40	2000/11/11	12:44	09-05.24N	090-59.81E	28.53	33.135	1035	3544	00092736
X41	2000/11/11	15:16	09-32.78N	090-29.95E	28.50	33.619	1035	3363	00092738
X42	2000/11/11	17:51	09-59.95N	089-59.95E	28.48	33.327	1035	3313	00092740
X43	2000/11/11	20:03	09-30.01N	090-00.04E	28.50	33.721	1100	3298	00092733
X44	2000/11/11	22:06	09-00.00N	090-00.22E	28.58	33.807	1100	3063	00092732
X45	2000/11/12	0:12	08-29.99N	090-00.09E	28.45	33.350	1100	2806	00092731
X46	2000/11/12	2:15	07-59.98N	089-59.89E	28.30	33.242	1080	3243	00061831
X47	2000/11/12	4:22	07-29.98N	090-00.22E	28.42	33.307	1100	2743	00061830
X48	2000/11/12	6:25	07-00.00N	089-59.81E	28.51	33.155	1100	2622	00061829
X49	2000/11/12	8:28	06-29.99N	090-00.23E	28.58	33.396	1100	2819	00062735
X50	2000/11/12	10:32	05-59.92N	089-59.96E	28.8	34.541	1100	2851	00092737
X51	2000/11/12	12:44	05-30.01N	090-00.11E	28.73	34.267	1100	2891	99120563
X52_1	2000/11/12	15:06	05-00.11N	089-59.97E	N/A	N/A	failed	2885	00061828
X52_2	2000/11/12	15:12	05-00.12N	089-59.98E	N/A	N/A	failed	2825	00061827
X52_3	2000/11/12	15:17	05-00.11N	089-59.99E	28.94	34.403	1100	2825	00061826
X52_4	2000/11/12	15:31	05-00.11N	089-59.88E	28.94	34.406	1100	2825	99120558
X53	2000/11/12	18:31	04-29.96N	090-00.16E	28.85	33.821	1067	3247	00061823
X54	2000/11/13	0:49	03-29.99N	089-59.91E	29.07	33.829	1100	2458	00061824
X55	2000/11/13	6:42	02-29.99N	089-59.85E	29.23	34.144	1100	2718	00061820
X56	2000/11/13	12:31	01-29.99N	090-00.07E	29.61	34.696	1043	2300	00061821
X57	2000/11/13	18:18	00-29.99N	089-50.88E	28.99	33.962	1076	3638	00061822
X58_1	2000/11/14	8:48	00-00.14N	089-59.77E	29.39	34.045	1100	4205	00061825
X58_2	2000/11/14	9:02	00-00.17N	089-59.79E	29.32	34.046	1094	4201	00061820

X59	2000/11/14	12:18	00-29.87S	090-00.86E	29.18	34.340	1100	3077	00061859
X60	2000/11/14	18:27	01-30.01S	090-00.75E	28.86	34.555	1100	4168	00061858
X61	2000/11/15	0:40	02-30.00S	090-01.61E	28.72	34.239	1100	3492	00061857
X62	2000/11/15	6:19	03-30.01S	090-00.90E	28.81	34.130	1078	3884	00061860
X63	2000/11/15	12:29	04-30.02S	090-01.29E	28.98	33.840	1100	4648	00061861
X64_1	2000/11/15	15:05	04-59.90S	090-00.26E	28.54	33.681	1100	5008	00061863
X64_2	2000/11/15	15:18	04-59.91S	090-00.46E	28.53	33.642	1100	5011	99063617
X64_3	2000/11/15	15:32	04-59.94S	090-00.55E	28.52	33.639	1100	5014	00061862
X65	2000/11/15	18:16	04-59.99S	090-30.00E	28.52	33.891	1100	5049	00061864
X66	2000/11/16	0:22	04-59.96S	091-30.04E	28.38	33.922	1100	5012	00061865
X67	2000/11/16	6:15	04-59.54S	092-30.00E	28.36	33.993	1100	5006	00061866
X68	2000/11/16	12:10	04-58.96S	093-30.03E	28.61	33.933	1100	4793	00061867
X69	2000/11/16	17:57	04-53.50S	094-30.01E	28.79	33.870	1073	4984	00061868
X70	2000/11/17	6:05	04-59.90S	095-00.11E	28.85	33.849	1100	5009	00061832
X71	2000/11/18	0:15	05-10.56S	095-30.02E	28.68	33.882	979	5020	00061844
X72	2000/11/18	2:33	05-16.83S	096-00.02E	29.09	33.981	1000	5016	00061843
X73	2000/11/18	4:50	05-24.04S	096-30.19E	29.08	33.930	1100	5218	00061833
X74	2000/11/18	7:09	05-25.63S	097-00.00E	29.22	33.981	1100	4539	00061841
X75	2000/11/18	9:24	05-28.77S	097-30.06E	29.31	34.004	1020	4818	00061813
X76	2000/11/18	11:44	05-33.90S	097-59.94E	29.07	33.870	1034	5194	00061839
X77	2000/11/18	13:57	05-38.98S	098-30.08E	28.81	33.733	1036	5266	00061838
X78	2000/11/18	16:06	05-42.92S	099-00.01E	28.92	33.823	1036	5605	00061835
X79	2000/11/18	18:17	05-47.74S	099-30.06E	29.13	33.874	1036	5174	00061836
X80	2000/11/18	20:27	05-53.02S	100-00.05E	29.01	33.264	1036	5288	00061837
X81	2000/11/18	22:34	05-58.06S	100-30.05E	28.92	33.578	1029	4929	00061834
X82	2000/11/19	0:45	06-03.66S	101-00.02E	28.88	33.724	1100	5544	00061816
X83	2000/11/19	3:01	06-10.22S	101-30.02E	28.63	33.372	1100	6153	00061809
X84	2000/11/19	5:17	06-14.14S	102-00.01E	28.66	33.392	957	3804	00061808
X85	2000/11/19	7:28	06-19.34S	102-30.00E	28.63	33.150	1100	3051	00061812
X86	2000/11/19	9:36	06-24.69S	103-00.00E	28.62	33.361	1100	1728	00061811
X87	2000/11/19	11:41	06-30.01S	103-30.02E	N/A	N/A	1100	990	00061818
X88	2000/11/19	13:52	06-26.97S	104-00.05E	N/A	N/A	1028	1933	00061840
X89	2000/11/19	15:59	06-24.23S	104-30.03E	N/A	N/A	1035	1060	00061810

Acronyms in Table 6.2.2-1 are as follows;

SST: Sea surface temperature [deg-C] measured by Continuous Sea Surface Monitoring System
SSS: Sea surface salinity [PSU] measured by Continuous Sea Surface Monitoring System
MD: Maximum measured depth [m]
WD: Water Depth [m]

(5) Preliminary result

Vertical sections are shown in the following figures combined with CTD data. Fig. 6.2.2-1 and Fig. 6.2.2-2 are temperature and salinity plots along ship's track from 35N to 25N, Fig. 6.2.2-3 and Fig. 6.2.2-4 are along ship's track from 95E to 90E, Fig. 6.2.2-5 and Fig. 6.2.2-6 are along 90E, Fig. 6.2.2-7 and Fig. 6.2.2-8 are along 5S respectively.

(6) Data archive

XCTD data obtained during this cruise will be submitted to the DMO (Data Management Office), JAMSTEC and will be available via "R/V Mirai Data Web Page" in JAMSTEC home page.

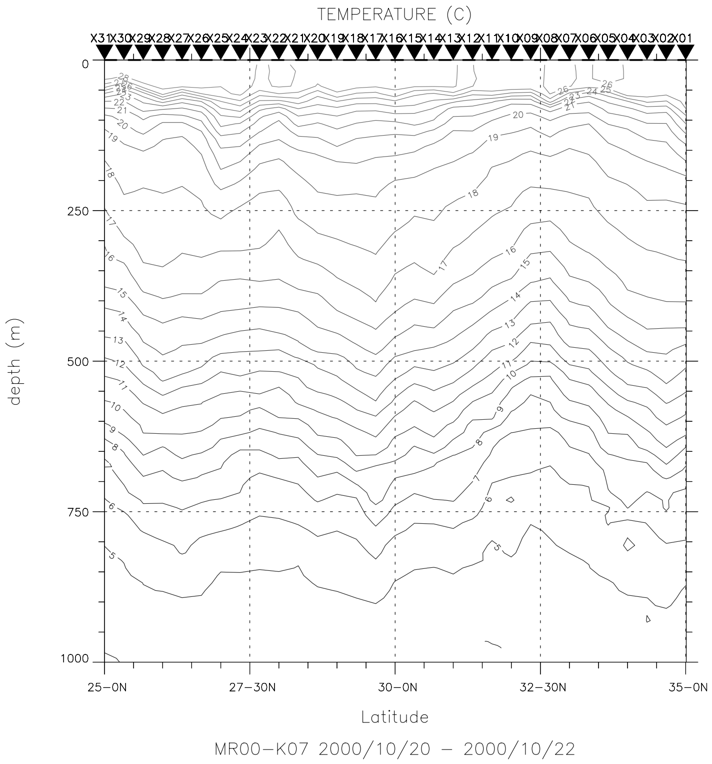


Fig. 6.2.2-1 Temperature along Ship's track from 35N to 25N

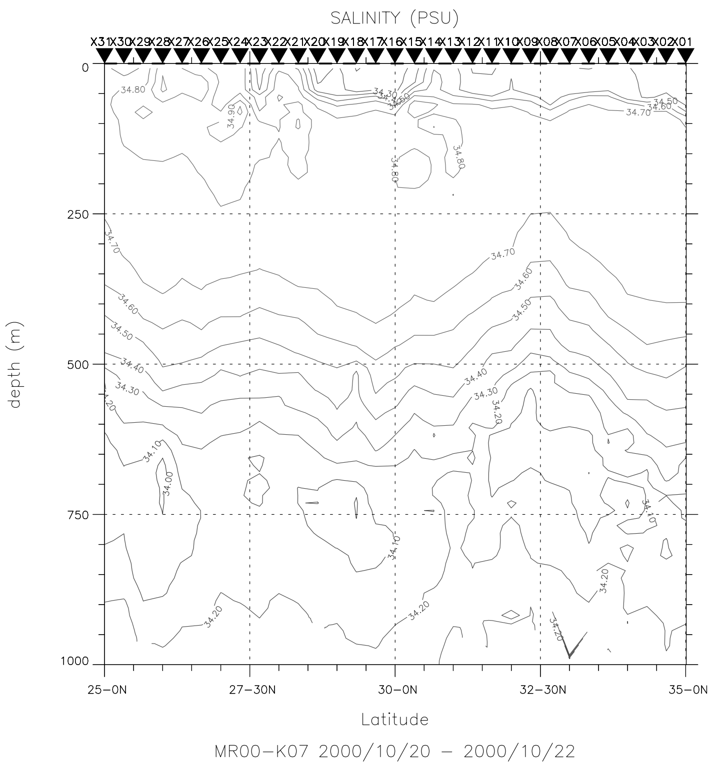


Fig. 6.2.2-2 Salinity along ship's track from 35N to 25N

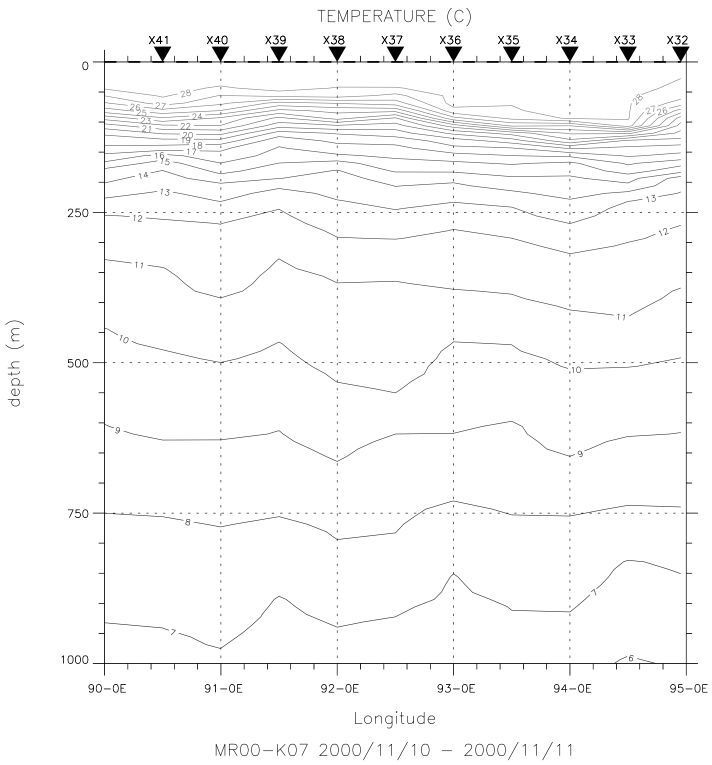


Fig. 6.2.2-3 Temperature along ship's track from 95E to 90E

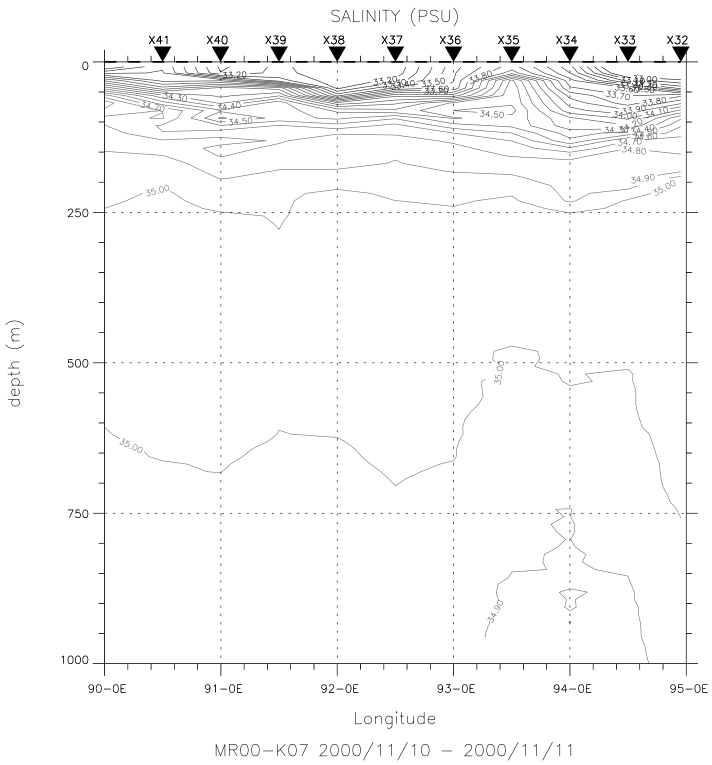


Fig. 6.2.2-4 Salinity along ship's track from 95E to 90E

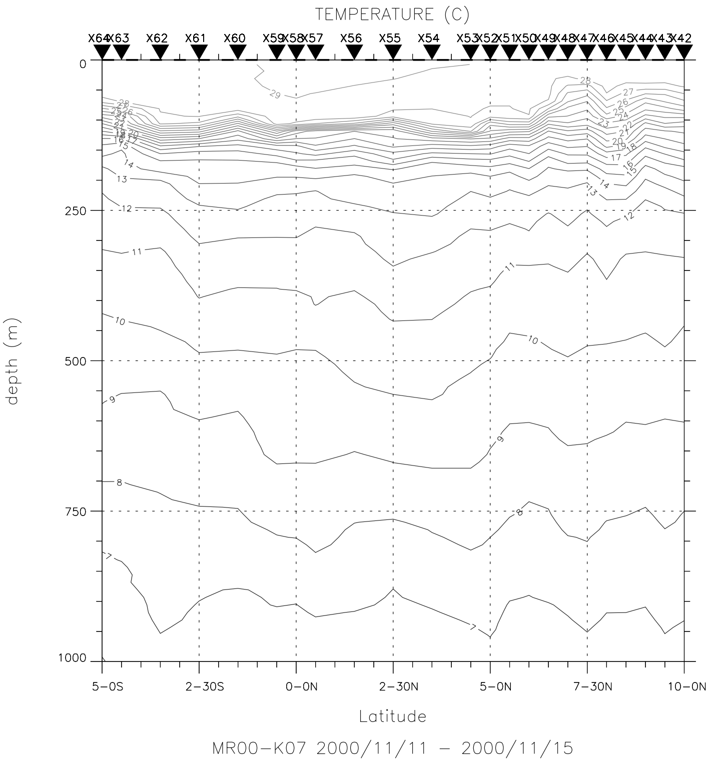


Fig. 6.2.2-5 Temperature along 90E

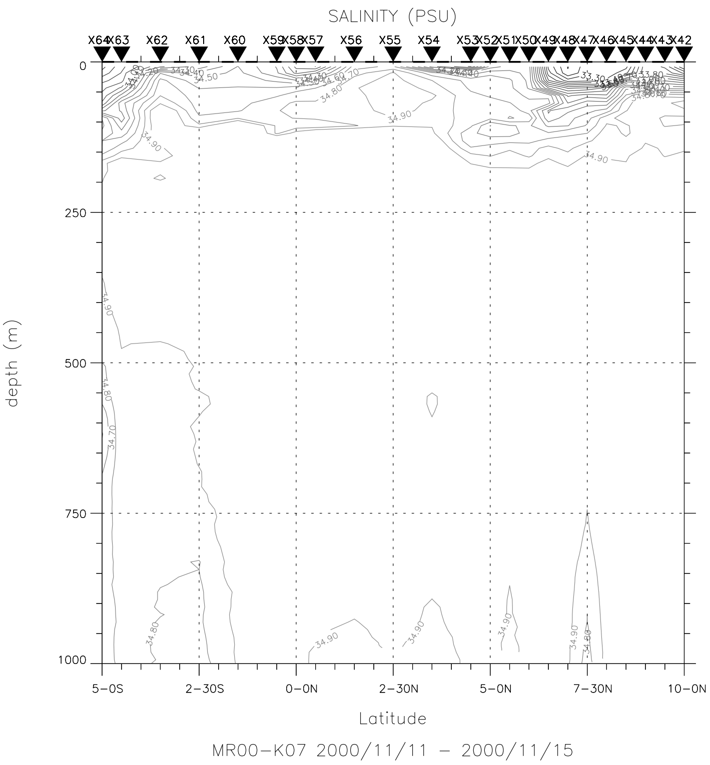


Fig. 6.2.2-6 Salinity along 90E

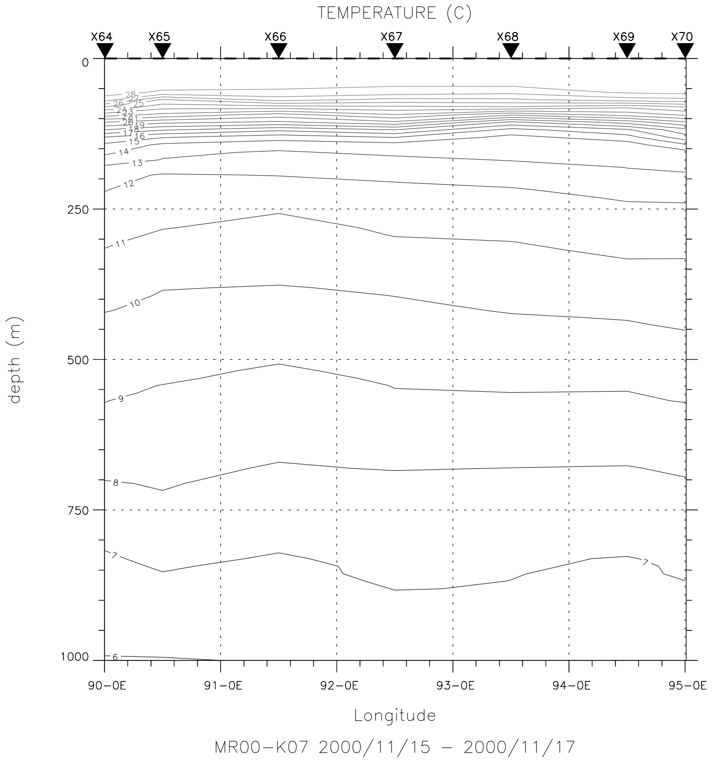


Fig. 6.2.2-7 Temperature along 5S

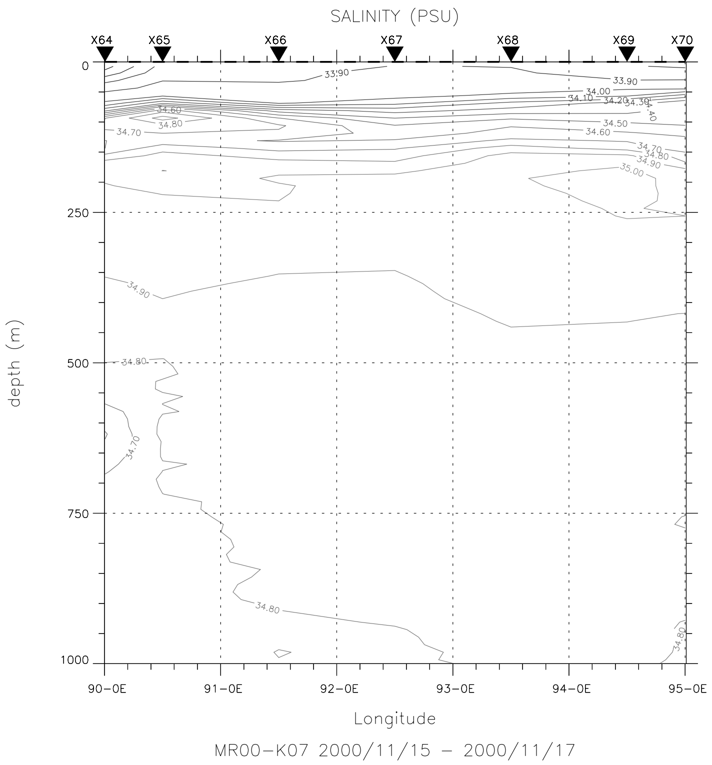


Fig. 6.2.2-8 Salinity along 5S

6.2.3. Salinity measurements of sampled seawater for validation of CTD salinity data

(1) Personnel

Atsuo Ito(MWJ):Operation Leader
Masayuki Fujisaki(MWJ)
Takeo Matsumoto(MWJ)

(2) Objectives

To check the quality of CTD

(3) Parameters

Salinity of sampled water

(4) Method

Seawater samples were collected from the 12 sampling layer of Niskin Sampling Bottle. Sampling layer at St.C01 are 2000db, 1600db, 1200db, 800db, 600db, 400db, 300db, 200db, 100db, 50db, 25db, 10db, at St.C02-St.C04 are 1000db, 700db, 500db, 300db, 250db, 200db, 125db, 100db, 75db, 50db, 25db, 10db and at St.C05-C20 are 2000db, 1500db, 1000db, 800db, 600db, 500db, 400db, 300db, 200db, 150db, 100db, 50db. Also seawater samples were collected from surface seawater by using a bucket at every CTD station. The bottles in which the salinity samples were collected and stored were 250 ml Phoenix brown glass bottles with screw caps. Each bottles were rinsed three times and filled with sample water. Salinity samples were stored in the same laboratory as the salinity measurement was made.

The salinity measurements were carried out using the laboratory salinometer (Model 8400B AUTOSAL S/N 62823; Guildline Instruments Ltd.), which was modified by addition of an Ocean Scientific International peristaltic-type sample intake pump, with a bath temperature 24 deg-C. The instrument was operated in the “AUTOSAL Room” of R/V Mirai. A double conductivity ratio was defined as a median of 31 readings of the salinometer. Data collection was started after 15 data readings and it took about 10 seconds by a personal computer. We obtained two conductivity readings for each sample, and averaged values were used to calculate salinity [for each sample]. The salinometer was standardized with IAPSO Standard Seawater batch P137 whose conductivity ratio is 0.99995(salinity 34.998 psu). Sub-standard seawater was used to check the drift of the AUTOSAL and measured in every 6 samples.

(5) Results

Measured data of all samples were shown in Table 6.2.3-1 and Table 6.2.3-2. Salinity comparison between CTD data and AUTOSAL data sampled were shown in Fig. 6.2.3-1 and Fig. 6.2.3-2 for Leg.1, and Fig. 6.2.3-3 and Fig. 6.2.3-4 for Leg.2.

(6) Data archive

The data of sample will be submitted to the Data Management Office (DMO) in JAMSTEC together with the MO disk of CTD data in this cruise.

Table.6.2.3-1 Salinity comparison between CTD and AUTOSAL
(CTD1:primary sensor,CTD2:secondary sensor)

Station	Bottle	Pres(CTD)	Temp(CTD1)	Sal(CTD1)	Sal(Bottle)	Diff(CTD1-Btl)	Temp(CTD2)	Sal(CTD2)	Diff(CTD2-Btl)
C01	0	1.000	27.2638	34.2427	34.2610	-0.0183	27.2636	34.2497	-0.0113
C01	1	2001.190	2.0730	34.5770	34.5794	-0.0024	2.0720	34.5821	0.0027
C01	2	1600.496	2.5194	34.5028	34.5072	-0.0044	2.5186	34.5079	0.0007
C01	3	1200.271	3.4336	34.3517	No Data		3.4327	34.3569	
C01	4	800.991	6.0151	34.0760	34.0820	-0.0060	6.0170	34.0828	0.0008
C01	5	599.875	11.1645	34.3543	34.3587	-0.0044	11.1651	34.3617	0.0030
C01	6	399.859	16.4614	34.7167	34.7263	-0.0096	16.4687	34.7248	-0.0015
C01	7	300.092	17.8866	34.7700	34.7790	-0.0090	17.8851	34.7781	-0.0009
C01	8	200.166	19.0357	34.7929	34.8008	-0.0079	19.0355	34.8004	-0.0004
C01	9	100.515	22.4791	34.7389	34.7444	-0.0055	22.5019	34.7434	-0.0010
C01	10	49.860	27.2031	34.2484	34.3375	-0.0891	27.2048	34.2563	-0.0812
C01	11	25.208	27.2199	34.2438	34.2548	-0.0110	27.2191	34.2512	-0.0036
C01	12	9.783	27.2690	34.2423	34.2521	-0.0098	27.2675	34.2498	-0.0023
C03	0	1.000	29.7402	34.1060	34.1304	-0.0244	29.7405	34.1109	-0.0195
C03	1	1000.070	4.6619	34.5475	34.5485	-0.0010	4.662	34.548	-0.0005
C03	2	700.458	6.0631	34.5357	34.5377	-0.0020	6.0629	34.5376	-0.0001
C03	3	499.760	7.6823	34.5775	34.5794	-0.0019	7.6824	34.5802	0.0008
C03	4	298.707	12.0449	34.9282	34.9256	0.0026	12.0498	34.9324	0.0068
C03	5	250.608	15.2073	35.0293	35.0659	-0.0366	15.2152	35.0355	-0.0304
C03	6	199.518	17.7778	35.3667	35.3896	-0.0229	17.8088	35.3681	-0.0215
C03	7	125.370	26.0754	35.3242	35.3464	-0.0222	26.0789	35.3298	-0.0166
C03	8	99.297	28.9667	35.0030	35.0190	-0.0160	28.9613	35.006	-0.0130
C03	9	75.083	29.8665	34.4937	34.5098	-0.0161	29.8685	34.4955	-0.0143
C03	10	49.390	29.8030	34.2160	34.2473	-0.0313	29.8036	34.2235	-0.0238
C03	11	24.883	29.7165	34.1121	34.1228	-0.0107	29.7154	34.1169	-0.0059
C03	12	9.211	29.7418	34.1065	34.1156	-0.0091	29.7408	34.1109	-0.0047
C04	0	1.000	29.3323	34.1402	34.1536	-0.0134	29.3265	34.1442	-0.0094
C04	1	1001.084	4.8478	34.5469	34.5471	-0.0002	4.8487	34.5457	-0.0014
C04	2	700.061	6.0459	34.5229	34.5247	-0.0018	6.0459	34.5231	-0.0016
C04	3	500.460	8.2851	34.6070	34.6091	-0.0021	8.2872	34.6085	-0.0006
C04	4	301.150	11.2685	34.8358	34.8369	-0.0011	11.2679	34.8374	0.0005
C04	5	250.116	12.0292	34.5882	34.5932	-0.0050	12.0427	34.5919	-0.0013
C04	6	200.954	16.8796	34.6604	34.6679	-0.0075	16.9094	34.6659	-0.0020
C04	7	124.883	26.2099	35.0935	35.1033	-0.0098	26.2003	35.0976	-0.0057
C04	8	100.148	26.7117	35.1347	35.1308	0.0039	26.7209	35.1396	0.0088
C04	9	75.069	29.1262	34.4031	34.4209	-0.0178	29.1257	34.3968	-0.0241
C04	10	50.215	29.1597	34.2367	34.2542	-0.0175	29.1594	34.2401	-0.0141
C04	11	25.097	29.1692	34.1818	34.1966	-0.0148	29.1686	34.1843	-0.0123
C04	12	10.272	29.1730	34.1442	34.1542	-0.0100	29.1721	34.1464	-0.0078

Table. 6.2.3-2 Salinity comparison between CTD and AUTOSAL
(CTD1:primary sensor, CTD2:secondary sensor)

Station	Bottle	Pres(CTD)	Temp(CTD1)	Sal(CTD1)	Sal(Bottle)	Diff(CTD1-Btl)	Temp(CTD2)	Sal(CTD2)	Diff(CTD2-Btl)
C05	0	1.000	28.9171	34.4099	34.4476	-0.0377	28.9173	34.4123	-0.0353
C05	1	1999.944	2.7471	34.7775	34.7789	-0.0014	2.7472	34.7772	-0.0017
C05	2	1500.963	4.4665	34.8490	34.8507	-0.0017	4.4654	34.8495	-0.0012
C05	3	1000.213	6.8095	34.9409	34.9411	-0.0002	6.8092	34.9413	0.0002
C05	4	800.363	7.8259	34.9812	34.9813	-0.0001	7.8236	34.9825	0.0012
C05	5	599.846	9.1426	35.0227	35.0220	0.0007	9.1420	35.0234	0.0014
C05	6	500.243	9.9561	35.0398	35.0405	-0.0007	9.9559	35.0410	0.0005
C05	7	399.862	10.7101	35.0525	35.0543	-0.0018	10.7094	35.0532	-0.0011
C05	8	300.517	11.6620	35.0616	35.0602	0.0014	11.6624	35.0625	0.0023
C05	9	200.271	13.4510	35.0040	35.0101	-0.0061	13.4507	35.0051	-0.0050
C05	10	149.795	16.3029	34.8539	34.8599	-0.0060	16.3060	34.8562	-0.0037
C05	11	100.521	27.3163	34.7528	34.7352	0.0176	27.3242	34.7552	0.0200
C05	12	50.355	28.1194	34.7039	34.7212	-0.0173	28.1201	34.7067	-0.0145
C06	0	1.000	29.1132	33.9209	33.9355	-0.0146	29.1146	33.9219	-0.0136
C06	1	2000.495	2.7505	34.7782	34.7796	-0.0014	2.7491	34.7769	-0.0027
C06	2	1500.120	4.2893	34.8457	34.8462	-0.0005	4.2884	34.8451	-0.0011
C06	3	1000.628	6.3947	34.9198	34.9203	-0.0005	6.3942	34.9194	-0.0009
C06	4	799.978	7.8761	34.9885	34.9889	-0.0004	7.8757	34.9885	-0.0004
C06	5	600.459	9.3460	35.0192	35.0214	-0.0022	9.3447	35.0193	-0.0021
C06	6	500.068	10.1013	35.0377	35.0376	0.0001	10.1105	35.0362	-0.0014
C06	7	399.328	10.9438	35.0419	35.0419	0.0000	10.9435	35.0416	-0.0003
C06	8	300.922	11.9376	35.0666	35.0681	-0.0015	11.9294	35.0672	-0.0009
C06	9	200.792	13.4393	35.0360	35.0355	0.0005	13.4438	35.0361	0.0006
C06	10	150.169	16.4587	34.9228	34.9374	-0.0146	16.4590	34.9249	-0.0125
C06	11	100.357	27.7584	34.9237	34.9156	0.0081	27.7604	34.9261	0.0105
C06	12	50.062	28.5018	34.8962	34.9079	-0.0117	28.5225	34.8978	-0.0101
C07	0	1.000	29.0414	34.0958	34.0862	0.0096	29.0437	34.1000	0.0138
C07	1	2001.652	2.7341	34.7780	34.7795	-0.0015	2.7332	34.7761	-0.0034
C07	2	1500.362	4.2675	34.8459	34.8467	-0.0008	4.2666	34.8446	-0.0021
C07	3	1000.490	6.3537	34.9221	34.9228	-0.0007	6.3530	34.9209	-0.0019
C07	4	800.049	7.7990	34.9821	34.9832	-0.0011	7.7995	34.9817	-0.0015
C07	5	600.185	9.5312	35.0264	35.0273	-0.0009	9.5323	35.0257	-0.0016
C07	6	498.189	10.5151	35.0407	35.0432	-0.0025	10.5145	35.0398	-0.0034
C07	7	399.482	11.2142	35.0476	35.0470	0.0006	11.2178	35.0474	0.0004
C07	8	297.462	12.6547	35.0851	35.0862	-0.0011	12.6592	35.0844	-0.0018
C07	9	199.806	14.0351	35.1245	35.1275	-0.0030	14.0398	35.1242	-0.0033
C07	10	149.693	15.2446	34.9391	34.9859	-0.0468	15.2713	34.9426	-0.0433
C07	11	99.318	25.5627	34.8679	34.8772	-0.0093	25.5556	34.8669	-0.0103
C07	12	49.565	28.5235	34.8654	34.8762	-0.0108	28.5272	34.8671	-0.0091
C08	0	1.000	29.5775	34.9995	35.0283	-0.0288	29.5833	34.9993	-0.0290
C08	1	1999.135	2.7191	34.7771	34.7782	-0.0011	2.7174	34.7755	-0.0027
C08	2	1501.022	4.3775	34.8424	34.8402	0.0022	4.3771	34.8408	0.0006
C08	3	999.808	6.2368	34.9175	34.9159	0.0016	6.2369	34.9162	0.0003
C08	4	799.894	7.7373	34.9870	34.9870	0.0000	7.7371	34.9859	-0.0011
C08	5	599.558	9.3778	35.0279	35.0279	0.0000	9.3770	35.0273	-0.0006
C08	6	500.432	10.5137	35.0265	35.0271	-0.0006	10.5141	35.0252	-0.0019
C08	7	400.043	11.1340	35.0463	35.0467	-0.0004	11.1342	35.0456	-0.0011
C08	8	300.026	12.1428	35.0921	35.0917	0.0004	12.1436	35.0913	-0.0004
C08	9	201.707	14.0559	35.0928	35.0882	0.0046	14.0585	35.0918	0.0036
C08	10	150.482	16.6612	35.1438	35.1447	-0.0009	16.6809	35.1417	-0.0030
C08	11	100.360	27.4403	34.8337	34.8660	-0.0323	27.4532	34.8375	-0.0285
C08	12	49.529	28.5914	34.9573	34.9650	-0.0077	28.5925	34.9581	-0.0069

Table. 6.2.3-2 Salinity comparison between CTD and AUTOSAL
(CTD1:primary sensor, CTD2:secondary sensor)

Station	Bottle	Pres(CTD)	Temp(CTD1)	Sal(CTD1)	Sal(Bottle)	Diff(CTD1-Btl)	Temp(CTD2)	Sal(CTD2)	Diff(CTD2-Btl)
C09	0	1.000	29.0869	34.0157	34.0226	-0.0069	29.0922	34.0047	-0.0179
C09	1	2001.410	2.6668	34.7739	34.7737	0.0002	2.6665	34.7713	-0.0024
C09	2	1500.860	4.3801	34.8460	34.8466	-0.0006	4.3797	34.8440	-0.0026
C09	3	1001.041	6.0557	34.9119	34.9111	0.0008	6.0574	34.9111	0.0000
C09	4	800.381	7.7458	34.9886	34.9891	-0.0005	7.7451	34.9874	-0.0017
C09	5	599.983	9.4975	35.0334	35.0338	-0.0004	9.4974	35.0322	-0.0016
C09	6	500.658	10.1163	35.0171	35.0175	-0.0004	10.1156	35.0156	-0.0019
C09	7	400.220	10.6265	35.0258	35.0257	0.0001	10.6269	35.0244	-0.0013
C09	8	300.552	11.7125	35.0572	35.0573	-0.0001	11.7162	35.0557	-0.0016
C09	9	200.947	13.6011	35.1031	35.1023	0.0008	13.6018	35.1017	-0.0006
C09	10	150.431	15.9447	35.0974	35.1013	-0.0039	15.9699	35.0973	-0.0040
C09	11	100.375	27.8405	34.7897	34.8039	-0.0142	27.8628	34.7877	-0.0162
C09	12	50.128	29.4664	34.7038	34.7160	-0.0122	29.4548	34.7045	-0.0115
C10	0	1.000	29.3453	34.0324	34.0786	-0.0462	29.3557	34.0313	-0.0473
C10	1	2000.226	2.7766	34.7774	34.7780	-0.0006	2.7771	34.7751	-0.0029
C10	2	1500.400	4.2779	34.8378	34.8372	0.0006	4.2768	34.8363	-0.0009
C10	3	999.894	6.3554	34.9203	34.9199	0.0004	6.3577	34.9186	-0.0013
C10	4	799.713	7.9340	34.9915	34.9914	0.0001	7.9346	34.9909	-0.0005
C10	5	600.012	9.2809	35.0039	35.0044	-0.0005	9.2802	35.0029	-0.0015
C10	6	500.190	9.7503	35.0010	35.0016	-0.0006	9.7500	34.9998	-0.0018
C10	7	399.816	10.7983	35.0180	35.0176	0.0004	10.7971	35.0177	0.0001
C10	8	300.300	11.7863	35.0531	35.0530	0.0001	11.7882	35.0525	-0.0005
C10	9	200.091	13.8465	35.1064	35.1085	-0.0021	13.8464	35.1061	-0.0024
C10	10	149.658	17.1312	35.1515	35.1436	0.0079	17.1498	35.1536	0.0100
C10	11	99.840	28.7200	34.8080	34.8208	-0.0128	28.7223	34.8095	-0.0113
C10	12	49.706	29.2257	34.7460	34.7818	-0.0358	29.2261	34.7475	-0.0343
C11	0	1.000	29.1323	34.5578	34.5853	-0.0275	29.1366	34.5579	-0.0274
C11	1	1999.915	2.8130	34.7771	34.7779	-0.0008	2.8126	34.7746	-0.0033
C11	2	1500.019	4.2248	34.8248	34.8249	-0.0001	4.2243	34.8229	-0.0020
C11	3	999.978	6.1175	34.9067	34.9066	0.0001	6.1167	34.9047	-0.0019
C11	4	801.173	7.9137	34.9808	34.9826	-0.0018	7.9137	34.9796	-0.0030
C11	5	599.770	9.2570	34.9869	34.9884	-0.0015	9.2562	34.9856	-0.0028
C11	6	499.400	9.9225	34.9578	34.9571	0.0007	9.9222	34.9563	-0.0008
C11	7	400.120	10.5888	34.9930	34.9919	0.0011	10.5904	34.9917	-0.0002
C11	8	300.084	11.6610	35.0497	35.0472	0.0025	11.6614	35.0483	0.0011
C11	9	199.695	13.8632	35.1260	35.1279	-0.0019	13.8667	35.1251	-0.0028
C11	10	149.786	16.0583	35.1051	35.1125	-0.0074	16.0611	35.1051	-0.0074
C11	11	98.794	25.3170	34.7971	35.0033	-0.2062	25.3974	34.7854	-0.2179
C11	12	49.885	28.7469	34.6350	34.6835	-0.0485	28.7627	34.6387	-0.0448
C12	0	1.000	28.6079	34.6371	34.6566	-0.0195	28.6082	34.6370	-0.0196
C12	1	2001.527	2.8201	34.7748	34.7754	-0.0006	2.8200	34.7722	-0.0032
C12	2	1500.130	4.3119	34.8297	34.8299	-0.0002	4.3113	34.8277	-0.0022
C12	3	999.986	6.3752	34.8966	34.8966	0.0000	6.3754	34.8951	-0.0015
C12	4	800.550	7.5791	34.9444	34.9445	-0.0001	7.5782	34.9427	-0.0018
C12	5	599.720	8.7703	34.9638	34.9643	-0.0005	8.7705	34.9611	-0.0032
C12	6	500.327	9.5753	34.9454	34.9457	-0.0003	9.5748	34.9435	-0.0022
C12	7	398.378	10.6212	34.9825	34.9836	-0.0011	10.6214	34.9806	-0.0030
C12	8	300.735	11.5396	35.0302	35.0317	-0.0015	11.5450	35.0294	-0.0023
C12	9	199.330	13.9275	35.1216	35.1225	-0.0009	13.9280	35.1198	-0.0027
C12	10	149.996	15.2673	35.1473	35.1468	0.0005	15.2741	35.1468	0.0000
C12	11	100.594	26.7508	34.8349	34.9383	-0.1034	26.7419	34.8300	-0.1083
C12	12	50.543	28.6200	34.6454	34.6580	-0.0126	28.6199	34.6454	-0.0126

Table. 6.2.3-2 Salinity comparison between CTD and AUTOSAL
(CTD1:primary sensor, CTD2:secondary sensor)

Station	Bottle	Pres(CTD)	Temp(CTD1)	Sal(CTD1)	Sal(Bottle)	Diff(CTD1-Btl)	Temp(CTD2)	Sal(CTD2)	Diff(CTD2-Btl)
C13	0	1.000	28.8684	34.3153	34.3405	-0.0252	28.8704	34.3153	-0.0252
C13	1	2001.437	2.7973	34.7741	34.7744	-0.0003	2.7970	34.7712	-0.0032
C13	2	1500.307	4.0787	34.8105	34.8105	0.0000	4.0780	34.8083	-0.0022
C13	3	1000.518	6.4172	34.8892	34.8887	0.0005	6.4170	34.8871	-0.0016
C13	4	799.850	7.4859	34.9227	34.9226	0.0001	7.4861	34.9208	-0.0018
C13	5	599.476	8.8907	34.9348	34.9342	0.0006	8.8911	34.9331	-0.0011
C13	6	500.096	9.7742	34.9166	34.9180	-0.0014	9.7742	34.9148	-0.0032
C13	7	400.296	10.5519	34.9707	34.9717	-0.0010	10.5529	34.9689	-0.0028
C13	8	299.888	11.5286	35.0205	35.0182	0.0023	11.5281	35.0190	0.0008
C13	9	199.669	12.9797	35.0410	35.0501	-0.0091	12.9856	35.0391	-0.0110
C13	10	149.596	15.4149	34.8663	34.8731	-0.0068	15.4595	34.8562	-0.0169
C13	11	99.943	26.5210	34.9476	35.0260	-0.0784	26.5962	34.9484	-0.0776
C13	12	49.017	28.4338	34.7459	34.7568	-0.0109	28.4376	34.7463	-0.0105
C14	0	1.000	28.9403	33.9586	33.9595	-0.0009	28.9346	33.9609	0.0014
C14	1	2000.450	2.7877	34.7701	34.7704	-0.0003	2.7875	34.7671	-0.0033
C14	2	1501.414	4.1138	34.7992	34.7994	-0.0002	4.1132	34.7966	-0.0028
C14	3	999.632	6.1806	34.8455	34.8456	-0.0001	6.1817	34.8435	-0.0021
C14	4	799.436	7.4280	34.9147	34.9150	-0.0003	7.4273	34.9127	-0.0023
C14	5	600.422	8.6857	34.8937	34.8940	-0.0003	8.6866	34.8917	-0.0023
C14	6	500.608	9.3668	34.8961	34.8953	0.0008	9.3662	34.8939	-0.0014
C14	7	400.332	10.3076	34.9367	34.9368	-0.0001	10.3072	34.9346	-0.0022
C14	8	300.463	11.1764	34.9810	34.9803	0.0007	11.1787	34.9797	-0.0006
C14	9	200.106	12.6154	34.9705	34.9758	-0.0053	12.6159	34.9685	-0.0073
C14	10	150.355	15.8146	34.8268	34.8479	-0.0211	15.8219	34.8254	-0.0225
C14	11	99.335	25.2322	34.9871	35.0604	-0.0733	25.2277	34.9839	-0.0765
C14	12	49.828	28.5422	34.9191	34.9383	-0.0192	28.5447	34.9185	-0.0198
C15	0	1.000	28.4658	33.6007	33.6096	-0.0089	28.4657	33.5998	-0.0098
C15	1	2000.658	2.6298	34.7604	34.7602	0.0002	2.6304	34.7576	-0.0026
C15	2	1500.106	3.9626	34.7808	34.7812	-0.0004	3.9635	34.7785	-0.0027
C15	3	999.465	6.0234	34.7886	34.7891	-0.0005	6.0224	34.7862	-0.0029
C15	4	799.945	7.2951	34.8297	34.8309	-0.0012	7.2942	34.8276	-0.0033
C15	5	600.785	8.6991	34.8688	34.8692	-0.0004	8.6986	34.8667	-0.0025
C15	6	503.391	9.4365	34.8909	34.8916	-0.0007	9.4368	34.8889	-0.0027
C15	7	399.610	10.3690	34.9248	34.9252	-0.0004	10.3685	34.9226	-0.0026
C15	8	300.549	11.1737	34.9598	34.9604	-0.0006	11.1732	34.9577	-0.0027
C15	9	200.476	12.4690	34.9281	34.9282	-0.0001	12.4684	34.9259	-0.0023
C15	10	149.663	14.5652	34.6429	34.6941	-0.0512	14.5701	34.6409	-0.0532
C15	11	100.173	22.1193	34.8017	34.8189	-0.0172	22.1712	34.8001	-0.0188
C15	12	50.156	28.5955	33.9421	33.9657	-0.0236	28.5974	33.9417	-0.0240
C16	0	1.000	28.3942	33.8748	33.8937	-0.0189	28.3938	33.8740	-0.0197
C16	1	2001.154	2.6002	34.7600	34.7599	0.0001	2.6001	34.7565	-0.0034
C16	2	1500.009	4.0215	34.7816	34.7824	-0.0008	4.0206	34.7790	-0.0034
C16	3	999.678	6.0555	34.8104	34.8085	0.0019	6.0556	34.8081	-0.0004
C16	4	799.190	7.1273	34.8293	34.8290	0.0003	7.1283	34.8272	-0.0018
C16	5	599.641	8.4731	34.8651	34.8681	-0.0030	8.4719	34.8617	-0.0064
C16	6	500.462	9.1237	34.8711	34.8699	0.0012	9.1209	34.8693	-0.0006
C16	7	398.857	10.0205	34.9097	34.9082	0.0015	10.0207	34.9075	-0.0007
C16	8	299.853	10.7964	34.9360	34.9341	0.0019	10.7957	34.9340	-0.0001
C16	9	199.704	11.7182	34.8682	34.8726	-0.0044	11.7337	34.8658	-0.0068
C16	10	150.063	13.6397	34.7777	34.8007	-0.0230	13.6422	34.7745	-0.0262
C16	11	99.658	19.7590	34.7602	34.7679	-0.0077	19.7597	34.7602	-0.0077
C16	12	49.641	28.2345	33.9836	34.0137	-0.0301	28.2452	33.9849	-0.0288

Table. 6.2.3-2 Salinity comparison between CTD and AUTOSAL
(CTD1:primary sensor, CTD2:secondary sensor)

Station	Bottle	Pres(CTD)	Temp(CTD1)	Sal(CTD1)	Sal(Bottle)	Diff(CTD1-Btl)	Temp(CTD2)	Sal(CTD2)	Diff(CTD2-Btl)
C17	0	1.000	28.5795	33.9248	No Data		28.5806	33.9240	
C17	1	1999.92	2.6138	34.7597	34.7598	-0.0001	2.6147	34.7564	-0.0034
C17	2	1500.55	4.0356	34.7763	34.7766	-0.0003	4.0349	34.7733	-0.0033
C17	3	1000.9	6.1689	34.8200	34.8207	-0.0007	6.1695	34.8179	-0.0028
C17	4	800.406	7.1873	34.8428	34.8424	0.0004	7.1871	34.8404	-0.0020
C17	5	601.036	8.6077	34.8801	34.8802	-0.0001	8.6088	34.8778	-0.0024
C17	6	500.327	9.2847	34.8897	34.8896	0.0001	9.2851	34.8875	-0.0021
C17	7	400.427	9.9825	34.9040	34.9039	0.0001	9.9820	34.9015	-0.0024
C17	8	298.976	10.8273	34.9389	34.9386	0.0003	10.8269	34.9365	-0.0021
C17	9	200.619	12.0297	34.9545	34.9513	0.0032	12.0310	34.9522	0.0009
C17	10	149.863	12.9567	34.7484	34.7544	-0.0060	12.9580	34.7457	-0.0087
C17	11	100.252	19.1033	34.6161	34.6613	-0.0452	19.1190	34.6166	-0.0447
C17	12	50.197	27.8818	34.0024	34.0144	-0.0120	27.8794	33.9996	-0.0148
C18	0	1.000	28.3943	33.8756	33.8840	-0.0084	28.3930	33.8747	-0.0093
C18	1	2001.007	2.6599	34.7646	34.7641	0.0005	2.6598	34.7610	-0.0031
C18	2	1500.210	3.8865	34.7815	34.7818	-0.0003	3.8857	34.7787	-0.0031
C18	3	999.921	6.0920	34.8053	34.8044	0.0009	6.0924	34.8027	-0.0017
C18	4	799.245	7.3740	34.8770	34.8774	-0.0004	7.3730	34.8744	-0.0030
C18	5	600.621	8.5969	34.8818	34.8820	-0.0002	8.5966	34.8796	-0.0024
C18	6	499.439	9.3738	34.8989	34.8988	0.0001	9.3766	34.8960	-0.0028
C18	7	399.245	10.0619	34.9095	34.9089	0.0006	10.0622	34.9070	-0.0019
C18	8	299.861	10.8813	34.9537	34.9524	0.0013	10.8812	34.9513	-0.0011
C18	9	200.174	12.1082	34.9872	34.9862	0.0010	12.1104	34.9845	-0.0017
C18	10	150.446	13.0926	34.7956	34.8151	-0.0195	13.0917	34.7924	-0.0227
C18	11	100.858	20.2177	34.5324	34.5568	-0.0244	20.4202	34.5365	-0.0203
C18	12	50.375	27.5194	33.9332	34.0316	-0.0984	27.5180	33.9334	-0.0982
C19	0	1.000	28.7476	33.7751	33.7997	-0.0246	28.7483	33.7744	-0.0253
C19	1	2000.705	2.7483	34.7672	34.7670	0.0002	2.7477	34.7639	-0.0031
C19	2	1500.030	4.1358	34.8049	34.8052	-0.0003	4.1355	34.8020	-0.0032
C19	3	1000.131	6.0966	34.8160	34.8171	-0.0011	6.0956	34.8134	-0.0037
C19	4	800.215	7.4807	34.9043	34.9041	0.0002	7.4823	34.9025	-0.0016
C19	5	600.508	8.7266	34.8902	34.8914	-0.0012	8.7288	34.8882	-0.0032
C19	6	500.209	9.4611	34.9008	34.9011	-0.0003	9.4613	34.8986	-0.0025
C19	7	400.735	10.0400	34.9128	34.9123	0.0005	10.0398	34.9105	-0.0018
C19	8	300.146	11.0455	34.9763	34.9762	0.0001	11.0463	34.9744	-0.0018
C19	9	200.628	12.0316	34.9744	34.9864	-0.0120	12.0366	34.9723	-0.0141
C19	10	150.133	13.2368	34.8605	34.8701	-0.0096	13.2362	34.8564	-0.0137
C19	11	100.524	21.3099	34.7401	34.7050	0.0351	21.3102	34.7404	0.0354
C19	12	49.771	28.1411	33.9904	34.0094	-0.0190	28.1770	33.9823	-0.0271
C20	0	1.000	29.0553	33.8419	33.8640	-0.0221	29.1206	33.8395	-0.0245
C20	1	2007.287	2.7390	34.7677	34.7683	-0.0006	2.7392	34.7646	-0.0037
C20	2	1500.269	4.1525	34.8060	34.8066	-0.0006	4.1518	34.8034	-0.0032
C20	3	999.927	6.1744	34.8003	34.7973	0.0030	6.1742	34.7976	0.0003
C20	4	800.738	7.3755	34.8474	34.8450	0.0024	7.3750	34.8449	-0.0001
C20	5	600.189	8.8178	34.8660	34.8659	0.0001	8.8171	34.8639	-0.0020
C20	6	500.456	9.5479	34.8857	34.8858	-0.0001	9.5474	34.8834	-0.0024
C20	7	400.327	10.4564	34.9365	34.9369	-0.0004	10.4713	34.9353	-0.0016
C20	8	299.387	11.5376	35.0124	35.0089	0.0035	11.5382	35.0103	0.0014
C20	9	200.676	12.8803	34.9892	34.9892	0.0000	12.8786	34.9865	-0.0027
C20	10	150.133	13.6248	34.7869	34.8027	-0.0158	13.6344	34.7834	-0.0193
C20	11	99.080	21.7684	34.4799	34.5098	-0.0299	21.8351	34.4705	-0.0393
C20	12	50.230	28.2683	34.0196	34.0292	-0.0096	28.2690	34.0183	-0.0109

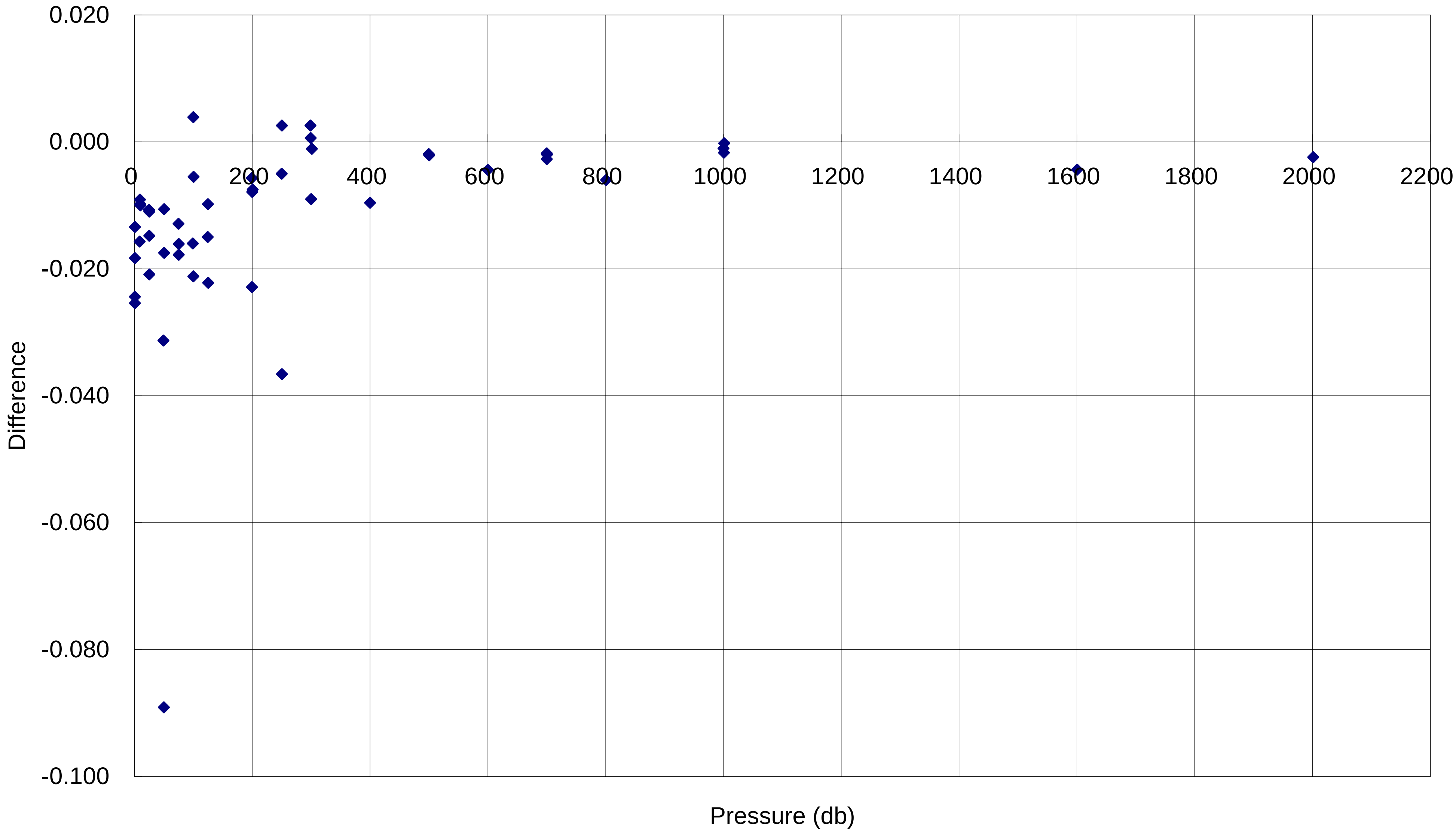


Fig. 6.2.3-1 Salinity difference in Leg.1 (CTD1-Btl)

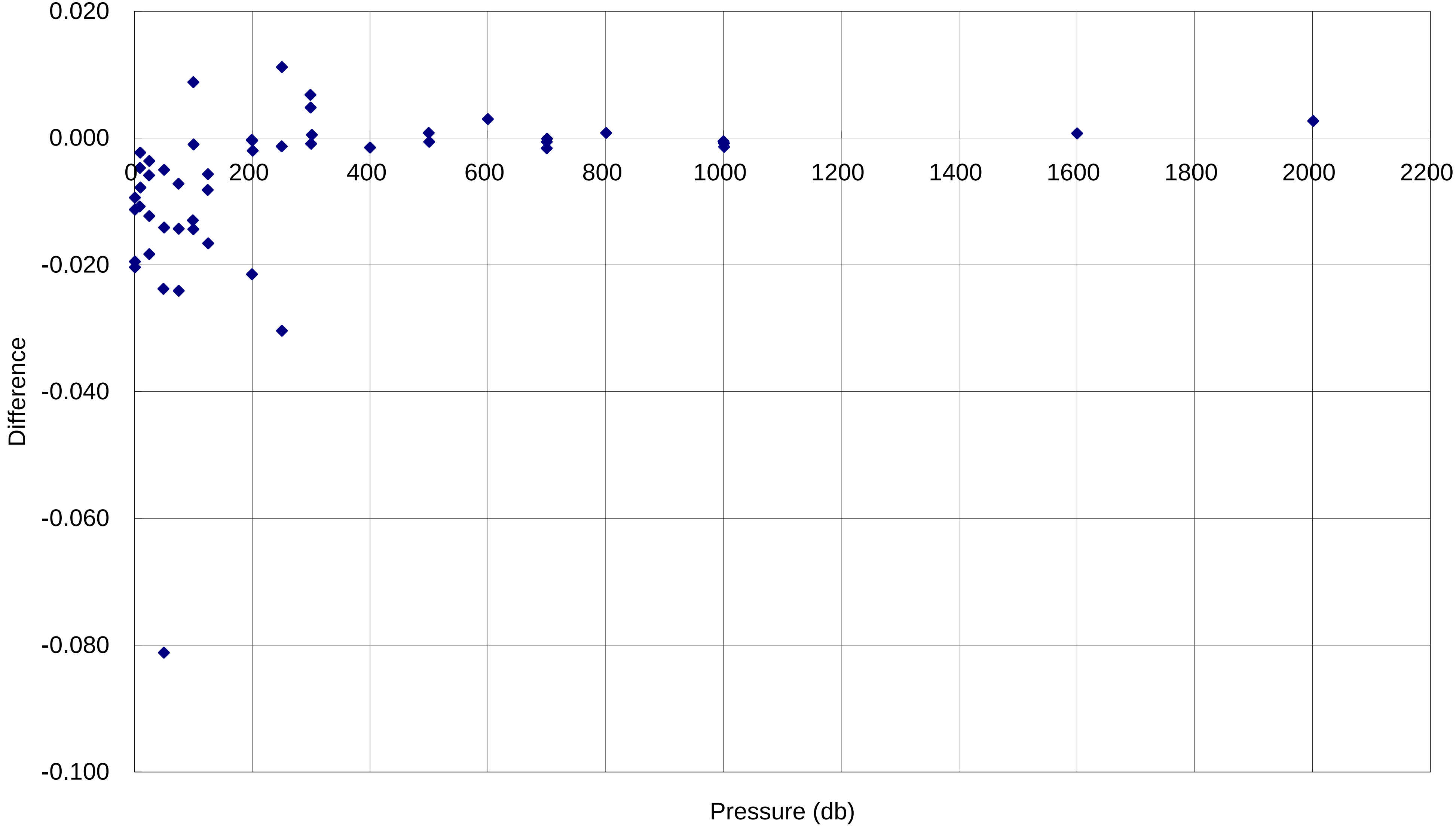


Fig. 6.2.3-2 Salinity difference in Leg.1 (CTD2-Btl)

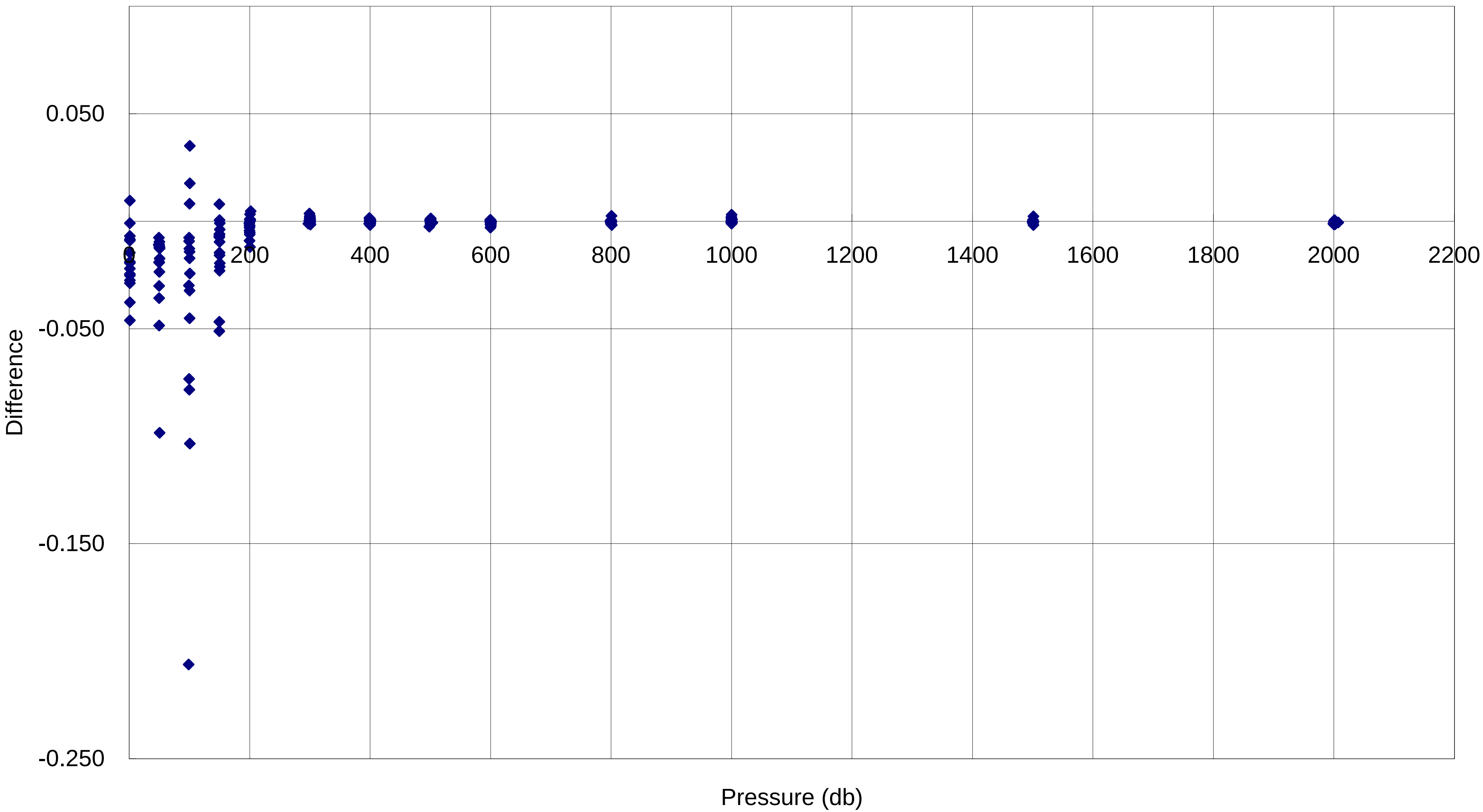


Fig. 6.2.3-3 Salinity difference in Leg.2 (CTD1-Btl)

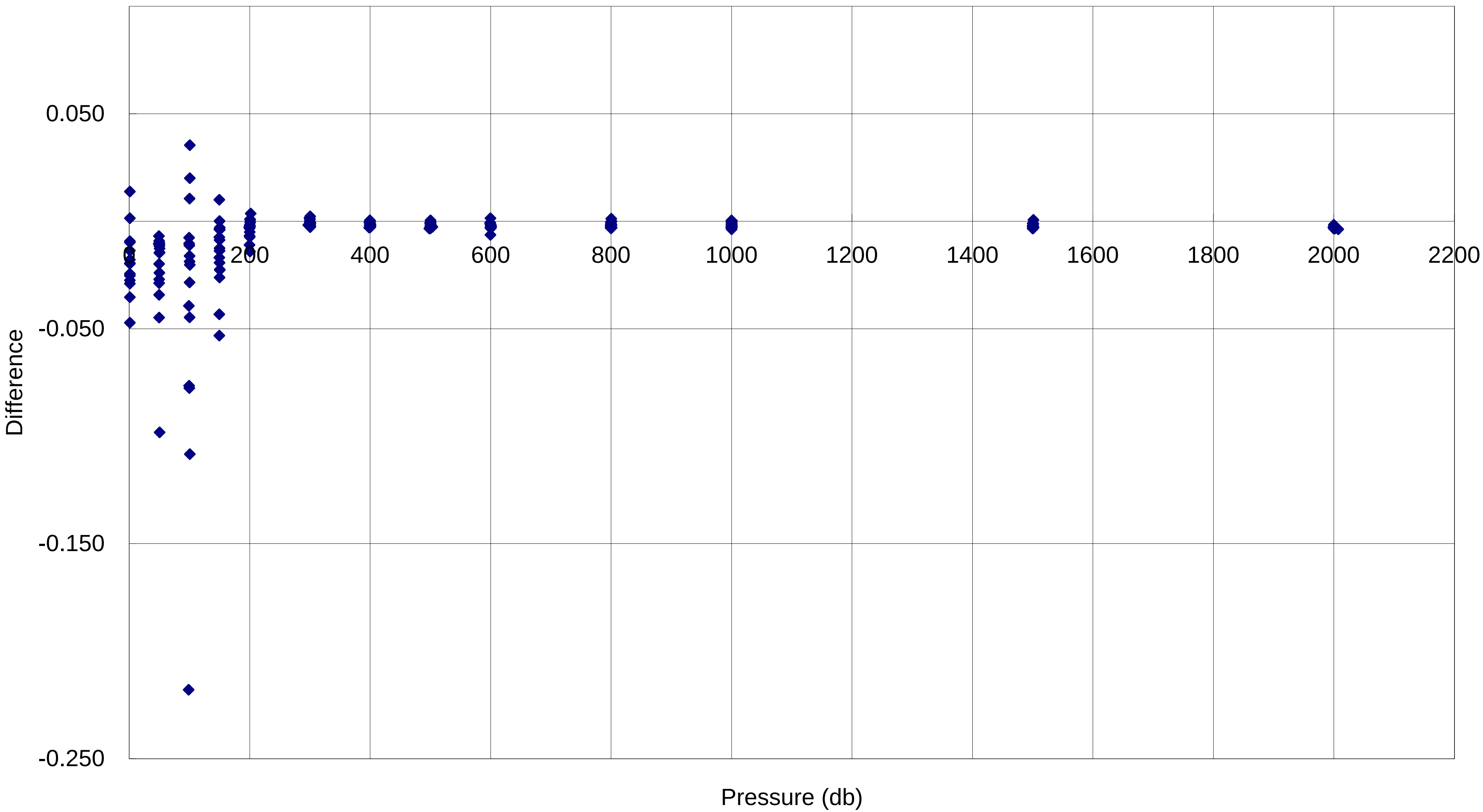


Fig. 6.2.3-4 Salinity difference in Leg.2 (CTD2-Btl)

6.3 Dissolved oxygen analysis

(1) Personnel

Katsunori Sagishima (Marine Works Japan Ltd.)
Ai Yasuda (Marine Works Japan Ltd.)

(2) Introduction

Dissolved oxygen is major parameter for deciding the seawater characteristic on oceanography. In this cruise, the method of dissolved oxygen determination is based on WHP Operations and Methods manual (Culberson, 1991, Dickson, 1994).

(3) Methods

(a) Instruments and Apparatus

Glass bottle: Glass bottle for D.O. measurements consist of the ordinary BOD flask (ca.180 ml) and glass stopper with long nipple, modified from the nipple presented in Green and Carritt (1966).

Dispenser: Eppendorf Comforpette 4800 / 1000µl
OPTIFIX / 2 ml (for MnCl2 & NaOH / NaI aq.)
Metrohm Model 725 Multi Dosimat / 20 ml (for KIO3)

Titrator: Metrohm Model 716 DMS Titrino / 10 ml of titration vessel
Metrohm Pt Electrode / 6.0403.100 (NC)

Software: Data acquisition and endpoint evaluation / “The Brinkmann Titrino Workcell”

(b) Methods

Sampling and analytical methods were based on to the WHP Operations and Methods (Culberson, 1991, Dickson, 1994).

(b-1) Sampling

Sea water samples for dissolved oxygen measurement were collected from 12 litter Niskin bottles to calibrated dry glass bottles. During each sampling, 3 bottle volumes of seawater sample were overflowed to minimize contamination with atmospheric oxygen and the seawater temperature at the time of collection was measured for correction of the sample volume. After the sampling, MnCl2 (aq.) 1ml and NaOH / NaI (aq.) 1ml were added into the glass bottle, and then shook the bottle well. After the precipitation has settled, we shook the bottle vigorously to disperse the precipitate.

(b-2) D.O. analysis

The samples were analyzed by Metrohm titrator with 10 ml piston burette and Pt Electrode using whole bottle titration. Titration was determined by the potentiometric methods and the endpoint for titration was evaluated by software of Metrohm, “The Brinkmann Titrino Workcell”.

Concentration of D.O. was calculated by equation (8) and (9) of WHP Operations and Methods (Culberson, 1991). Salinity value of the equation (9) was used from the value of salinity of AutoSal. The amount of D.O. in the reagents was reported 0.0017 ml at 25.5 deg-C (Murray et. al., 1968). However in this cruise, we used the value (=0.0027 ml at 21 deg-C) measured at 1995 WHCE cruise of R/V Kaiyo D.O. concentrations we calculated were not corrected by seawater blank.

We prepared and used one batch of 5 liter of 0.07N thiosulfate solutions and 5 liter of 0.0100N standard KIO3 solutions (JM001006).

(4) Preliminary Result

(4-1) Comparison of our KIO3 standards to CSK standard solution.

After this cruise, we compared our standards with CSK standard solution (Lot. DLG8366) which is the commercially available standard solution prepared by Wako Pure Chemical Industries, Ltd. The results are shown in table 6.3.-1.

Table 6.3-1. Comparison of each standards

Titrator	KIO3 Lot No.	Nominal Normality	Average Titer (ml)	Standard Deviation	n
	DLG8366	0.0100	1.406	0.0007	5
	JM991216	0.010017	1.403	0.0004	5

(4-2) Reproducibility

In this cruise, 272 samples for D.O. samples were collected. 59 pairs (43.3%) of total samples were analyzed as "duplicates" which were collected from same Niskin bottle. Results of each stations show Fig.6.3.-1 (1) – (3)

(5) References

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

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

Dickson, A.G. (1994) Determination of dissolved oxygen in sea water by Winkler titration, in WHP Operations and Methods, Woods Hole., ppl-14.

Green, E.J. and D.E.Carritt (1996) An Improved Iodine Determination Flask for Whole-bottle Titrations, Analyst, 91, 207-208.

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

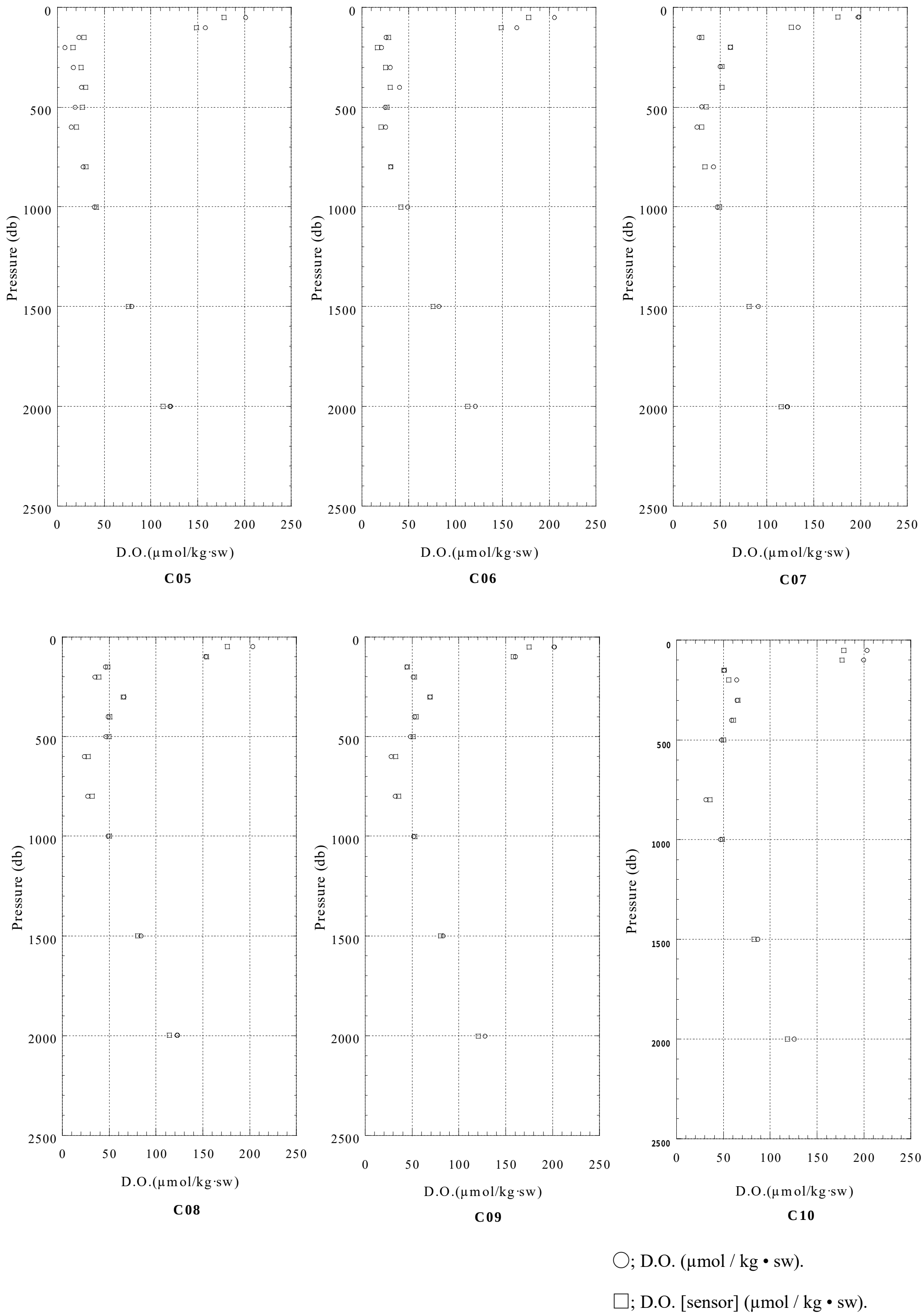


Fig.6.3 -1 (1) Vertical profiles at each stations.

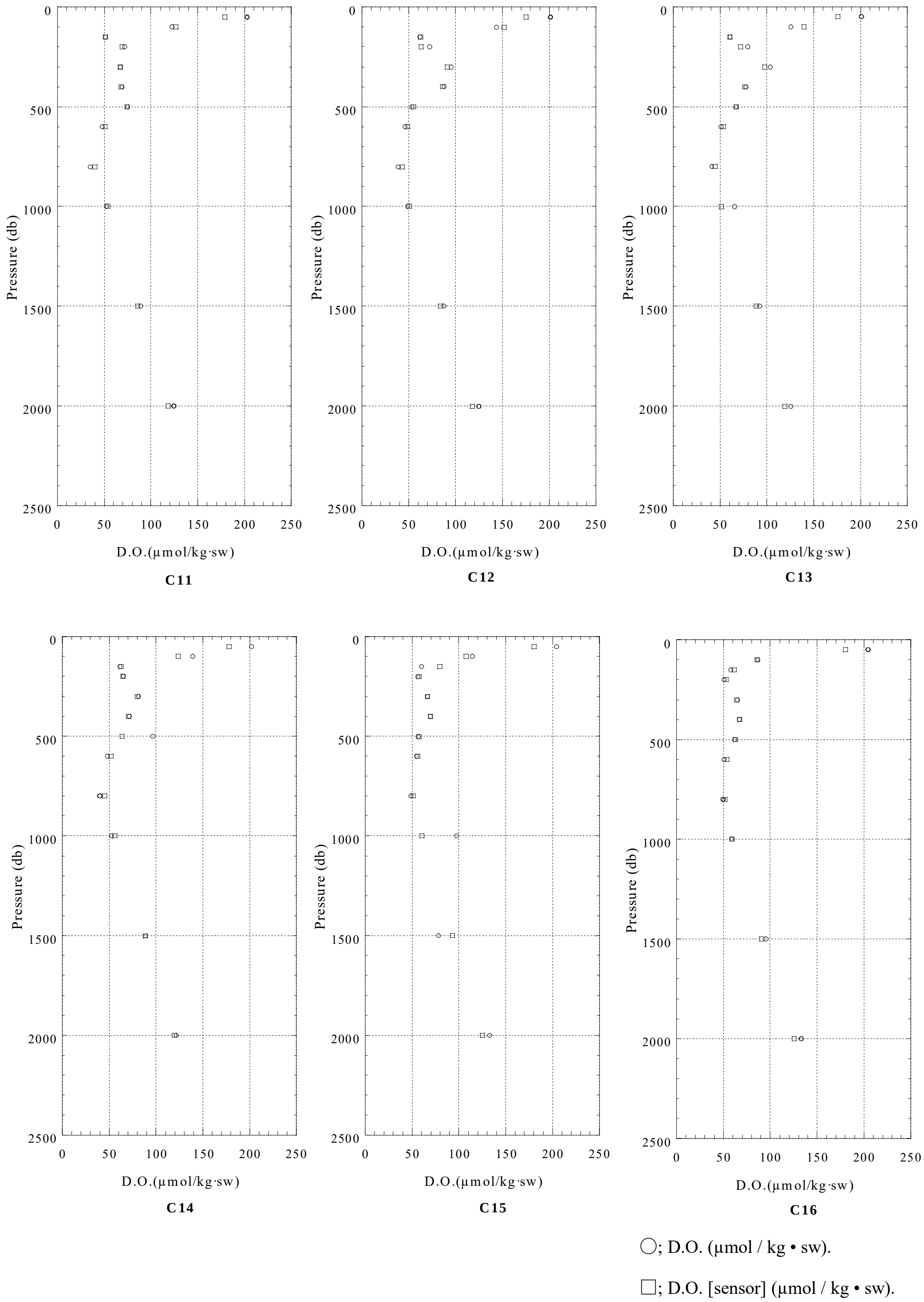


Fig.6.3 -1 (2) Vertical profiles at each stations.

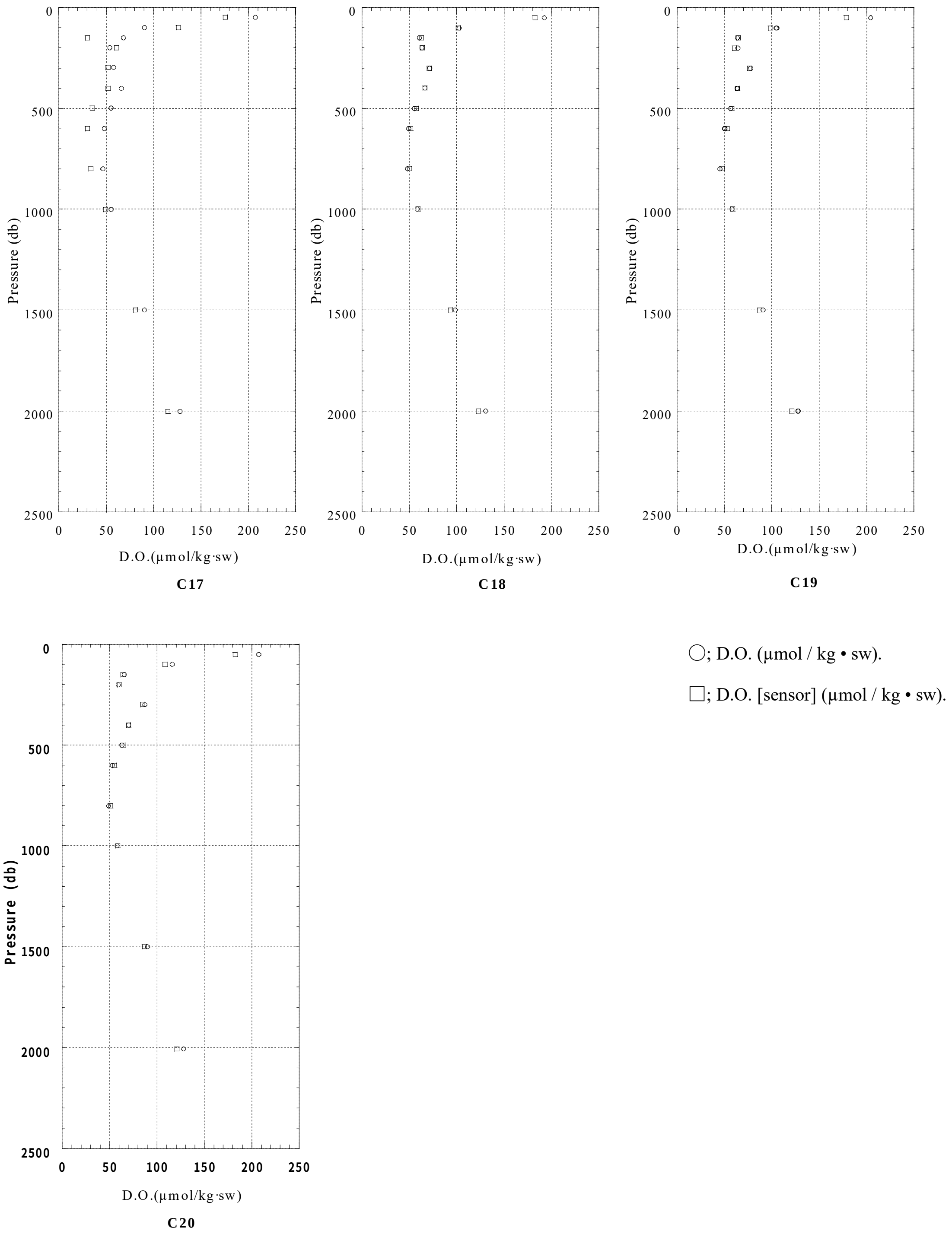


Fig.6.3 -1 (3) Vertical profiles at each stations

6.4 Continuous monitoring of surface seawater

(1) Personnel name and affiliation

Katsunori Sagishima (MWJ) :Operation Leader
Ai Yasuda (MWJ)

(2) Objective

To monitor continuously the physical, chemical and biological characteristics of near-sea surface water.

(3) Methods

The *Continuous Sea Surface Water Monitoring System* (Nippon Kaiyo co., Ltd.) is located in the "*sea surface monitoring laboratory*" on R/V Mirai. It can automatically measure temperature, salinity, dissolved oxygen, fluorescence and particle size of plankton in the near-surface water every 1-minute. Measured data are saved every one-minute together with time and the position of ship, and displayed in the data management PC machine. This system is connected to shipboard LAN-system and provides the acquired data for p-CO_2 measurement system, etc.

The uncontaminated seawater intake is 4.5m below the sea surface. Near-surface water was continuously pumped up about 200L/min from the intake to the laboratory and then flowed into *the Continuous Sea Surface Water Monitoring System* and p-CO_2 measurement system etc. through a steel pipe. The flow rate of surface water for this system was 12L/min, which controlled by some valves and passed through some sensors except with fluorometer (about 0.3L/min) through vinyl-chloride pipes.

The Continuous Sea Surface Water Monitoring System has six kinds of sensors, which TSG comprises of two SBE sensor modules. Sea surface temperature is measured by a ship bottom oceanographic thermometer situated on the suction side of the uncontaminated seawater supply in the forward hold. Specification and calibration date of the each sensor in this system of listed below.

a-1) Temperature and salinity sensors

SEACAT THERMOSALINOGRAPH

Model:	SBE-21, SEA-BIRD ELECTRONICS, INC.	
Serial number:	2118859-2641	
Measurement range:	Temperature -5 to +35 deg-C,	Salinity 0 to 6.5 S/m
Accuracy:	Temperature 0.01 deg-C/6month,	Salinity 0.001 S/m/month
Resolution:	Temperature 0.001 deg-C,	Salinity 0.0001 S/m
Calibration date:	22-May-00 (mounted on 04-Aug.-00 in this system)	

a-2) Ship bottom oceanographic thermometer (mounted at the back of the pump for surface water)

Model:	SBE 3S-A, SEA-BIRD ELECTRONICS, INC.
Serial number:	032175
Measurement range:	-5 to +35 deg-C
Initial Accuracy:	0.001 deg-C per year typical
Stability:	0.002 deg-C per year typical
Calibration date:	07-May.-00 (mounted on 04-Aug.-00 in this system)

b) Dissolved oxygen sensor

Model:	2127, Oubisufair Laboratories Japan INC.
Serial number:	31757
Measurement range:	0 to 14 ppm
Accuracy:	±1% at 5 deg-C of correction range
Stability:	1% per month

Calibration date: 13-Jun-00

c) Fluorometer

Model:	10-AU-005, TURNER DESIGNS
Detection limit:	5 ppt or less for chlorophyll a
Stability:	0.5% per month of full scale

d) Particle size sensor

Model:	P-05, Nippon Kaiyo LTD.
Serial number:	P5024
Accuracy:	±10% of range
Measurement range:	0.02681mm to 6.666mm
Reproducibility:	±5%
Stability:	5% per week

e) Flowmeter

Model:	EMARG2W, Aichi Watch Electronics LTD.
Serial number:	8672
Measurement range:	0 to 30 L/min
Accuracy:	±1%
Stability:	±1% per day

The monitoring periods (UTC) during this cruise are listed below.

Leg.1 19-Oct.-‘00 to 08-Nov.-‘00 (From Hachinohe to Shingapore)

Leg.2 09-Nov.-‘00 to 19-Nov.-‘00 (From Shingapore to Jakarta)

(4) Preliminary Result

(4-1) Salinity sensor

We cleaned the conductivity cell at Sekinehama port just before this cruise. We sampled every two days for salinity validation and in situ salinity calibration during this cruise. We collected one time each day at leg 1 to leg 2. All salinity samples were collected from the course of the system while on station or from regions with weak horizontal gradients. All samples were analyzed on the Guildline 8400B.

The results were shown in Figure 6.4-1.

(4-2) Dissolved Oxygen (D.O.) sensor

D.O. sensor of this system was calibrated before this cruise. To estimate of accuracy of the sensor, we collected the samples from the course of the system and analyzed by Winkler method. The standardization and pure water blank determination have been performed before the sample titration.

The results were shown in Figure 6.4-2. Precision of the sensor was different from the concentration and each calibration.

(5) Result

Preliminary data 10 minutes from Hachinohe to Jakarta. These data were compared with five part of Hachinohe to lat.0N, long.147E, lat.0N, long.147E to Singapore, Singapore to lat. 10N, long 90E,
90E, 90E to Jakarta (shown in Fig. 6-4-3, Fig. 6-4-4, Fig. 6-4-5, Fig. 6-4-6, Fig. 6-4-7) . All salinity and
dissolved oxygen data were not corrected.

(6) Other remarks

Equation was to obtain values of temperature (IPTS-68) converted into ITS-90 as follows.

$$T_{90} = 0.99976 * T_{68}$$

(7) Data archive

Format of raw data files was ASCII, calibration values of salinity and temperature (IPTS-68, ITS-90) were Microsoft excel files and ASCII format files, were stored on a magnetic optical disk (M.O.disk). All the data will be submitted to the DMO at JAMSTEC.

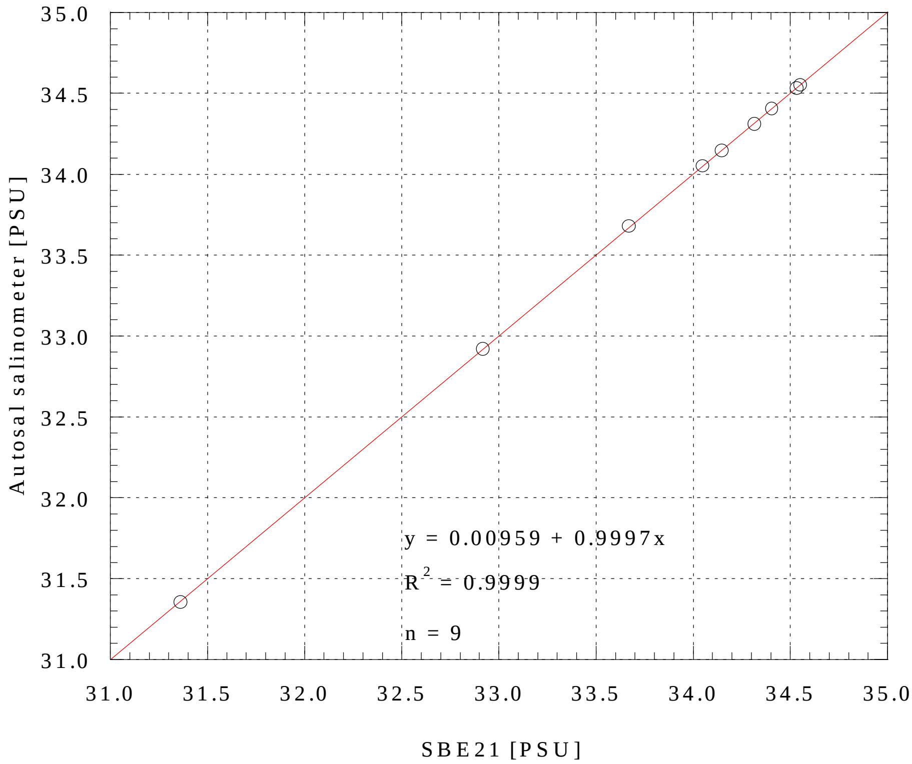


Fig. 6.4-1 Comparison between the salinity values measured by SBE21 of the Sea Surface Monitoring System and Autosal salinometer for 9 samples. Note: Salinity in this figure is not corrected.

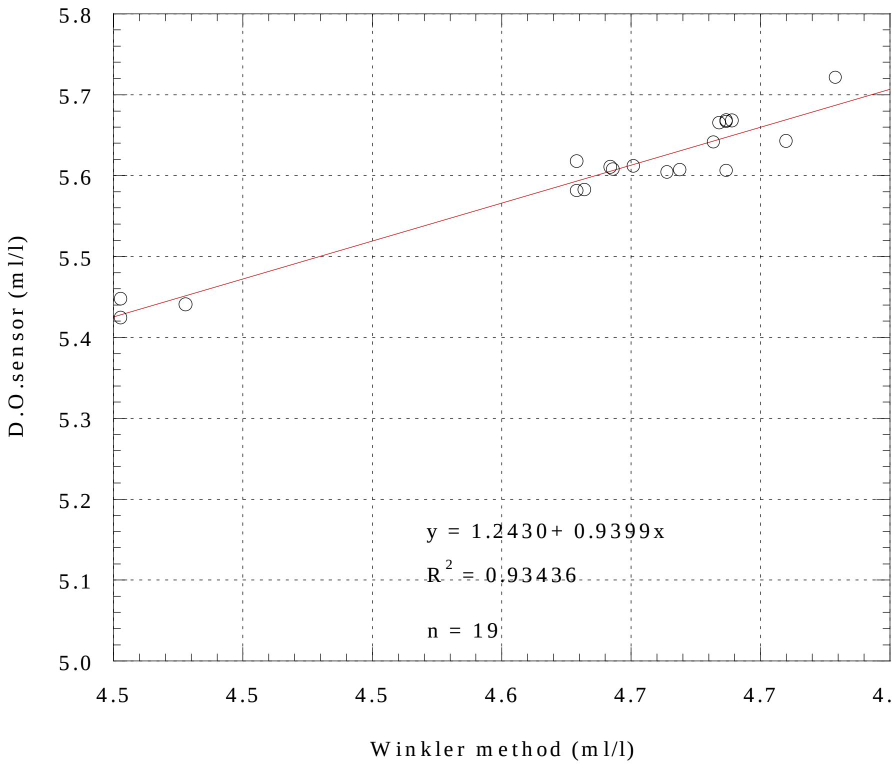


Fig.6.4 - 2 Comarison between the D.O. value measured by D.O. senser of the Sea Surface Monitoring System and by Winkler method for 11 samples obtained during MR00-K07 leg 1, leg 2 cruise.

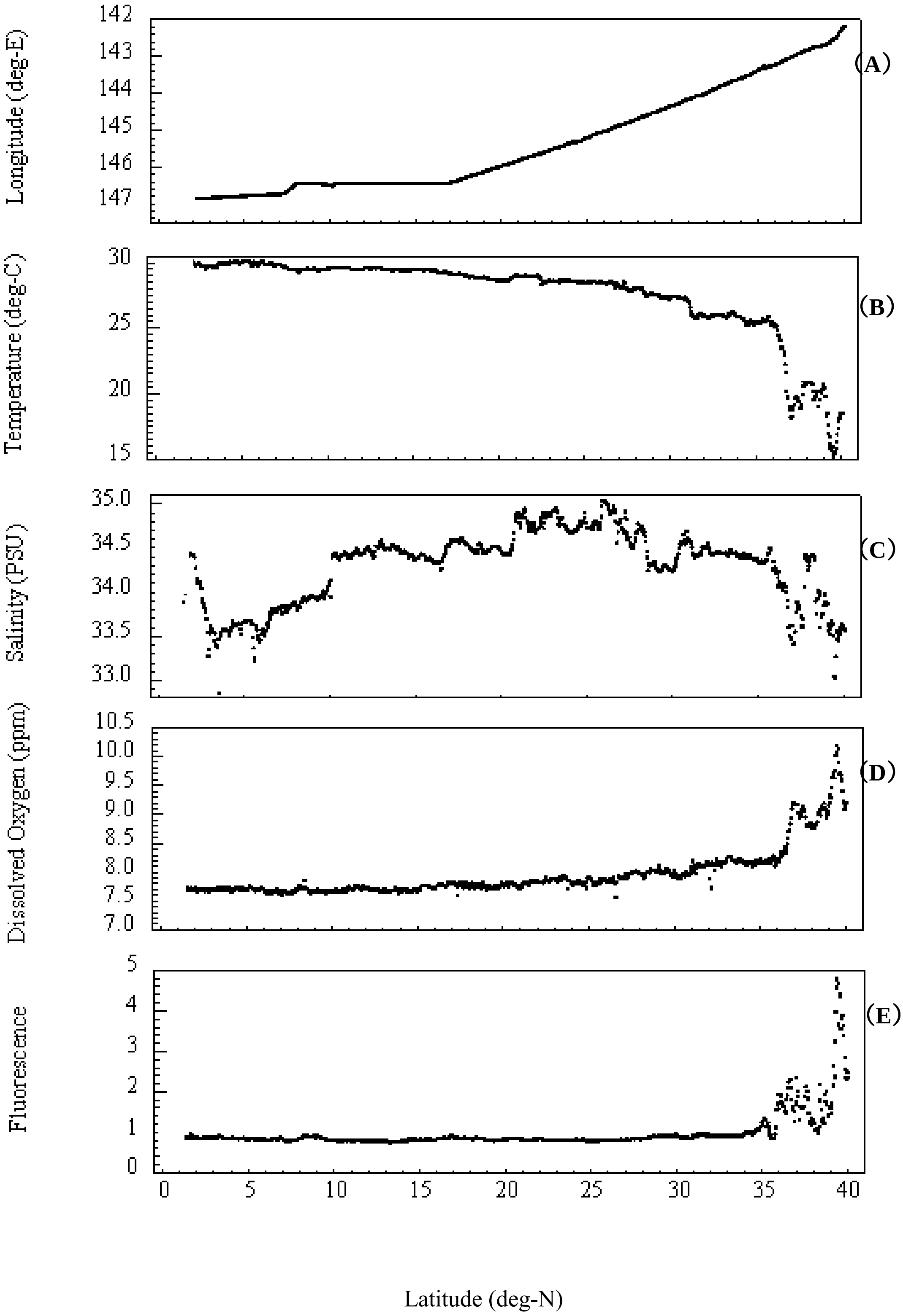
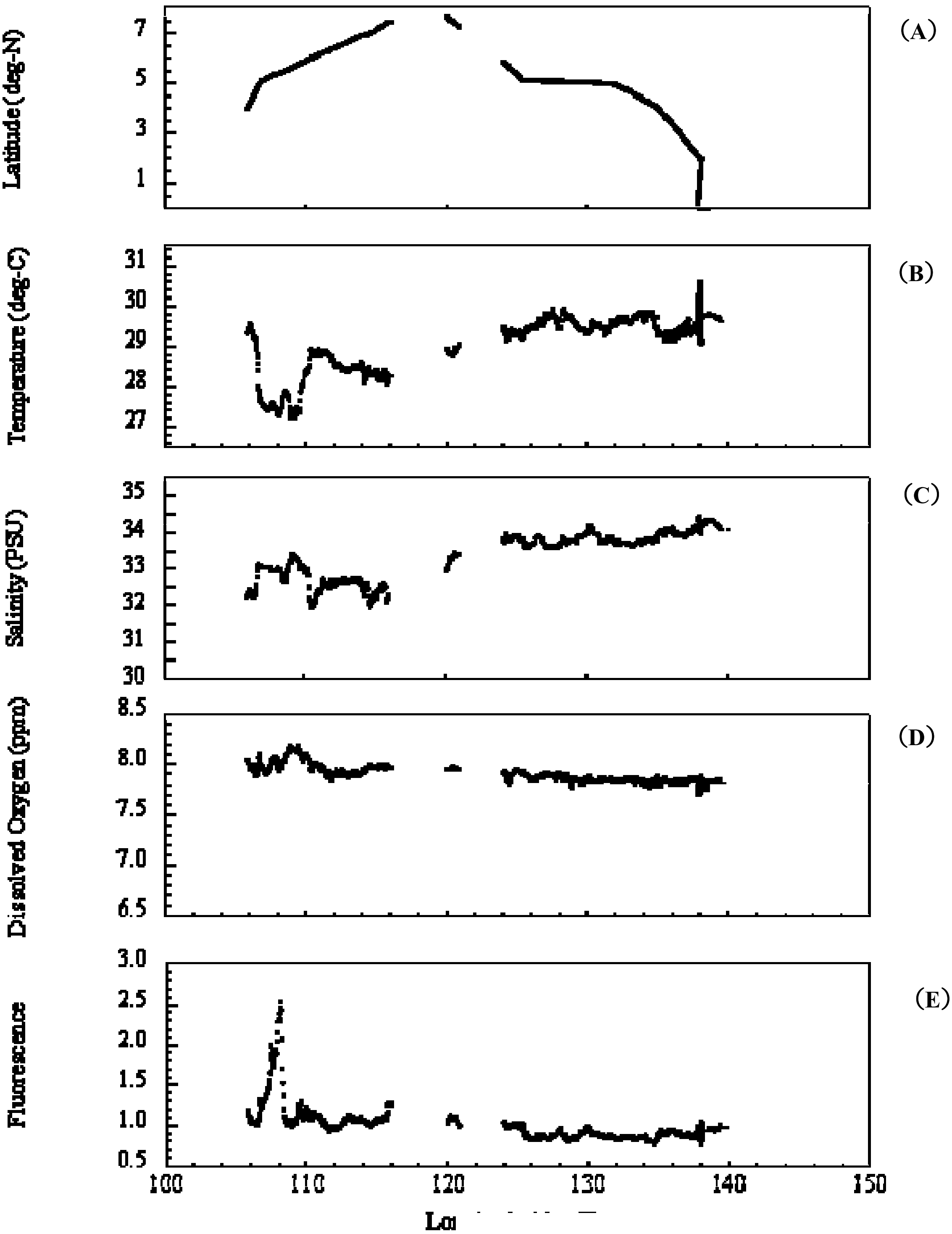


Fig.6.4-3 Ship's track (A), Temperature (B), Salinity (C), Dissolved Oxygen (D), and Fluorescence (E) of surface seawater from Hachinohe to lat 0, long.147.

Note: Salinity and D.O. in this figure is not corrected.



Latitude (deg-E)

Fig.6.4-4 Ship's track (A), Temperature (B), Salinity (C), Dissolved Oxygen (D), and Fluorescence (E) of surface seawater from lat 0, long.147 to Singapore.
Note: Salinity and D.O. in this figure is not corrected.

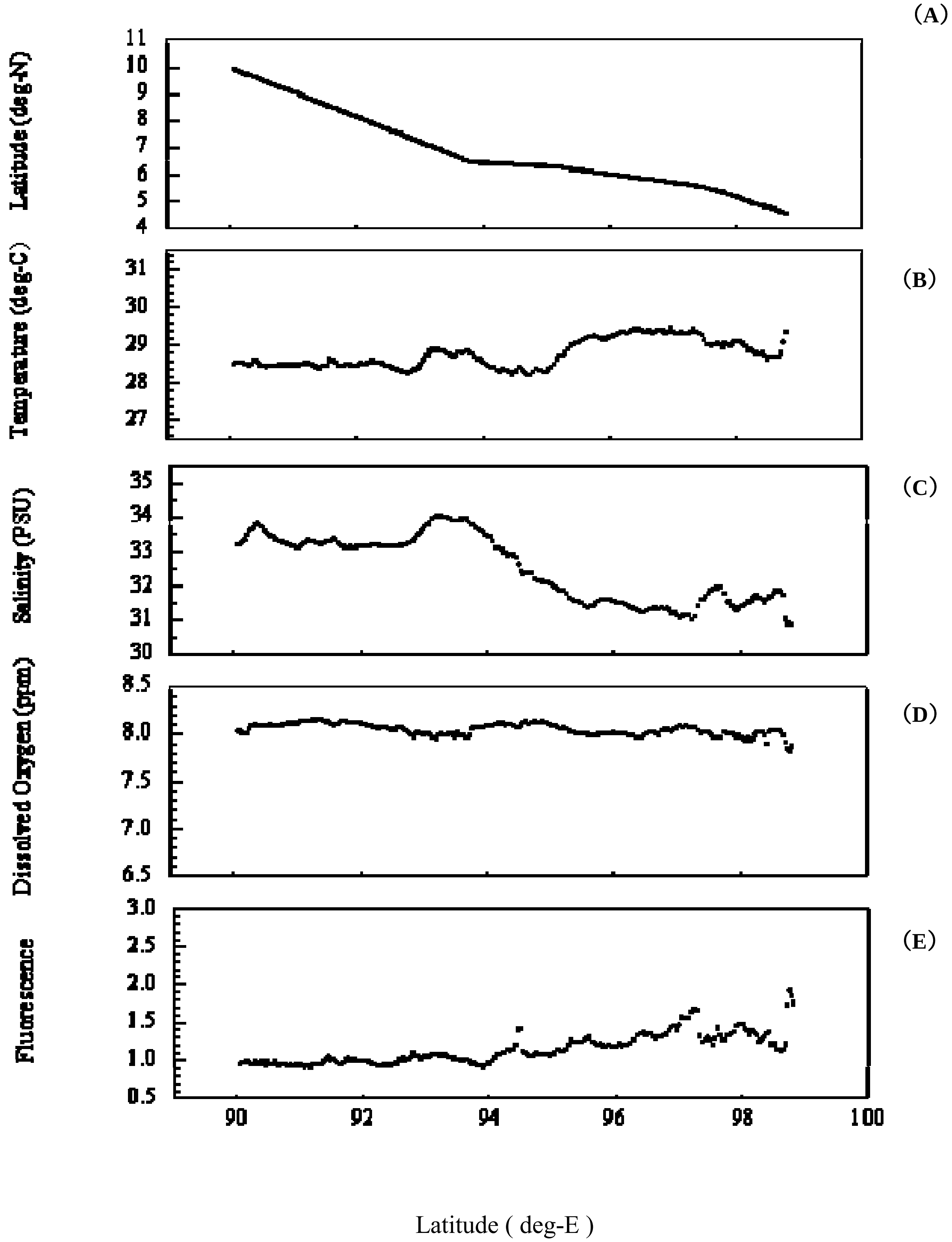


Fig.6.4-5 Ship's track (A), Temperature (B), Salinity (C),
Dissolved Oxygen (D), and Fluorescence (E)
of surface seawater from Singapore to lat. 10, long. 90.
Note: Salinity and D.O. in this figure is not corrected.

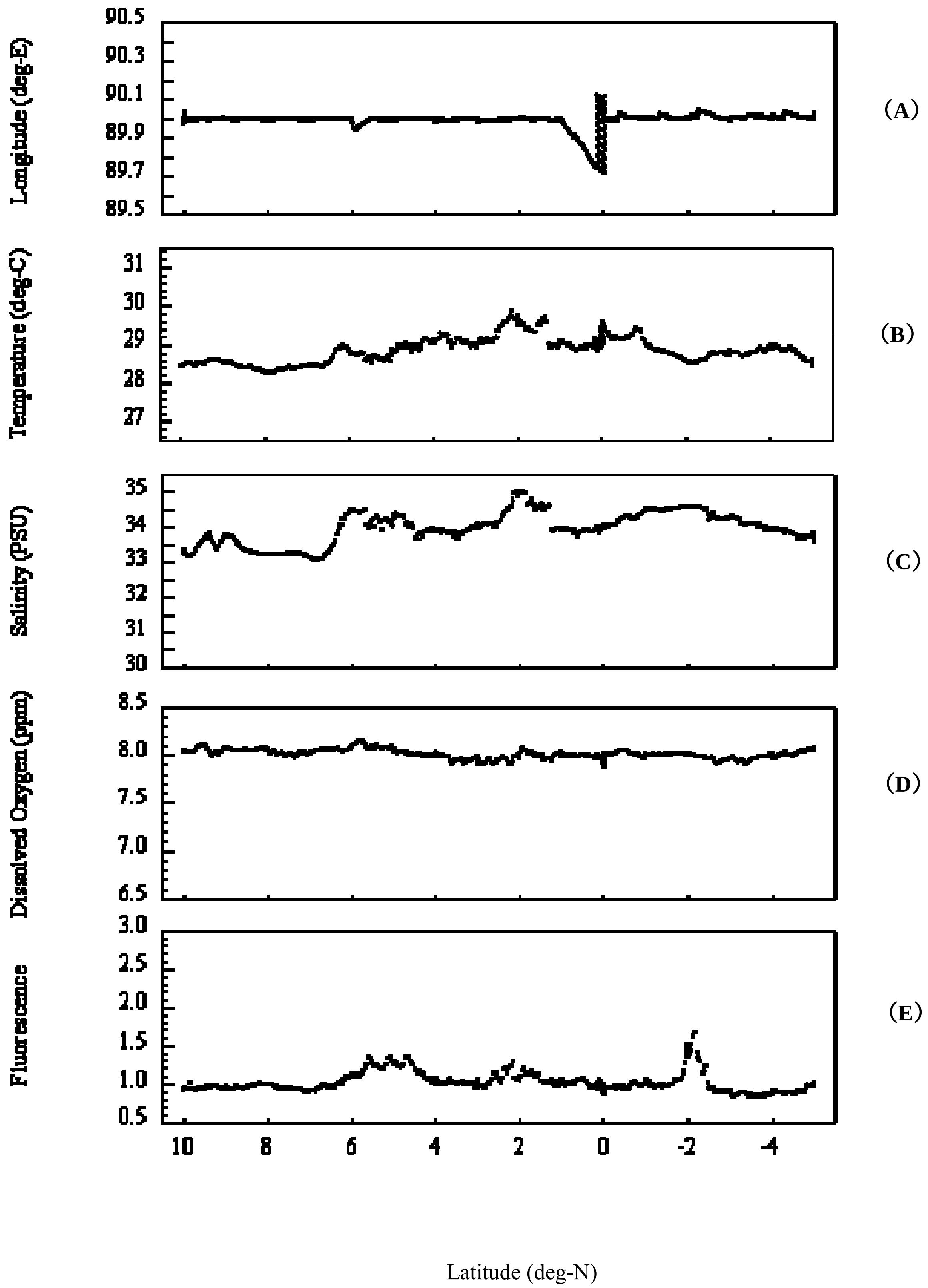
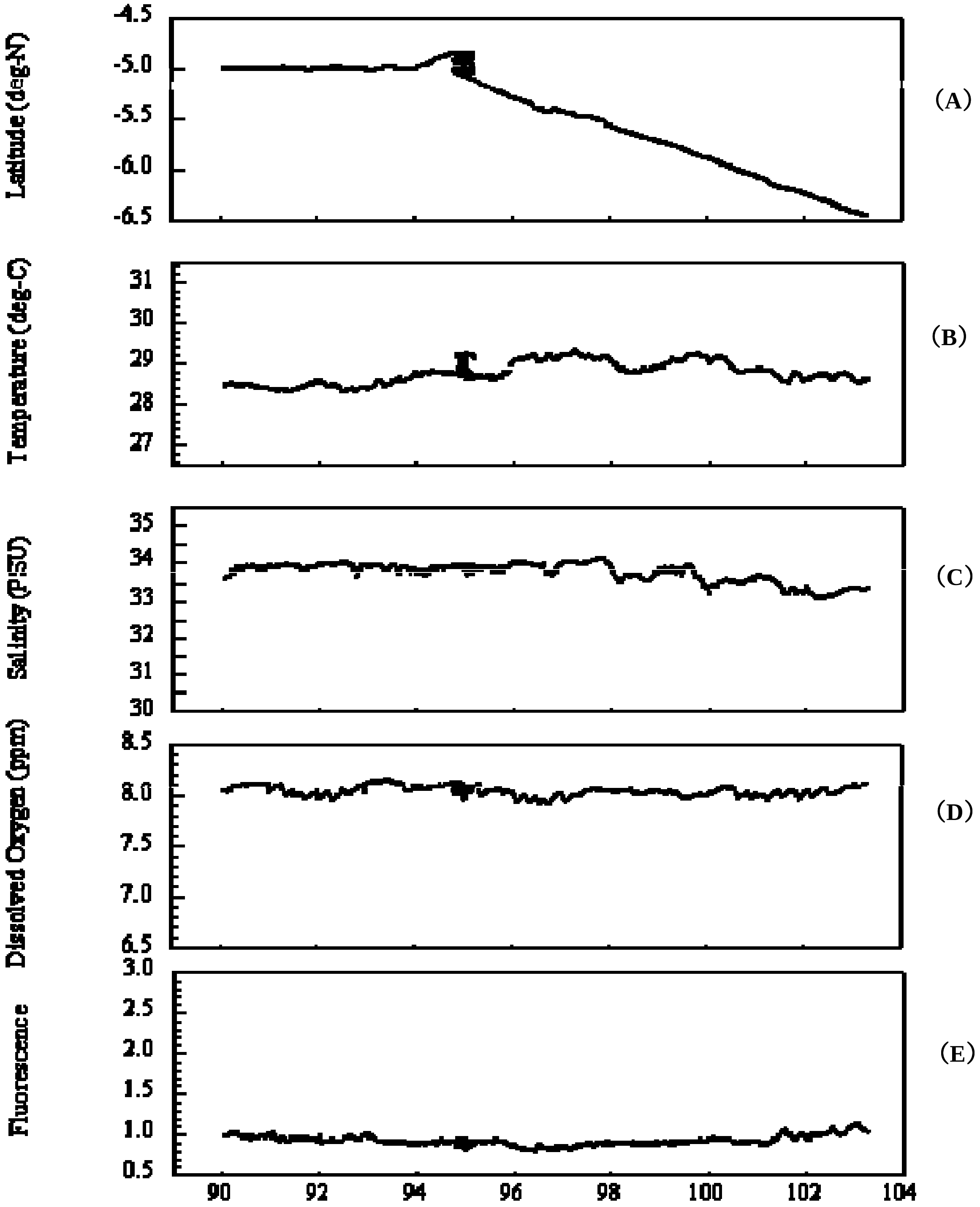


Fig.6.4-6 Ship's track (A), Temperature (B), Salinity (C), Dissolved Oxygen (D), and Fluorescence (E) of surface seawater along 90E line.

Note: Salinity and D.O. in this figure is not corrected.



Latitude (deg-N)

Fig.6.4-7 Ship's track (A), Temperature (B), Salinity (C), Dissolved Oxygen (D), and Fluorescence (E) of surface seawater from lat 5, long 90 to Jakarta.
Note: Salinity and D.O. in this figure is not corrected.

6.5 Shipboard ADCP

(1) Personnel name and affiliation

Hideaki Hase (JAMSTEC): Principal Investigator	- Leg 1, 2 -
Fumitaka Yoshiura (GODI): Operation Leader	- Leg 1, 2 -
Satoshi Okumura (GODI):	- Leg 1 -
Wataru Tokunaga (GODI):	- Leg 1, 2-

(2) Parameters

(2-1) N-S (North-South) and E-W (East-West) velocity components of each depth cell [cm/s]
(2-2) Echo intensity of each depth cell [dB]

(3) Methods

We measured current profiles by VM-75 (RD Instruments, Inc. U.S.A.) shipboard ADCP (Acoustic Doppler Current Profiler) throughout MR00-K07 cruise from the departure of Sekinehama, Japan on 18 October 2000 to the arrival of Jakarta, Indonesia on 20 November 2000.

Major parameters for the measurement configuration are as follows;

Frequency :	75kHz
Average :	every 300 sec
Depth cell length :	1600 cm
No. of depth cells :	40
First depth cell position :	30.9 m
Last depth cell position :	654.9 m
ADCP ensemble time :	32.4 sec
Ping per ADCP raw data :	8

(4) Preliminary result

Half-hourly current vectors of half-hour running mean averaged data are plotted. (Fig 6.5-1 ,-2 , -3 and -4: from Sekinehama to Singapore; Fig.6.5-3 and -4: from Singapore to Jakarta).

(5) Data archive

These data obtained in this cruise will be submitted to the DMO (Data Management Office), JAMSTEC and will be opened to the public via “R/V Mirai Data Web Page” in JAMSTEC home page.

17:31:49 10/19/100

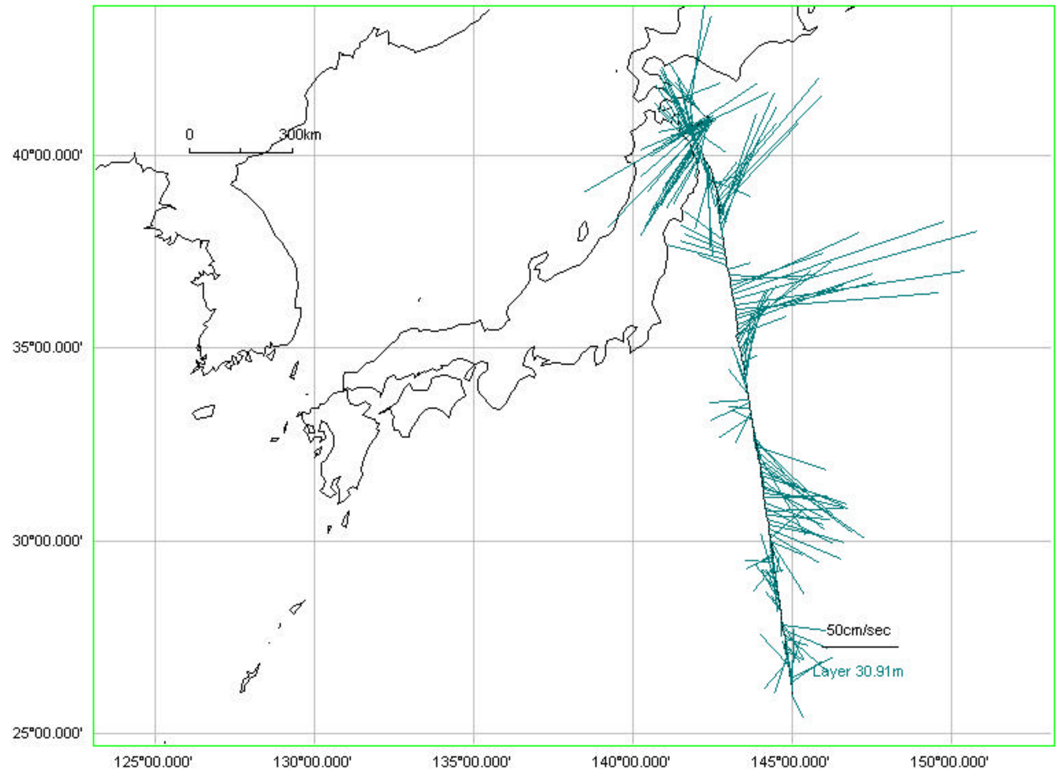


Fig.6.5-1: Half-hour averaged current vectors for every half hour along the ship track at 31m depth

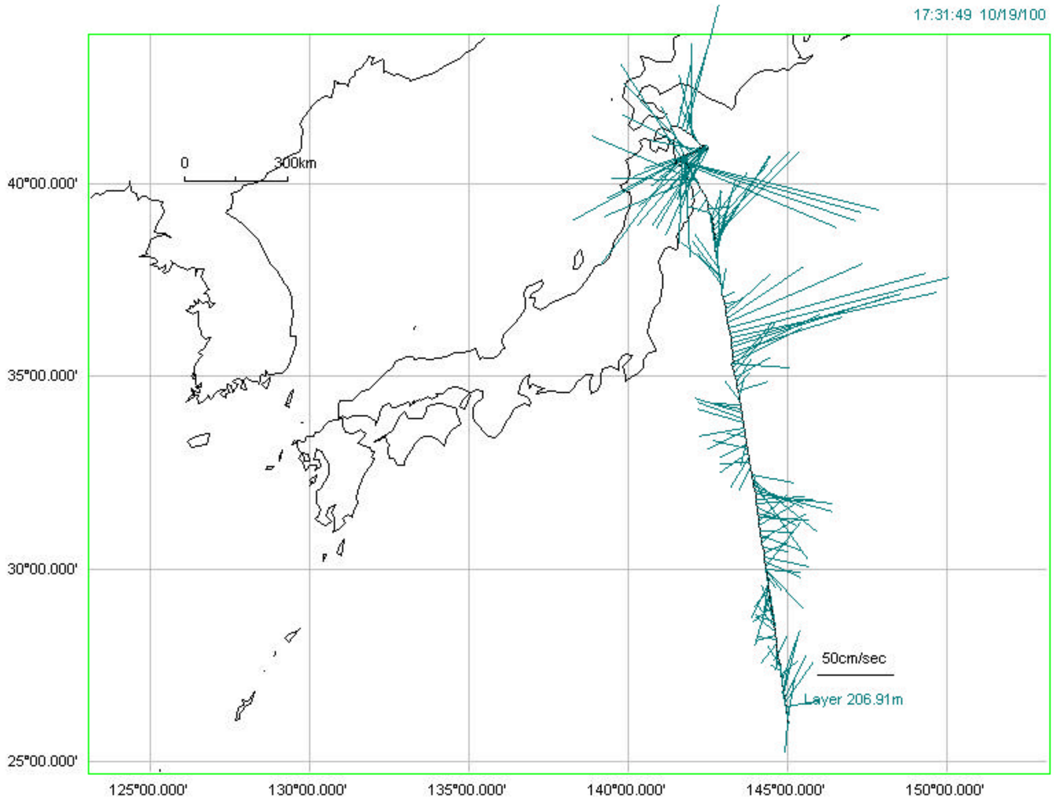


Fig. 6.5-2: Half-hour averaged current vectors for every half hour along the ship track at 207m depth

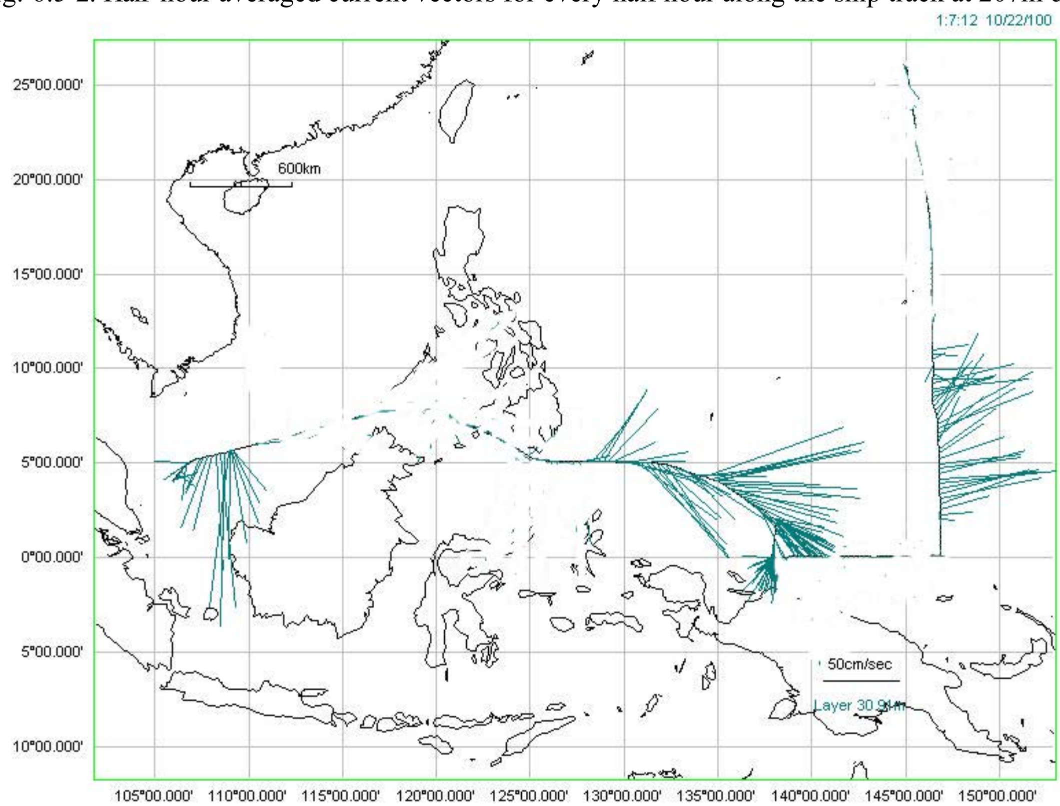
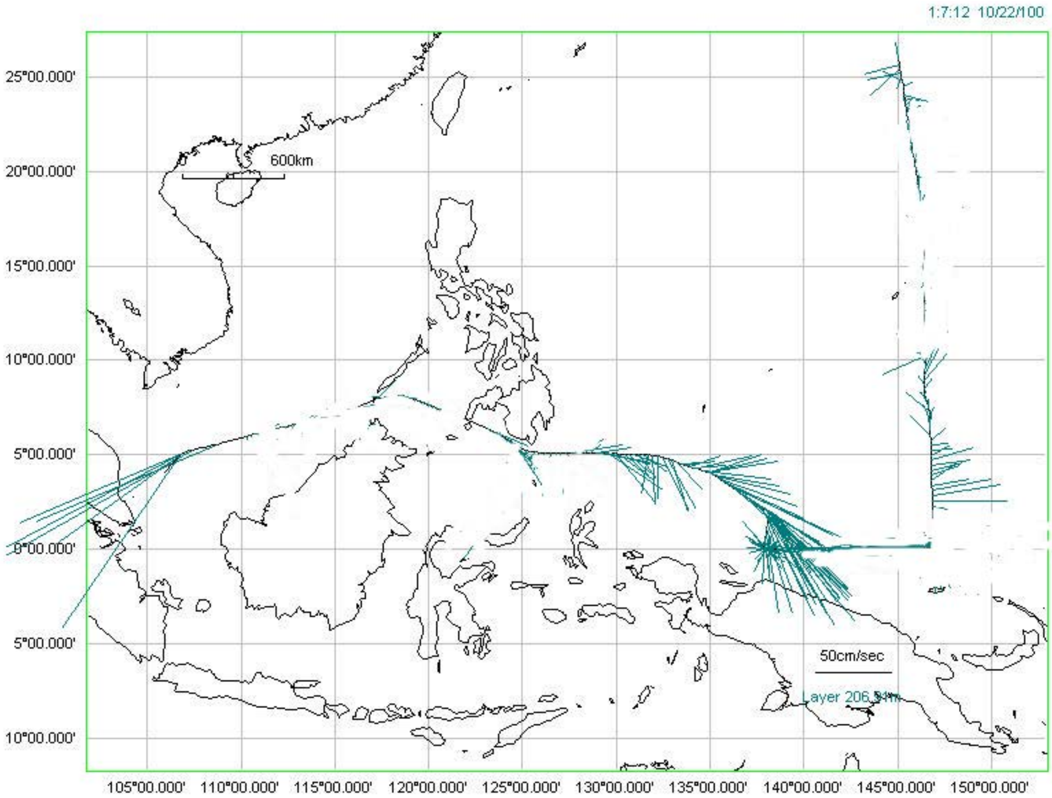


Fig. 6.5-3: Half-hour averaged current vectors for every hour along the ship track at 31m depth



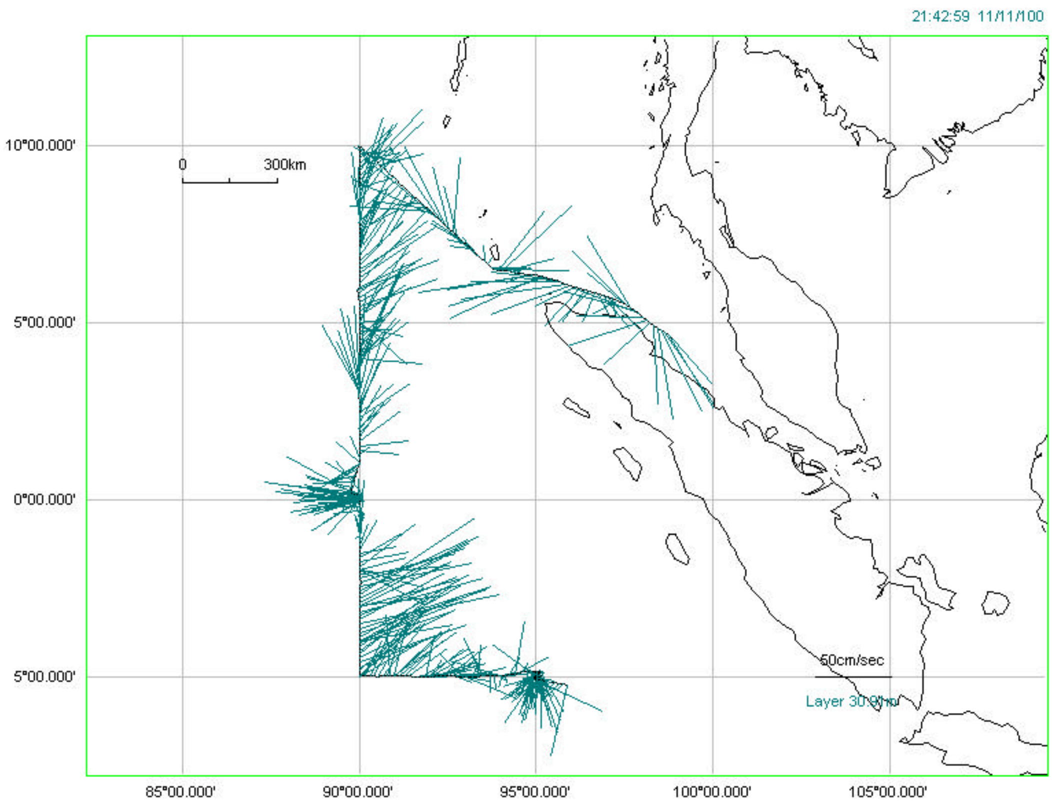


Fig.6.5-4: Half-hour averaged current vectors for every hour along the ship track at 207m depth
Fig. 6.5-5: Half-hour averaged current vectors for every half hour along the ship track at 31m depth

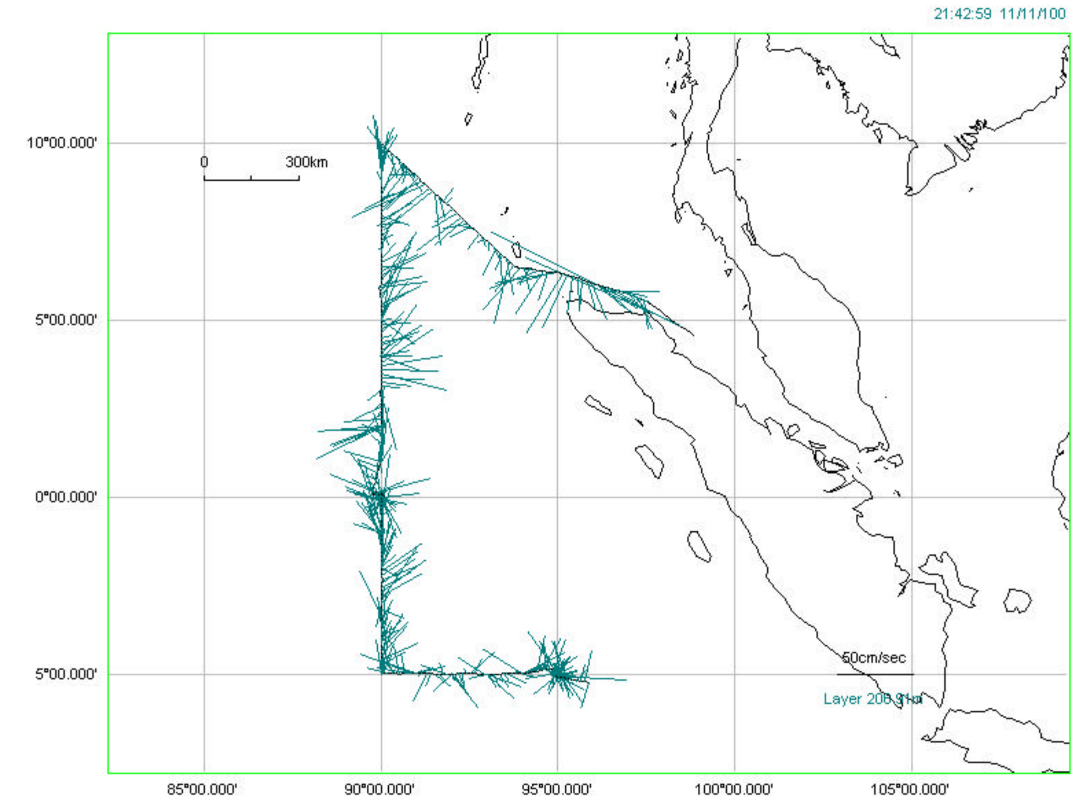


Fig. 6.5-6: Half-hour averaged current vectors for every half hour along the ship track at 207m depth

6.6. Underway geophysics

6.6.1. Sea surface gravity

(1) Personnel

Fumitaka Yoshiura (GODI): Operation Leader - Leg 1, 2 -
Satoshi Okumura (GODI) - Leg 1 -
Wataru Tokunaga (GODI) - Leg 1, 2 –

(2) Objectives

To obtain the continuous gravity data for contribution of geophysical investigation. To perform the above item, sea surface gravity is measured relative variation of gravity values throughout the cruise.

(3) Parameters

Gravity ［mgal］

(4) Methods

We measured relative gravity values by LaCoste-Romberg onboard gravity meter S-116 throughout MR00-K07 cruise from the departure of Sekinehama, Japan on 18 October 2000 to arrival of Jakarta, Indonesia on 20 November 2000.

To obtain absolute gravity values, we usually measure relative value by portable gravity meter (Scintrex gravity meter CG-3M) at comparable points. Unfortunately, portable gravity meter had a trouble at Sekinehama. So we could not measure relative value at comparable points, Sekinehama gravity base, already known absolute gravity values.

(5) Data archive

Gravity data obtained in this cruise will be submitted to the DMO (Data Management Office), JAMSTEC and will be archived there

6.6.2. Surface three axis fluxgate magnetometer

(1) Personnel

Fumitaka Yoshiura (GODI): Operation Leader - Leg 1, 2 -
Satoshi Okumura (GODI) - Leg 1
Wataru Tokunaga (GODI) - Leg 1, 2 -

(2) Objectives

In order to continuously obtain the geomagnetic field vectors on the sea surface, a three axis fluxgate magnetometer is a very useful equipment. The magnetic force on the sea is affected by induction of magnetized body beneath the subbottom in addition to the earth dipole magnetic field. The magnetic measurement on the sea is, therefore, one of utilities for geophysical reconstruction of crustal structure and so on. The geomagnetic field can be divided into three components, i.e., two horizontal (x & y) and one vertical (z) moments. Three-axis fluxgate observation instead of total force includes much information of magnetic structure of magnetized bodies.

(3) Parameters

Three component magnetic force
Ship's attitude (Pitch, Roll and Heading)

(4) Methods

The sensor is a three axes fluxgate magnetometer on the top of foremast and sampling period is 8 Hz. The timing of sampling is controlled by the 1 pps standard clock of GPS signal. Every one second data set which consists of 310 bytes; navigation information, 8 Hz three component of magnetic forces and vertical reference unit (VRU) data were recorded in the external hard disk. The data set is simultaneously fed to the R/V Mirai network server through ethernet LAN system.

(5) Preliminary result

During MR00-K07 cruise, the magnetic force is continuously measured from Sekinehama, Japan to Jakarta, Indonesia. Data obtained on the sea will be analyzed in near future. The procedure of quality control is mainly to eliminate the effect of ship's magnetized vector condition.

(6) Data archive

Magnetic force data obtained during this cruise will be submitted to DMO (Data Management Office), JAMSTEC and will be archived there.

6.6.3 Multi-narrow beam echo sounding system

(1) Personnel

Fumitaka Yoshiura (GODI): Operation Leader - Leg 1,2 -
Satoshi Okumura (GODI) - Leg 1 -
Wataru Tokunaga (GODI) - Leg 1, 2 -
Naoto Morioka (R/V MIRAI Crew) - Leg 1, 2 –

(2) Objective

a) To obtain the bathymetry data for the contribution of geophysical investigation.
b) To obtain the bathymetry data for the sea water sampling during the cruise.

(3) Methods

R/V Mirai has installed a multi narrow beam echo sounding system manufactured by SeaBeam Inc., SeaBeam 2100 system. This system utilized bathymetry mapping. The newest one can measure more than 120 degrees wider swath and available all depth of the world ocean floor.

We surveyed from Sekinehama, Japan to Jakarta. We created bathymetry maps around TRITON buoy deployment sites, 0° 147°E, 0° 138°E and 2°N 138°E, and ADCP buoy at 0° 138°E, 0° 90E and 5° 95E. After the survey near TRITON bouy sites and ADCP buoy site, the bathymetry data were fed to post processing W/S by ftp command. The post processing system furnished on this MNBES has two high performance W/S Indigo^2 which have “mb-system” software on the basis of the Generic Mapping Tool (GMT) called SeaView. Consequently, measured data can easily be edited on W/S by automatically or manually to provide gridding data and map images. Finally colored maps from A to E size were used to decide to buoy deployment locations.Bathymetry data was obtained by using SeaBeam2112.004 (SeaBeam, Inc., USA) 12kHz multi-narrow beam echo sounding system with 4kHz sub-bottom profiler.

(4) Preliminary results

The bathymetrical contour maps have been utilize for mooring buoy deployment. The accuracy seems to be enough to deploy the mooring at any depth. It is, of course, required to keep high accuracy that precise correction of sound speed of the target area can be performed based on the temperature profiles of water column. During this cruise, CTD/XCTD casts have done at the deployment sites or very close to the sites. We could use the CTD/XCTD data to derive sound velocity.

(5) Other remarks

The newest system has continuously measured the surface water sound velocity in real time, because sound velocity at the hydrophone alley is a very important factor to determine the angle of acoustic ray path which affects the outer beam of wider swath. Unfortunately, the SSV meter had a trouble whole of the cruise, so we input the newest sound velocity data site by site.

(6) Data archives

Bathymetry data obtained during this cruise will be submitted to DMO (Data Management Office), JAMSTEC and will be archived there.

7 Special Observation

7.1 TRITON moorings

7.1.1 TRITON Mooring Operation

(1) Personnel

Keisuke Mizuno	(JAMSTEC): Principal Investigator (on board Leg1, 2)
Norifumi Ushijima	(JAMSTEC): Engineer (on board Leg1, 2)
Hideaki Hase	(JAMSTEC): Scientist (on board Leg1, 2)
Atsuo Ito	(MWJ): Technical staff
Masayuki Fujisaki	(MWJ): Operation leader
Takeo Matsumoto	(MWJ): Technical staff
Hiroshi Matsunaga	(MWJ): Technical staff
Yutaka Matsuura	(MWJ): Technical staff
Kei Suminaga	(MWJ): Technical staff
Kentaro Shiraishi	(MWJ): Technical staff
Masaki Furuhata	(MWJ): Technical staff
Shinji Narita	(MWJ): Technical staff
Nakahito Nishikawa	(MWJ): Technical staff

(2) Objectives

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

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

The three TRITON buoys have been successfully deploy during this R/V Mirai cruise (MR00-K07).

(3) Measured parameters

Meteorological parameters:

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

Oceanic parameters:

water temperature and conductivity at 1.5m, 25m, 50m, 75m, 100m, 125m, 150m, 200m, 300m, 500m 750m, depth at 300m and 750m,

currents at 10m.

(4) Instrument

1) CTD and CT

SBE-37 IM MicroCAT

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

2) CRN(Current meter)

SonTek Argonaut ADCM

Sensor frequency : 1500kHz
Sampling interval : 1200sec
Average interval : 120sec

3) Meteorological sensors

Precipitation

SCTI ORG-115DX

Atmospheric pressure

PARPSCIENTIFIC. Inc. DIGIQUARTZ FLOATING BAROMETER 6000SERIES

Relative humidity/air temperature, Shortwave radiation, Wind speed/direction

Woods Hole Institution ASIMET

Sampling interval : 60sec
Data analysis : 600sec averaged

(5) Locations of TRITON Buoys

1) TRITON buoys deployed

Nominal location	0, 147E
ID number at JAMSTEC	09003
Number on surface float	T13
ARGOS PTT number	20434
ARGOS backup PTT number	24230
Deployed date	28 Oct. 2000
Exact location	0 - 03.72N, 147 - 00.71 E
Depth	4468 m

Nominal location	0, 138E
ID number at JAMSTEC	13002
Number on surface float	T25
ARGOS PTT number	none
ARGOS backup PTT number	24234
Deployed date	30 Oct. 2000
Exact location	0 - 01.91N, 137 - 52.96 E
Depth	4370 m

Nominal location	2N, 138E
ID number at JAMSTEC	12002
Number on surface float	T24
ARGOS PTT number	20431
ARGOS backup PTT number	24233
Deployed date	1 Nov. 2000
Exact location	1 - 59.90N, 138 - 06.21 E
Depth	4331m

*: Dates are UTC and represent anchor drop times for deployments.

(6) Details of deployed

We had deployed three TRITON buoys, described them details in the list

.

Deployed TRITON buoys

Observation No.	Location.	Details
09003	Eq. 147E	Full spec.
13003	Eq. 138E	No Floating sensors and buoy systems.
12003	2N 138E	Full spec.

(7) Data archive

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

TRITON Homepage: http://www.jamstec.go.jp/jamstec/triton

7.1.2 Intercomparison between shipboard CTD and TRITON data

(1) Personnel

Kentaro Ando (JAMSTEC): not on board
Takeo Matsumoto (MWJ)
Tetsuya Nagahama (MWJ): not on board

(2) Objectives

TRITON CTD data validation.

(3) Measured parameters

・Temperature
・Conductivity
・Pressure

(4) Methods

We used the same CTD system with general CTD observation. We conducted 1 CTD casts at each TRITON buoy site. The cast was performed immediately after the deployment and before recovery.

(5) Results

Most the temperature, Conductivity and salinity data from TRITON buoy showed good agreement with CTD data in each comparision. See the attached figures and tables.(fig.7.1.2-1～fig.7.1.2-2,table.7.1.2-1～table.7.1.2-2)

Table 7.1.2-2 Difference between TRITON Buoy and CTD

Buoy No.	T24	Position	2N 138E
Observation No.	12002	Comparision Date	2000/11/1
Operation	After Deploy	Comparision Time	4:20(UTC)

Pressure(db)	TRITON-CTD		
	Temparetuer(℃)	Conductivity(S/m)	Salinity(psu)
1.5	0.60	-2.811	-18.478
25	-0.01	0.000	0.006
50	0.00	0.000	-0.001
75	0.63	0.030	-0.244
100	0.20	0.023	0.018
125	-0.01	-0.001	0.005
150	-0.09	-0.015	-0.042
200	0.27	0.020	-0.049
250	-0.04	-0.005	-0.015
298	-0.01	0.000	0.010
500	-0.03	-0.005	-0.015
741	-0.02	-0.002	-0.002

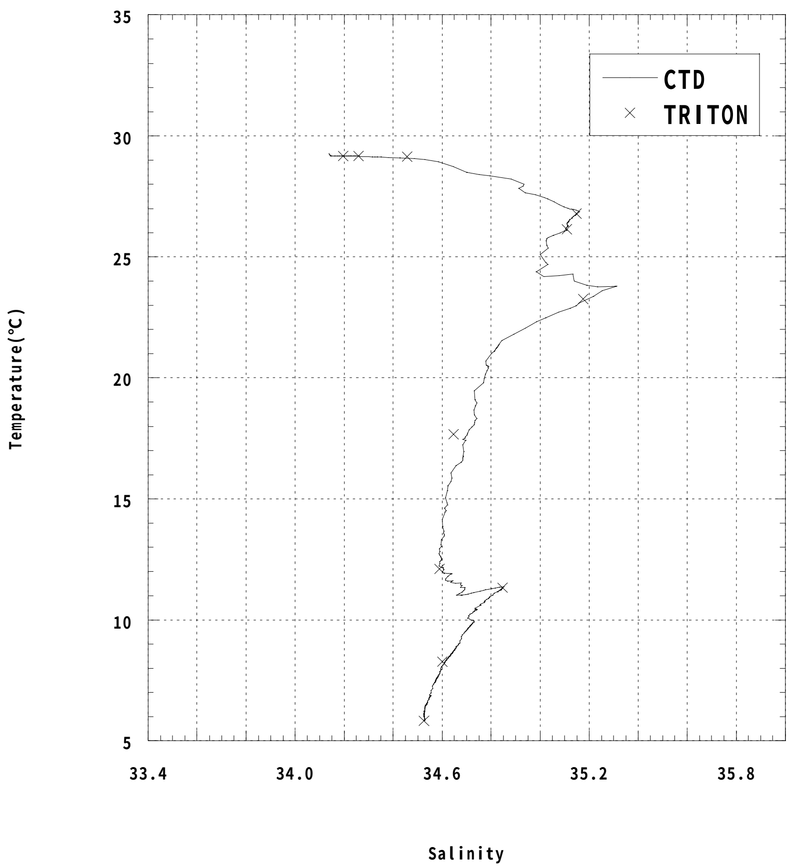


fig. 7.1.2-2 T-S Diagram :TRITON buoy data and ship board CTD
Observation No. 12002

(6) Data archive

All of raw and processed CTD data files were copied into 3.5 inch magnetic optical disks and submitted to JAMSTEC Data Management Office. All original data will be stored at JAMSTEC Mutsu brunch. (see 6.2.1)

7.1.3 Current condition and site survey around the mooring site

(1) Personnel

Norifumi Ushijima	(JAMSTEC): Principal Investigator
Fumitake Yoshiura	(GOJI): Shipboard measurements
Wataru Tokunaga	(GOJI): Shipboard measurements
Naoto Morioka	(Mirai crew): Shipboard measurements

(2) Objectives

In new development to a new area of sea of TRITON BUOY, the topography investigation of the bottom of the sea and ocean current investigation are important.

We investigated the seafloor topography and current speed about an area of sea to describe next, after having deployed three buoys at this voyage. (No.15, 17, 18 site)

In addition, we investigated an ocean current of a TRITON BUOY deployment area of sea. (No.9, 12,13 site)

TRITON No.9 site:	(EQ, 147E)
TRITON No.12 site:	(2N, 138E)
TRITON No.13 site:	(EQ, 138E)
TRITON No.15 site:	(5N, 130E)
TRTION No.17 site:	(5S, 95E)
TRITON No.18 site:	(EQ, 90E)

(3) Methods

R/V Mirai: Shipboard ADCP and Multi-narrow beam echo sounding system

(4) Preliminary results

(b) TRITON No.12 site: see Fig. 7.3.4

From speed distribution of a nearby depth of the water direction at the (2N, 138E) site nearby, a flow was calm generally. East and West course was a flow of a master, and a little strong flow was observed in surface of the sea lower part 80m, 280m and 450m nearby.

(c) TRITON No.13 site: see Fig. 7.1.3.5

A flow of nearby (EQ, 138E) site, the outer layer was around 1 knot. A little strong flow was observed in depth of the water 210m nearby. East and West direction and two ingredients of north and south direction were equal.

(d) TRITON No.15 site: see Fig.7.1.3.6-7

Because there was not investigation time, we judge it than the topography provided than a database, and we did it with one observation line for lat. 5 degrees 3 minutes N, and we found that roughly around 5100m depth floor was open in an area of sea of the west from long. 129 degrees 58 minutes E.

Area of sea investigation of a part of the south is more necessary in a real triton buoy deployment.

However, we selected two points of next as a deployment candidate position of Triton Buoy as a temporary establishment position for planning.

POINT A(5 degree 00.00’ N, 129 degree 57.00’ E): about 5105m depth of the water

POINT B (5 degree 03.00’ N, 129 degree 53.00’ E): about 5075m depth of the water

From speed distribution of a nearby depth of the water direction, East and West ingredient is important and there were little strong flows in depth of 50m and 150m nearby.

(e) TRITON No.17 site: see Fig.7.1.3.8-10

We executed five investigation with observation line of East and West direction 20 miles in 3 miles interval to the north and south, and this area of sea was generally plane, and it was about 5200m depth of the water.

We selected two points of next with a deployment position candidate of TRITON Buoy. We consider distance with a position of the ADCP mooring system that we just had deployed in this time.

POINT A (4 degree 57.00’ S, 94 degree 58.50’ E): About 5200m depth of the water

POINT B (5 degree‹ 02.00’S, 94 degree 58.50’ E): About 5200m depth of the water

Current speed distribution of a depth of the water direction presents a calm aspect, and north and south ingredient excels. There was only a little strong flow in the water depth of 70m and a calm flow was distributed over a plumb direction.

(f) TRITON N0.18 site: see Fig.7.1.3.11-13

With observation line of East and West direction 22 miles, we carried out five investigations in 3 miles interval to the north and south. From the bottom of the sea topography of equator southward, we found that the bottom of the seafloor goes through a lot of emotional ups and downs.

The comparatively flat bottom of the seafloor is located in the 2-5 miles north than the equator, and this bottom of the seafloor is deepened in east direction gently.

We selected two points of next as a deployment candidate position of Triton Buoy.

POINT A (0 degree 04.00’ N, 90 degree 04.00’ E): About 4540m depth of the water

POINT B (0 degree 04.00’ N, 89 degree 57.00’ E): About 4470m depth of the water

Depth distribution of current speed shows a comparatively calm aspect, and East and West ingredient excels a little. The outer layer has around 1 knot, and depth of 130m includes a flow strong a little.

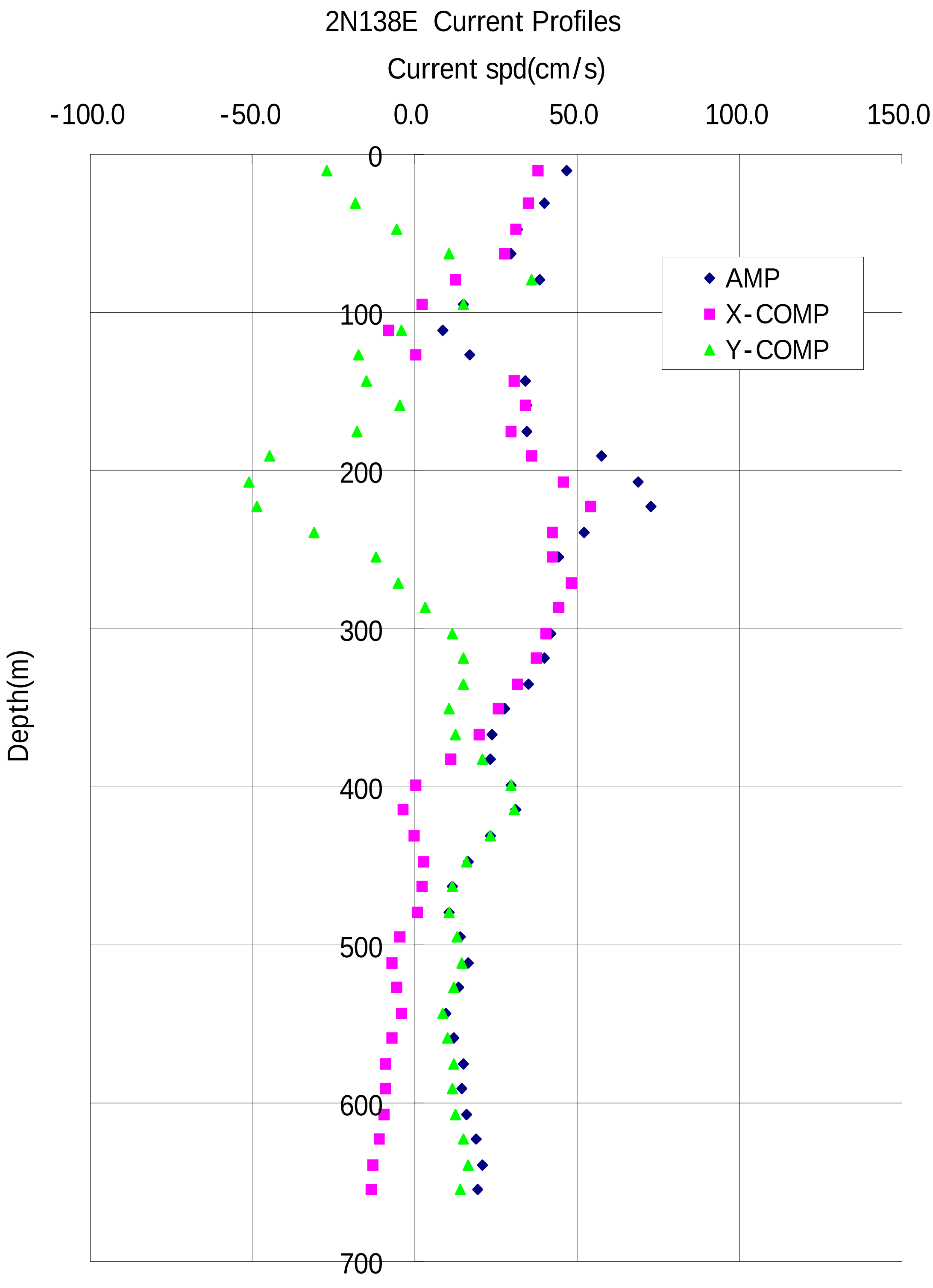


Fig. 7.3.4 Current profiles CASE 1 at (2N, 138E)

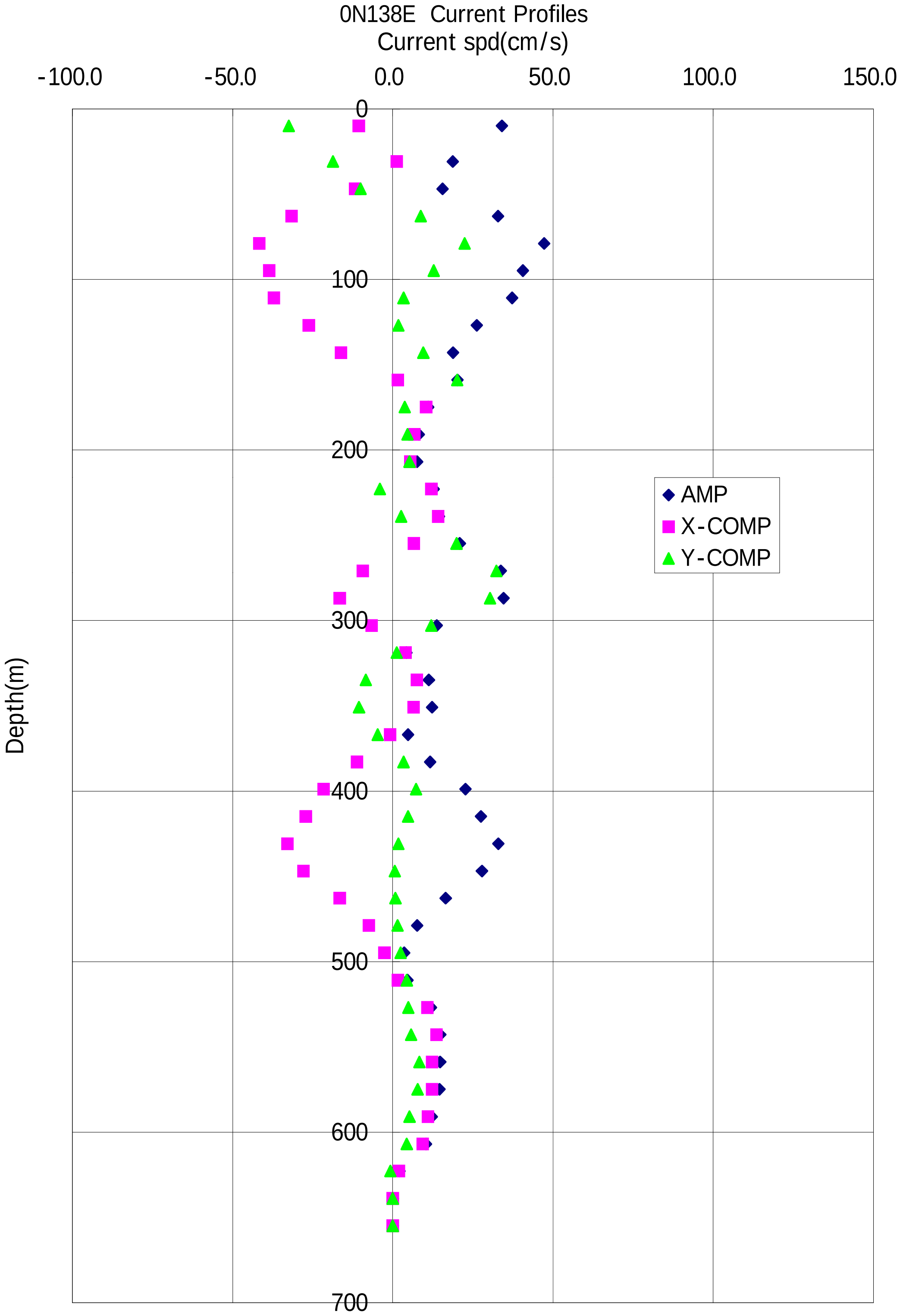


Fig. 7.3.5 Current profiles CASE 1 at (EQ, 138E)

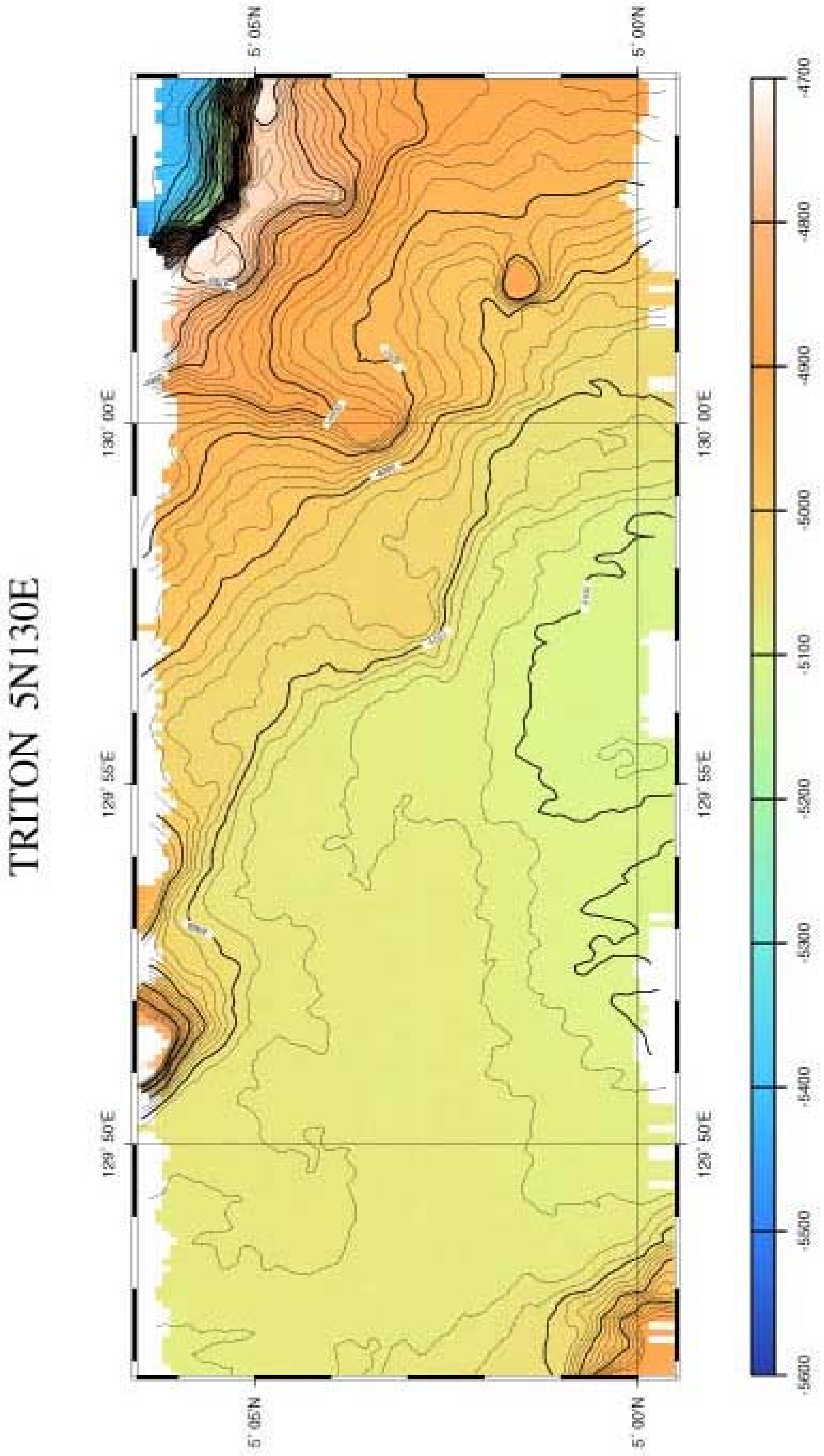


Fig. 7.3.6 TRITON No.15 site(5N, 130E)

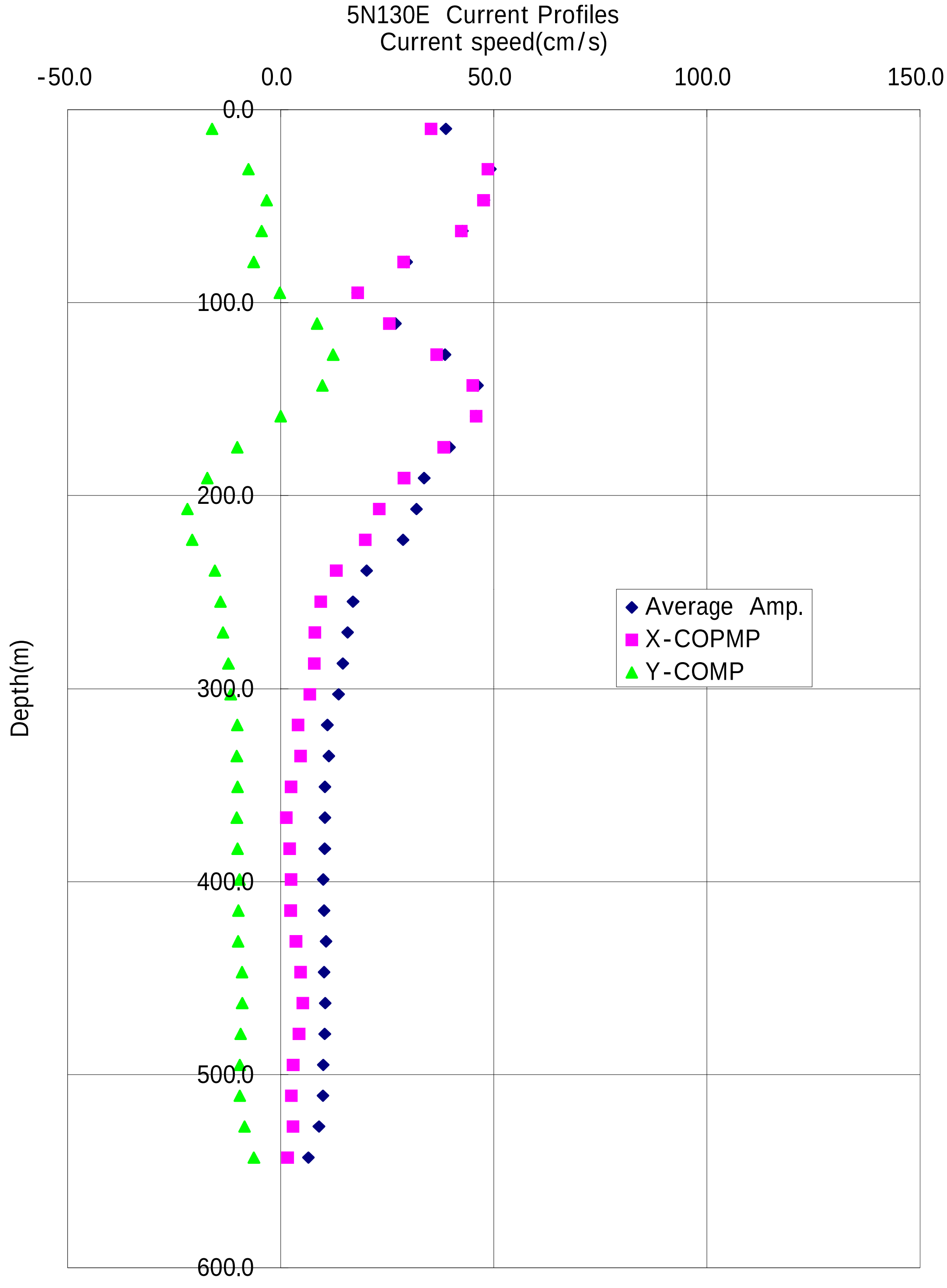


Fig. 7.3.7 Current profiles CASE 1 at (5N, 130E)

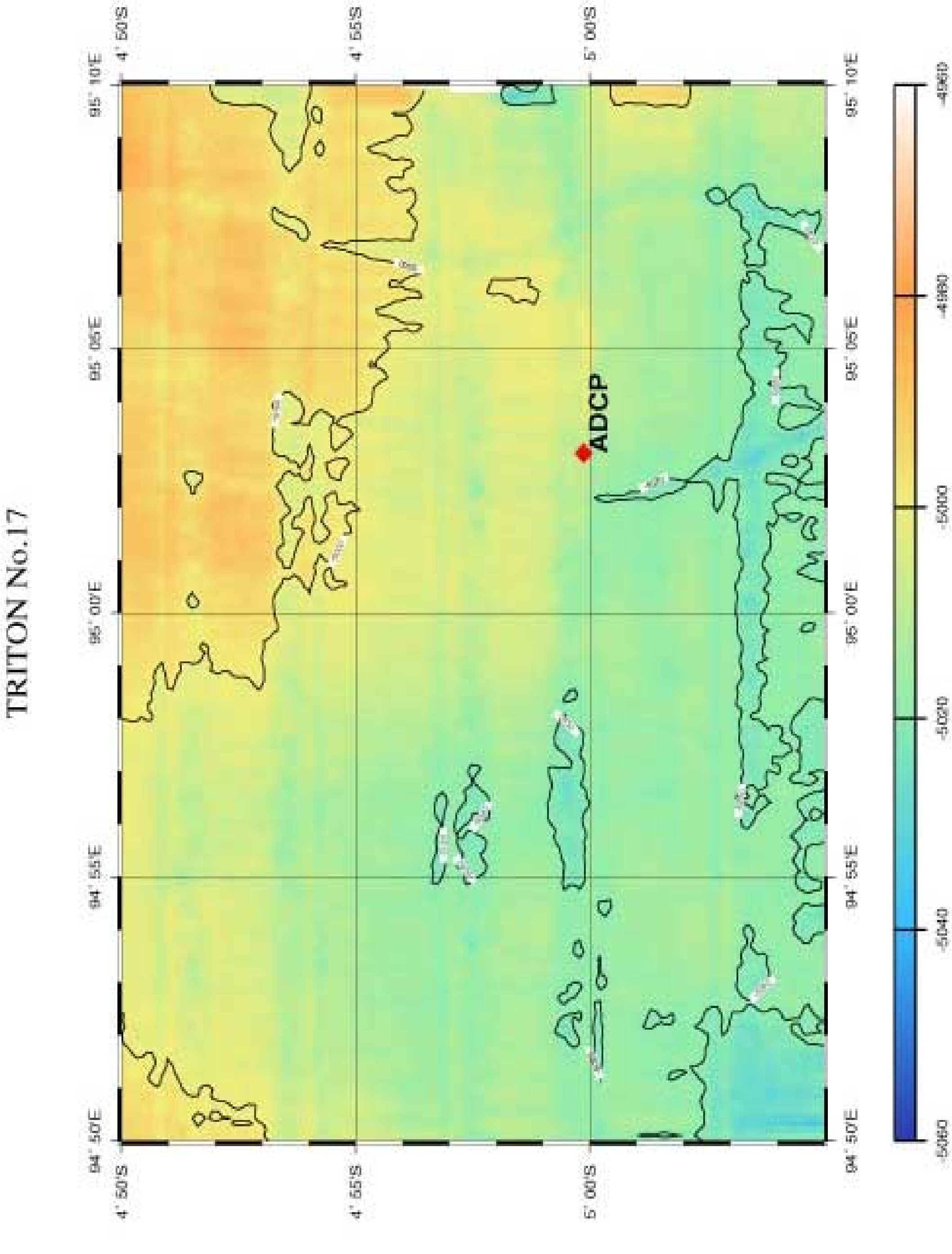


Fig. 7.3.8 TRITON No.17 site(5S, 95E)

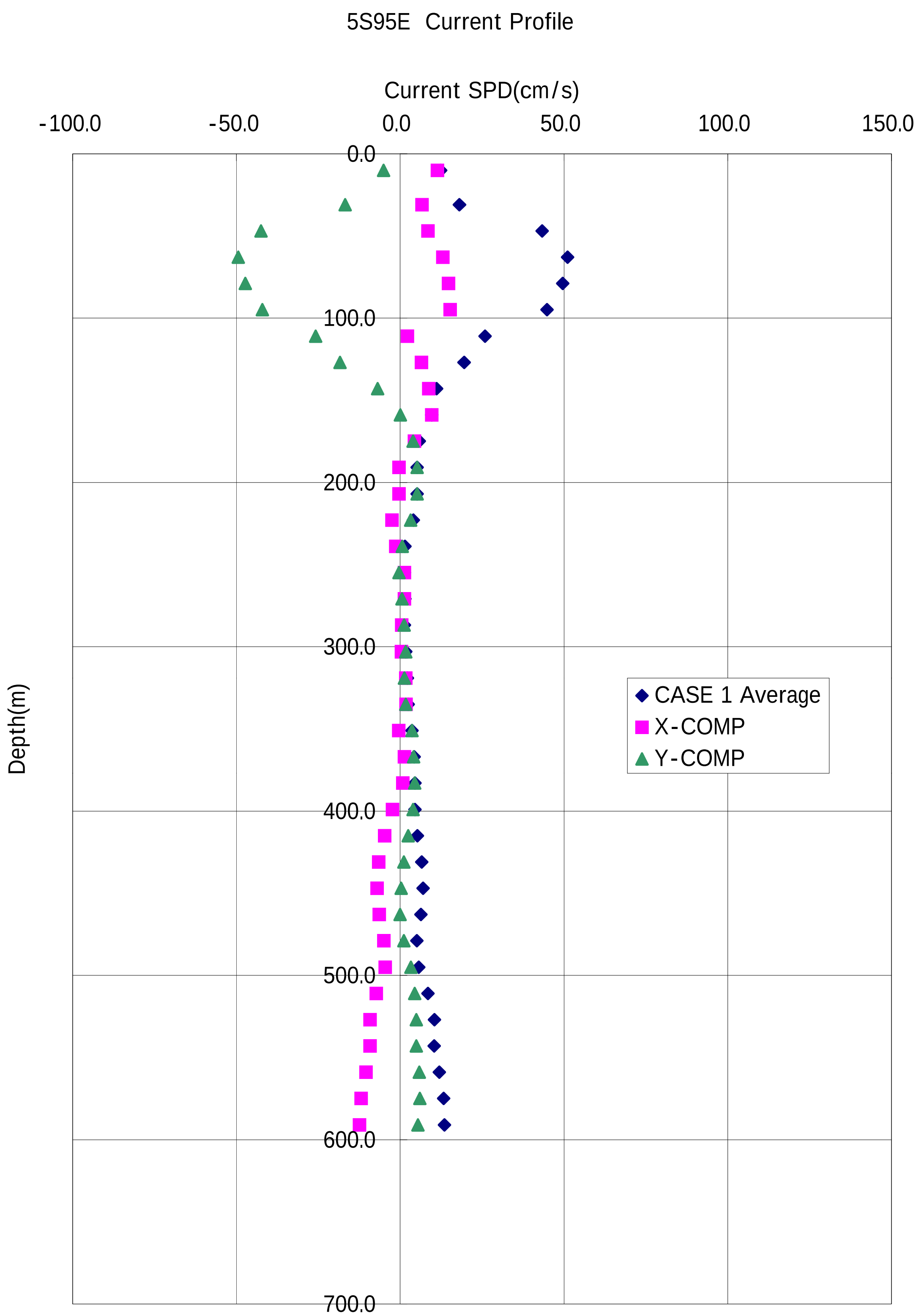


Fig. 7.3.9 Current profiles CASE 1 at (5S, 95E)

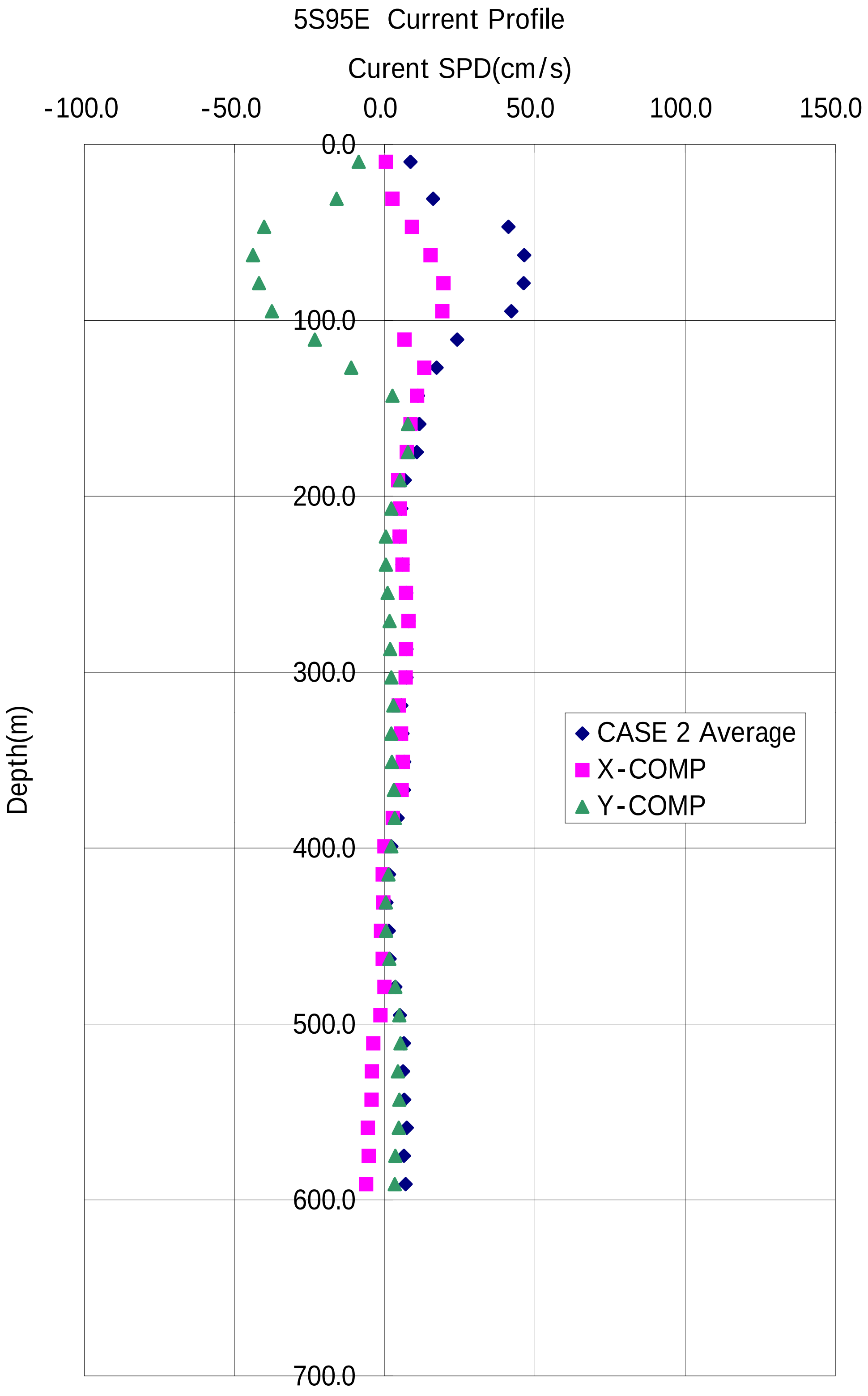


Fig. 7.3.10 Current profiles CASE 2 at (5S, 95E)

TRITON No.18

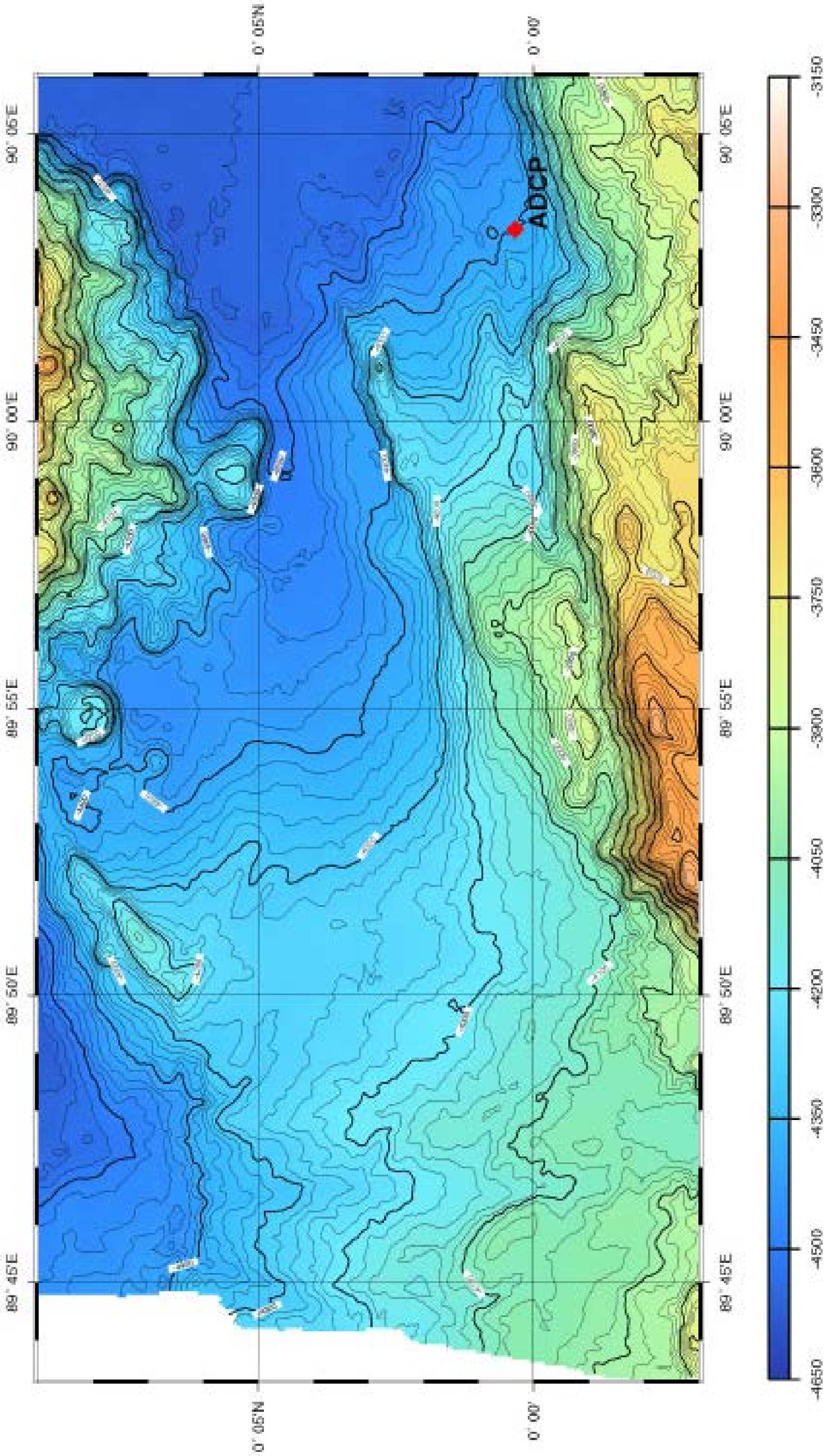


Fig. 7.3.11 TRITON No.18 site(EQ, 90E)

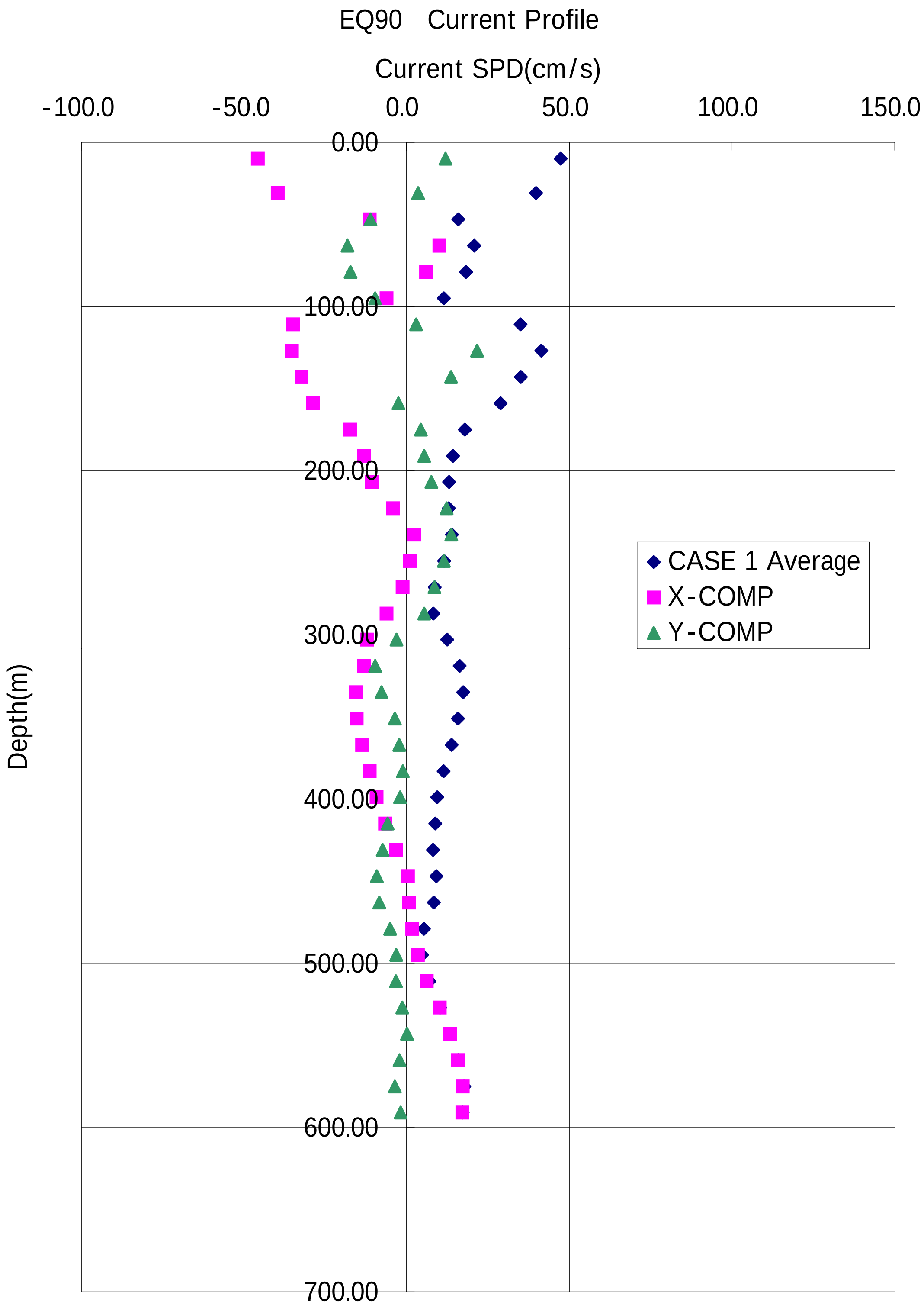


Fig. 7.3.12 Current profiles CASE 1 at (EQ, 90E)

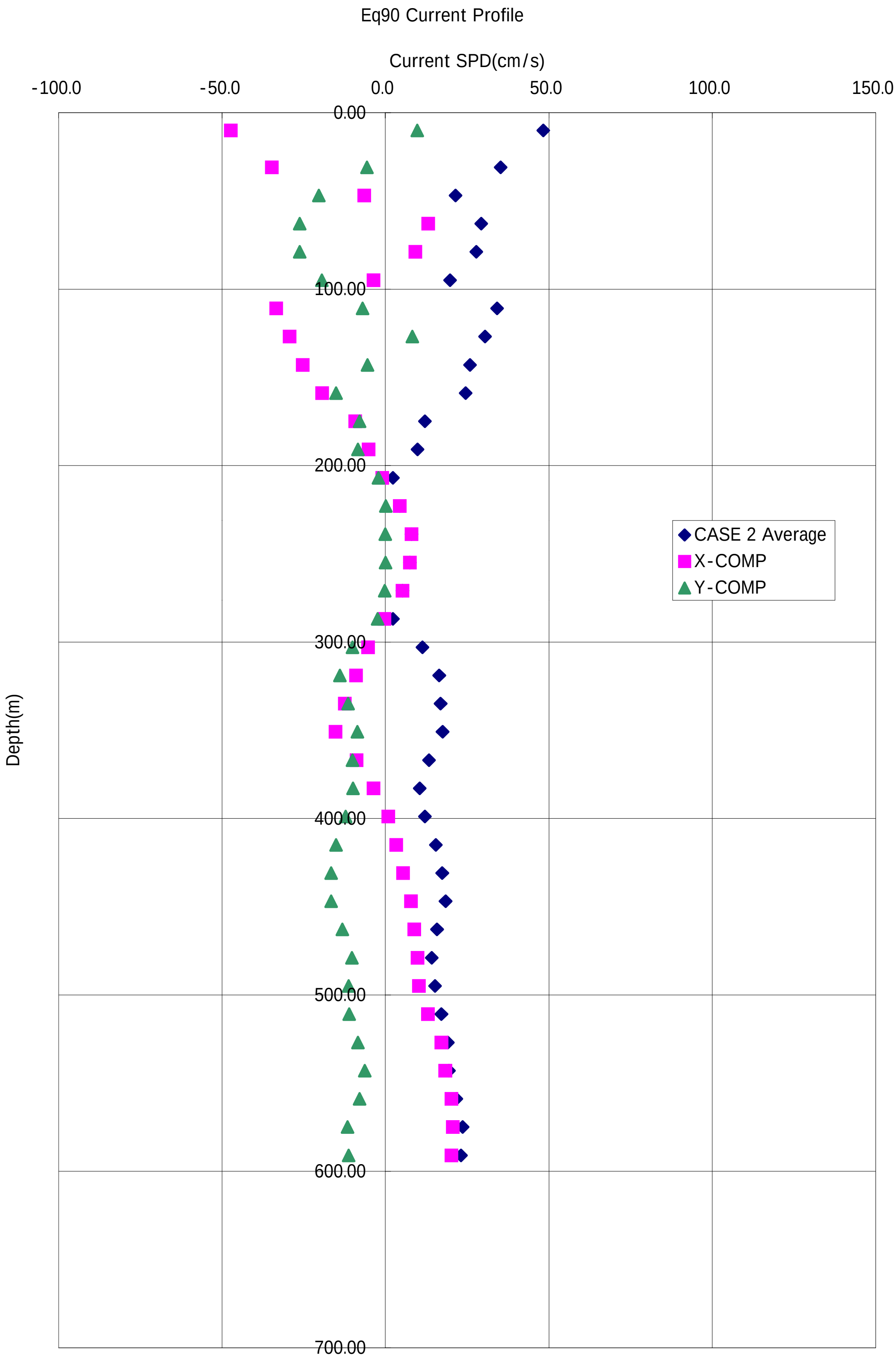


Fig. 7.3.13 Current profiles CASE 2 at (EQ, 90E)

7.2. Doppler radar observation

(1) Personnel

Masaki Katsumata (JAMSTEC): Principal Investigator
Fumitaka Yoshiura (GODI): Operation Leader
Wataru Tokunaga (GODI): Operator

(2) Objective

The Doppler radar is operated to obtain spatial and temporal distribution of rainfall amount, and structure of precipitating cloud systems. The objective of this observation is to investigate the life-cycle of the cloud convective systems during active phase of intraseasonal oscillation.

(3) Parameters

Spatial and temporal distribution of two parameters, radar reflectivity [dBZ] and Doppler velocity [m/s], are obtained for 120-km radius and 10-minutes intervals by 21-elevations volume scan. The horizontal radar reflectivity fields are also obtained for 200-km radius and 10-minutes intervals by one elevation (0.5 degrees) PPI (Plan Position Indicator) scan.

(4) Methods

The hardware specification of this shipboard Doppler radar (RC-52B, manufactured by Mitsubishi Electric Co. Ltd., Japan) are;

Frequency:	5290 MHz
Beam Width:	better than 1.5 degrees
Output Power:	250 kW (Peak Power)
Signal Processor:	RVP-6 (Sigmet Inc., U.S.A.)
Inertial Navigation Unit:	DRUH (Honeywell Inc., U.S.A.)
Application Software:	IRIS/Open (Sigmet Inc., U.S.A.)

The hardware is calibrated by checking (1) frequency, (2) mean power output, (3) pulse repetition frequency (PRF) for once a day, and (4) transmitting pulse width and (5) receiver linearity at the beginning and the end of the leg.

Operation is performed continuously from 0450 UTC on 11 November 2000 to 1210 UTC 19 November 2000,. During the operation, the programmed "tasks" are repeated every 10 minutes. One cycle consists of one volume scan (consists of PPIs for 21 elevations) with Doppler-mode (120-km range for reflectivity and Doppler velocity), one-elevation PPI with Intensity-mode (200-km range for reflectivity). Occasionally we operated RHI (Range Height Indicator) scan with Doppler-mode. The parameters for the above three tasks are listed in Table 7.2-1.

Table 7.2-1: Parameters for each task.

	Intensity-mode PPI	Volume Scan	RHI
Pulse Width	2 [us]	0.5 [us]	
Scan Speed	18 [deg./sec.]		Automatically determined
PRF	260 [Hz]	900 / 720 [Hz]	
Sweep Integration	32 samples		
Ray Spacing	about 1.0 [deg.]		0.2 [deg.]
Bin Spacing	250 [m]	125 [m]	
Elevations	0.5	0.5, 1.2, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.1, 11.3,12.8, 14.6, 16.6, 18.9, 21.6, 25.0, 29.0, 34.0, 40.0	0.0 to 85.0
Azimuths	Full Circle		Optional
Software Filters	No filter	Dual-PRF velocity unfolding	
Gain Control	Fixed		

(4) Preliminary Results

Figure 7.2-1 is the time series of the observed radar echo area through leg 2. The figure shows that several major precipitating events were observed by the Doppler radar. For one of the events, the time series of the PPI images is shown as Fig. 7.2-2. On the event, one mesoscale convective system (MCS) developed in the north of R/V Mirai at [5S, 90E]. At 15UTC of Nov.15, the stratiform region of the MCS developed rapidly. At the same time, lined radar echo appeared as surrounding the MCS. This lined echo continued to move eastward, while Mirai moved eastward along 5S line. As the result, we could observed the line from the generation to vanish: the line could see as the radar echo for 24 hours.

The detailed analyses for the observed events, with the other obtained datasets, are in future work.

(5) Data Archive

The inventory information of the Doppler radar data obtained during this cruise will be submitted to JAMSTEC DMO (Data Management Office). The original data will be archived at Ocean Research Department of JAMSTEC.

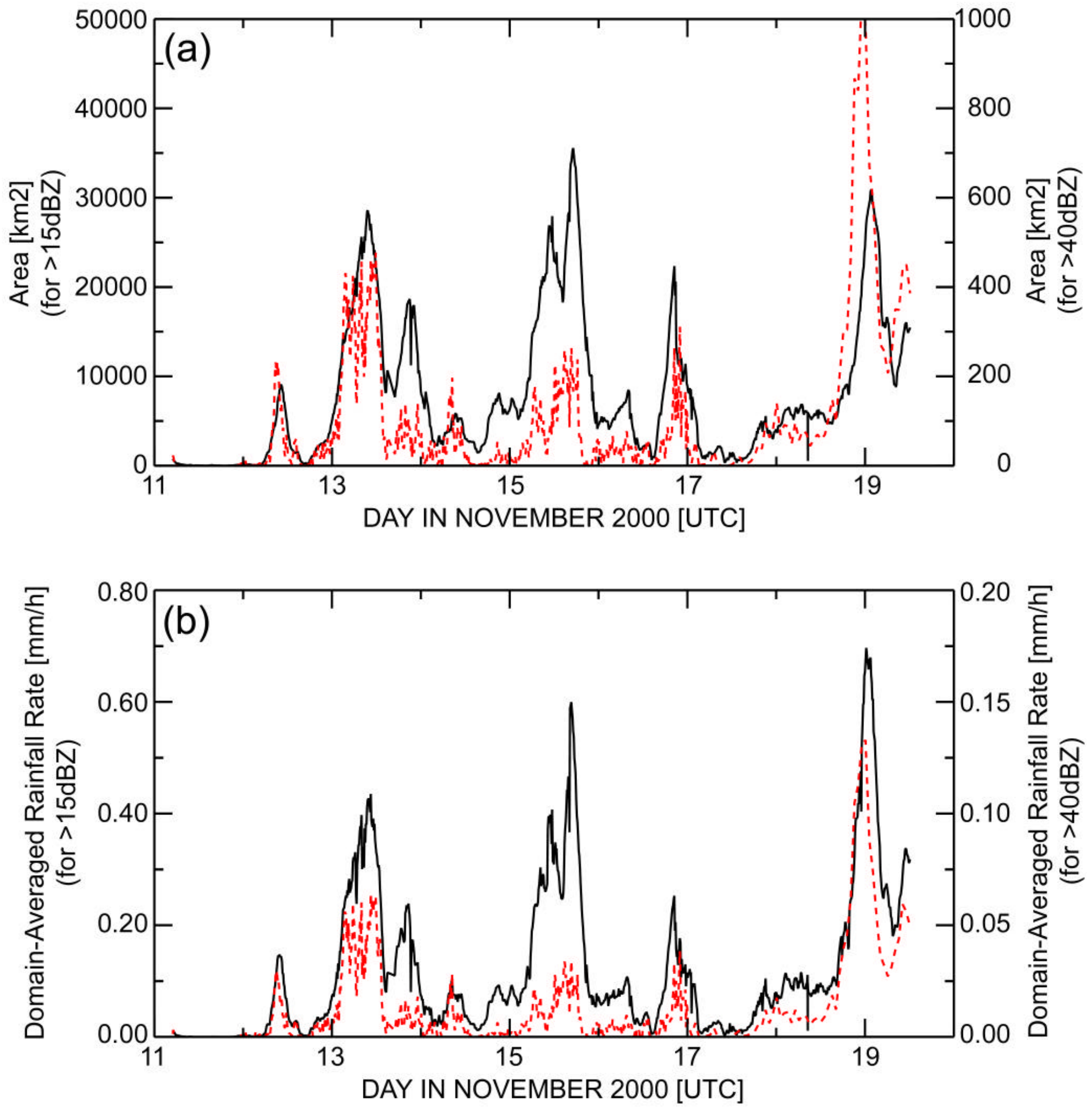


Fig. 7.2-1: Time series of the (a) radar echo area and (b) averaged rainfall rate for radar observation range. The solid and dashed line indicates the value for over 15dBZ area and over 40dBZ area, respectively.

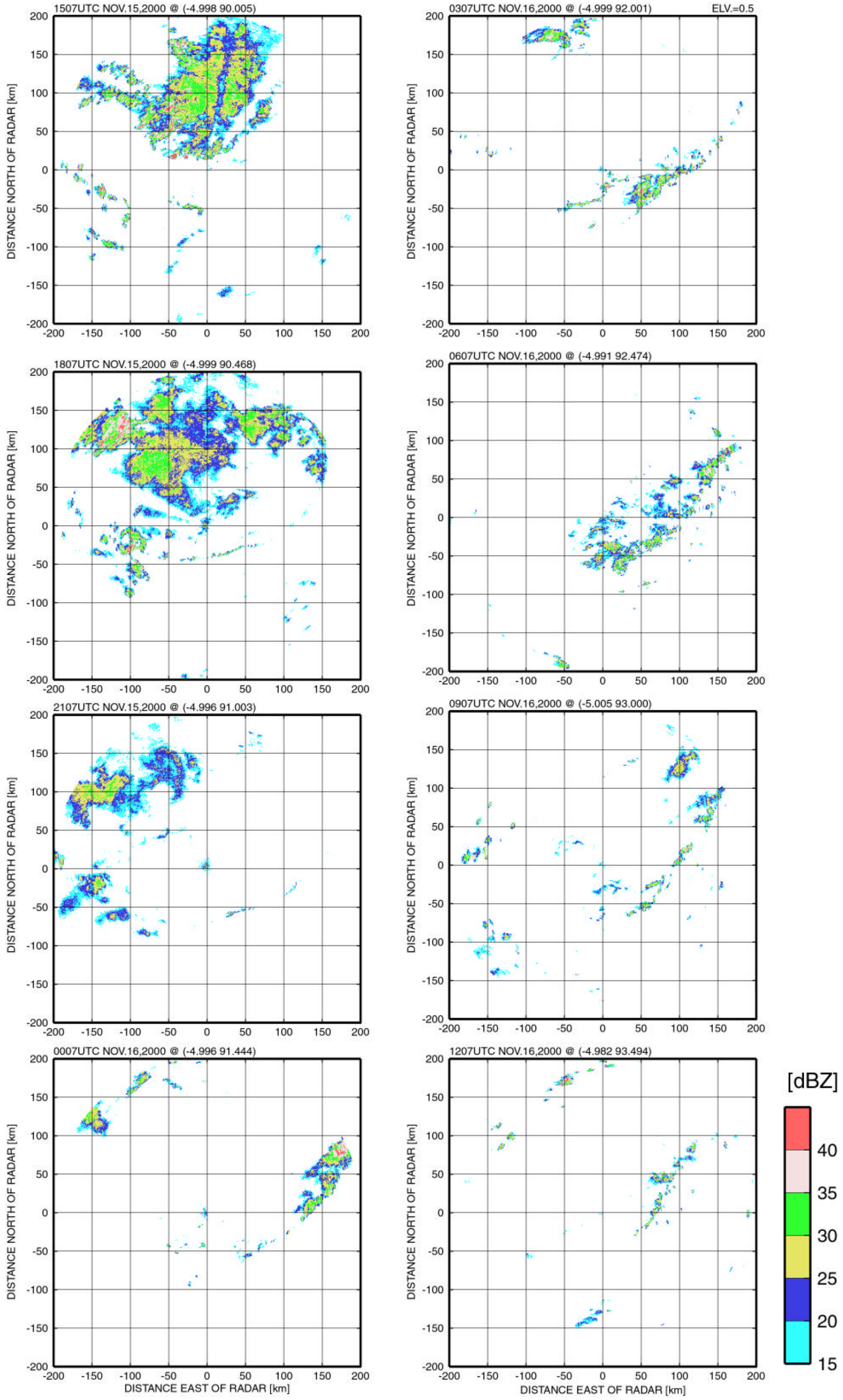


Fig. 7.2-2: Time series of radar reflectivity field, obtained by surveillance (intensity-mode) PPI, for every 3 hours, from 15UTC on Nov.15 to 12UTC on Nov.16.

7.3 Aerosol measurement

(1) Personnel

On board scientists
Tatsuo Endoh (Institute of Low Temperature Science, Hokkaido Univ.) Associate Professor
Keisuke Mizuno (JAMSTEC) Chief Research Scientist

Co-workers not on board
Tamio Takamura (Center of environmental remote sensing science, Chiba University) Professor
Sachio Ohta (Engineering environmental resource lab., Graduate school of engineering, Hokkaido Univ.) Professor
Teruyuki Nakajima (Center of climate system research, University of Tokyo) Professor

(2) Objects/Introduction

One of the most important objects is the collection of calibration and validation data from the surface (Nakajima et al.1996, 1997 and 1999). It may be considered for the observation over the widely opening of the huge ocean to be desired ideally because of horizontal homogeneity. Furthermore, the back ground values of aerosol concentration are easily obtained over there (Ohta et al.1996, Miura et al. 1997 and Takahashi et al. 1996) and vertical profile of aerosol concentration are obtained by means of extrapolation up to the scale height. It is desired to compare the integrated value of these profile of aerosol concentration with optical thickness observed by the optical and radiative measurement (Hayasaka et al. 1998, Takamura et al.1994). Facing this object, the optical and radiative observations were carried out by the Sky Radiometer providing more precise radiation data as the radiative forcing for global warming.

(3) Measuring parameters

Atmospheric optical thickness, Ångstrom coefficient of wave length efficiencies, Direct irradiating intensity of solar, and forward up to back scattering intensity with scattering angles of 2-140degree and seven different wave lengths GPS provides the position with longitude and latitude and heading direction of the vessel, and azimuth and elevation angle of sun. Horizon sensor provides rolling and pitching angles.
Concentration and size distribution of atmospheric aerosol.

(4) Methods

The instruments used in this work are shown as following in Table-7.3-1.
Sky Radiometer was measuring irradiating intensities of solar radiation through seven different filters with the scanning angle of 2-140 degree. These data will provide finally optical thickness, Åangstrom exponent and size distribution of atmospheric aerosols with a kind of retreaval method.
Optical Particle Counter was measuring the size of large aerosol particle and counting the number concentration with laser light scattering method and providing the size distribution in 0.3,0.5,1.0,2.0 and 5.0 micron of diameter with real time series display graphically.

(5) Results

Information of data and sample obtained are sammerized in Table-7.3-2. The sky radiometer has been going well owing to more calm and silent condition and circumstances about shivering problems provided by the R/V Mirai whose engines are supported by well defined cushions. Therefore, measured values will be expected to be considerably stable and provide good calculated parameters in higher quality. However, some noise waves were found to interfere the 16,13 and 12channel marine bands of VHF from sky radiometer. Fortunately the origin and source were identified by using a VHF wide band receiver and the interference waves were kept by fairly separating from two VHF antennae and decreased to recovery of 100%.

Aerosols size distribution of number concentration have been measured by the Particle Counter and data obtained are displayed in real time by a kind of time series *in situ* with 5stages of size range of 0.3, 0.5, 1.0, 2.0, and 5.0 micron in diameter.

(6)Data archive

This aerosol data by the Particle Counter will be able to be archived soon and anytime. However, the data of other kind of aerosol measurements are not archived so soon and developed, examined , arranged and finally provided as available data after a certain duration. All data will archived at ILTS (Endoh), Hokkaido University, CCSR(Nakajima), University of Tokyo and CeRES(Takamura), Chiba University after the quality check and submitted to JAMSTEC within 3-year.

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Data inventory

Table-7.3-1 Information of obtained data inventory (Method)

Item, No.data	Name	Instrument	Site position
Optical thickness Ångstrom expt.	Endoh	Sky Radiomete(Prede,POM-01MK2)	compass deck roof of stabilizer
Aerosol Size dis- tribution	Endoh	Particle Counter(Rion,KC-01C)	compass deck(inlet) & chosasiki-situ

Table-7.3-2 Data and Sample inventory

Data/Sample	rate	site	object	name	state	remarks
Sun & Sky Light	1/5min (fine Daytime)	roof of stabilizer	optical thickness Ångstrom expt.	Endoh	land analysis	7/23-8/1'99 8/5-8/19'99
Size distri- bution of aerosols	1/2.5min	compass deck	concentration of aerosols	Endoh	on board	7/23-8/19'99

7.4 ADCP subsurface mooring

(1)Personnel

Keisuke Mizuno	(JAMSTEC): Principal Investigator
Norifumi Ushijima	(JAMSTEC): Engineer
Hideaki Hase	(JAMSTEC): Scientist
Yukio Masumoto	(JAMSTEC): Scientist
Atsuo Ito	(MWJ): Technical staff
Masayuki Fujisaki	(MWJ): Operation leader
Takeo Matsumoto	(MWJ): Technical staff
Hiroshi Matsunaga	(MWJ): Technical staff
Yutaka Matsuura	(MWJ): Technical staff
Kei Suminaga	(MWJ): Technical staff
Kentaro Shiraishi	(MWJ): Technical staff
Masaki Furuhata	(MWJ): Technical staff
Shinji Narita	(MWJ): Technical staff
Nakahito Nishikawa	(MWJ): Technical staff

(2) Objectives

The purpose is to get the knowledge of physical process in the western equatorial Pacific Ocean and the eastern equatorial Indian Ocean. We have been observing subsurface currents using ADCP current moorings along the equator. In this cruise (MR00-K07), we recovered one subsurface ADCP mooring at 00° -138° E and Deployed three ADCP moorings at 00° -138° E, 00° -90° E and 5° S-95° E.

(3) Parameters

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

(4) Methods

Two instruments are mounted at the top float of the mooring. One is ADCP(Acoustic Doppler Current Profiler) to observe subsurface currents upward about 300m depth. Another one is CTD to observe pressure, temperature and salinity at the top of the mooring that is the depth of the ADCP and one Current Meter is fasten on moorings at 700m depth. Details of the instruments and their parameters are as follows:

1) ADCP

(a) Self-Contained Broadband ADCP 150 kHz (RD Instruments)

Distance to first bin : 8 m
Pings per ensemble : 16
Time per ping : 2.00 seconds
Bin length : 8.00 m
Sampling Interval : 3600 seconds

Recovered ADCP
・Serial Number : 1225 (Mooring No.991112-00138E)

Deployed ADCP

・Serial Number : 1222(Mooring No.001031-00138E)
・Serial Number : 1223(Mooring No.001117-5S95E)

(b) Self-Contained Workhose Long Ranger ADCP 75 kHz (RD Instruments)
Distance to first bin : 7.04m
Pings per ensemble : 27
Time per ping : 6.66 seconds
Bin length : 8.00 m
Sampling Interval : 3600 seconds
Deployed ADCP
・Serial Number : 1248(Mooring No.001114-0090E)

2) CTD
(a)SBE-16 (Sea Bird Electronics Inc.)
Sampling Interval : 1800 seconds
Recovered CTD
・Serial Number : 1275 (Mooring No.991112-00138E)
Deployed CTD
・Serial Number : 1282(Mooring No.001031-00138E)
・Serial Number :1280(Mooring No.001117-5S95E)

(b)SBE-37(Sea Bird Electronics Inc.)
Sampling Interval : 3600 seconds
・Serial Number :1388(Mooring No.001114-0090E)

3) Current Meter
RCM-8 (AANDERAA Instruments : These instruments belong to Tokyo University)
Recovered Current Meter
・Serial Number : SECM0035 (700m) (Mooring No.991112-00138E)
Deployed Current Meter
・Serial Number : 6641 (700m) (Mooring No.001031-00138E)

4)Other instrument
(a)Acoustic Releaser (BENTHOS,Inc.)
Recovered Acoustic Releaser
・Serial Number :844 (Mooring No.001031-00138E)
・Serial Number :636 (Mooring No.001031-00138E)
Deployed Acoustic Releaser
・Serial Number :916 (Mooring No.001031-00138E)
・Serial Number :692 (Mooring No.001031-00138E)
・Serial Number :937 (Mooring No.001114-0090E)
・Serial Number :936 (Mooring No.001114-0090E)
・Serial Number :630 (Mooring No.001117-5S95E)
・Serial Number :632 (Mooring No.001117-5S95E)

(5) Deployment

The ADCP mooring was deployed at 00° -138° E, 00° -90° E and 5° S-95° E. The ADCP mooring deployed at 00° -138° E and 5° S-95° E was planned to make the ADCP buoy placed at about 300m depth . The ADCP mooring deployed at 00° -90° E was planned to make the ADCP buoy placed at about 400m . After we dropped the anchor, we monitored depth of the acoustic releaser (Fig.7.4-1). The position of the mooring was shown below.

Result of calibration

・Mooring No.001031-00138E

Date: 31 Oct. 2000 Lat: 00-00.94S Long: 138-01.82E Depth: 3930m

・Mooring No.001114-0090E

Date: 14 Nov. 2000 Lat: 00-00.33N Long: 90-03.33E Depth: 4401m

・Mooring No.001031-00138E

Date:17 Nov.2000 Lat:04-59.87S Long:95-03.02E Depth:5027m

(6) Recovery

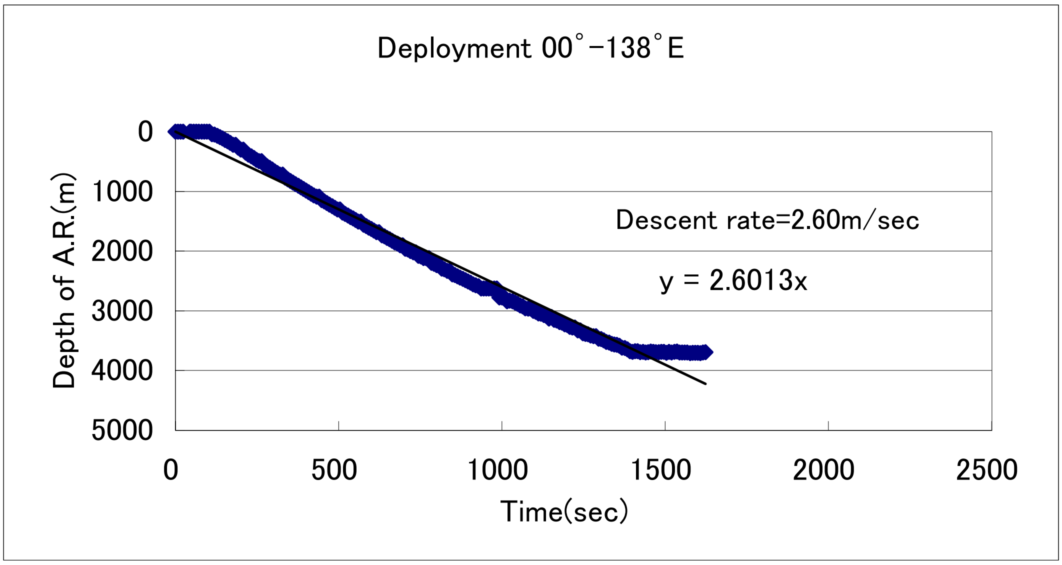
We recovered one ADCP mooring which was deployed in Nov.1999 (KY99-K09) on 31 Oct. 2000.

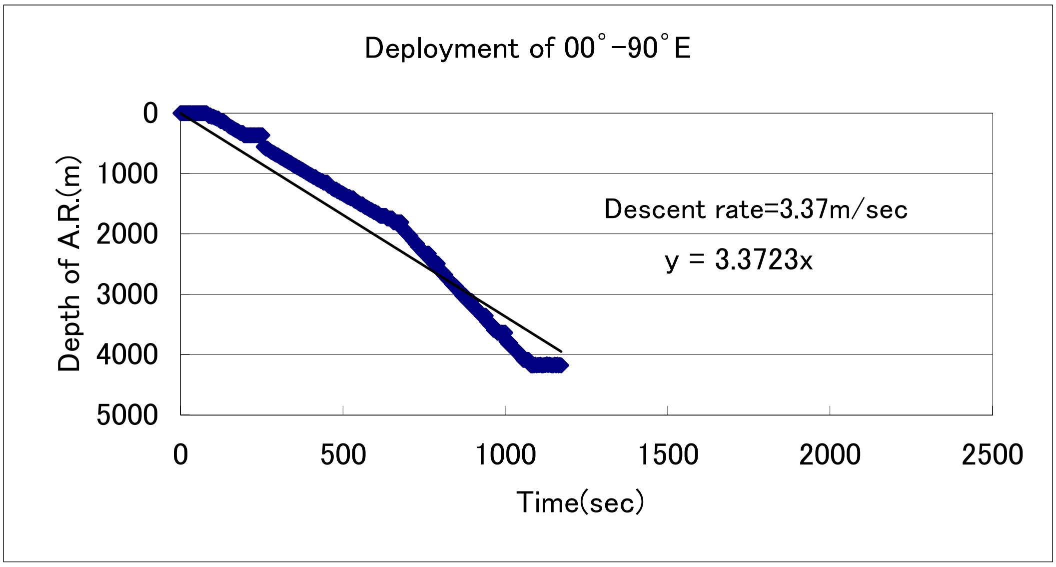
After the recovery , we uploaded ADCP and CTD data into a computer , then raw data were converted into ASCII code. Results were shown in the figures on following pages. Fig.7.4-2 shows CTD pressure, temperature and salinity data. Fig.7.4-3 and Fig.7.4-4 show the velocity data (eastward and northward component) at 50 m (bin24), 125 m (bin14) and 200 m(bin5) depth.

(7) Data archive

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

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





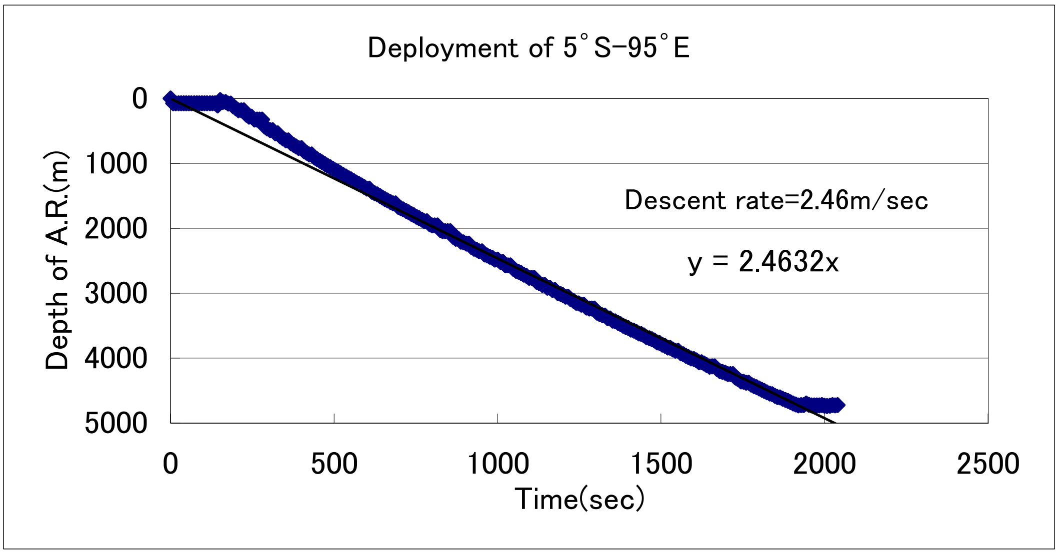
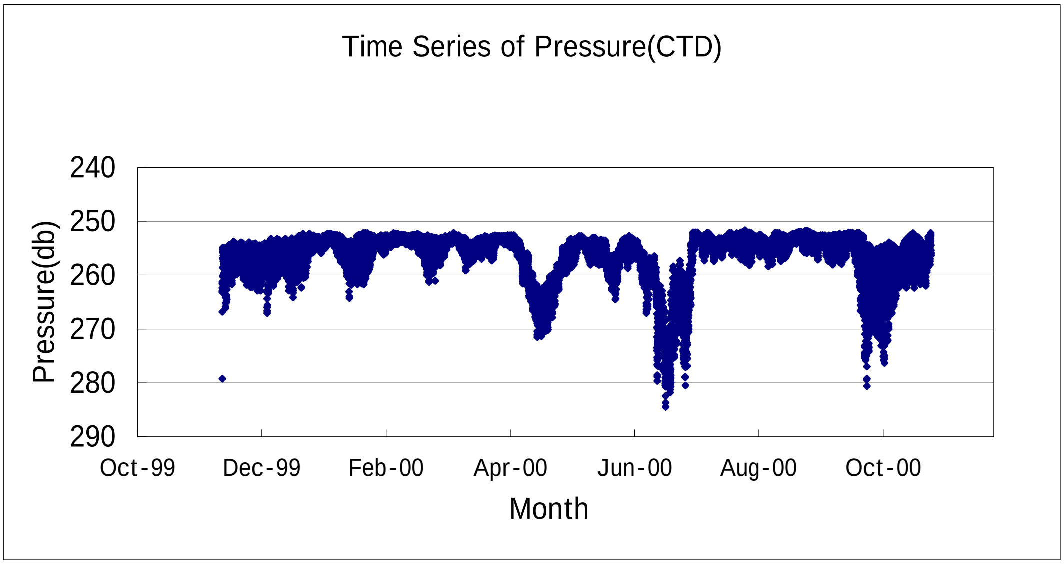
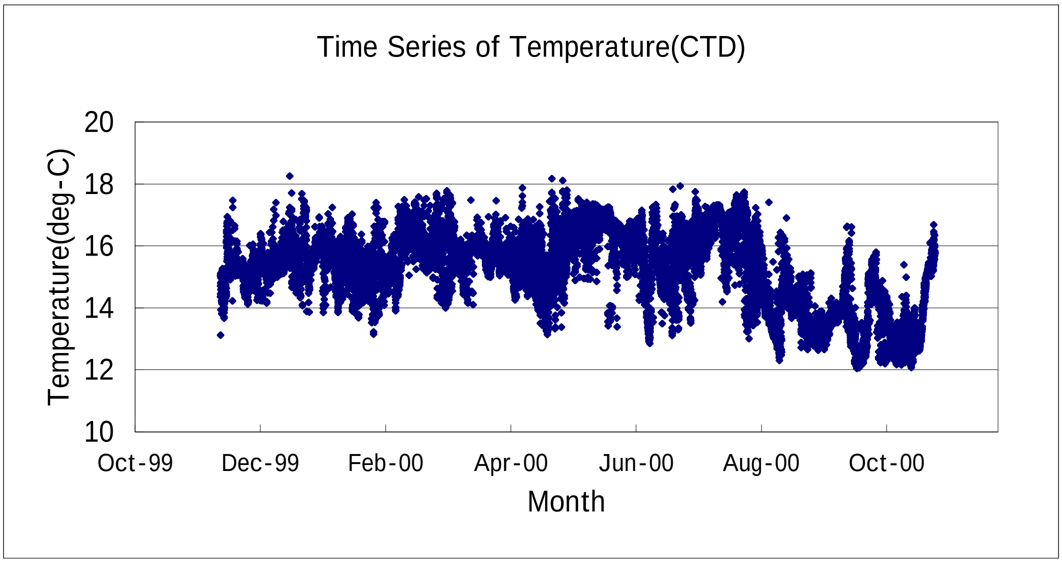


Fig.7.4-1Acoustic Releaser Depth Monitor
(A.R.:Acoustic Releaser)

(a)



(b)



(c)

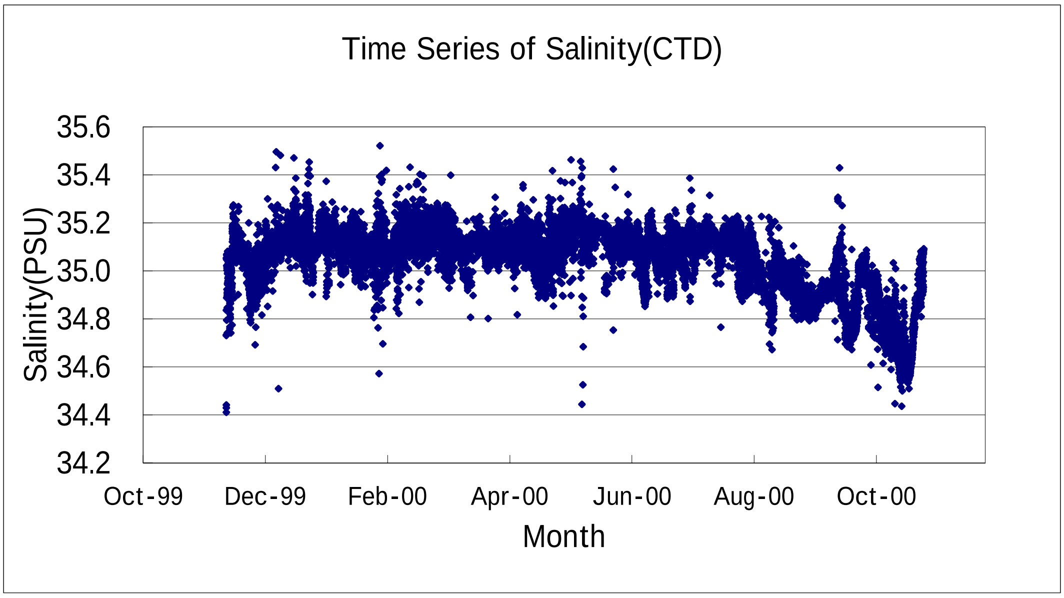
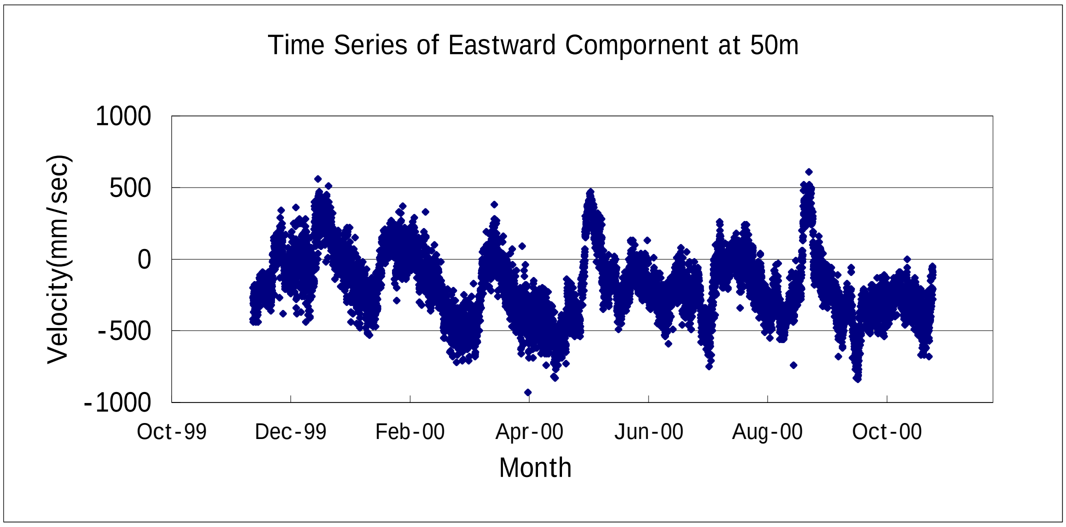
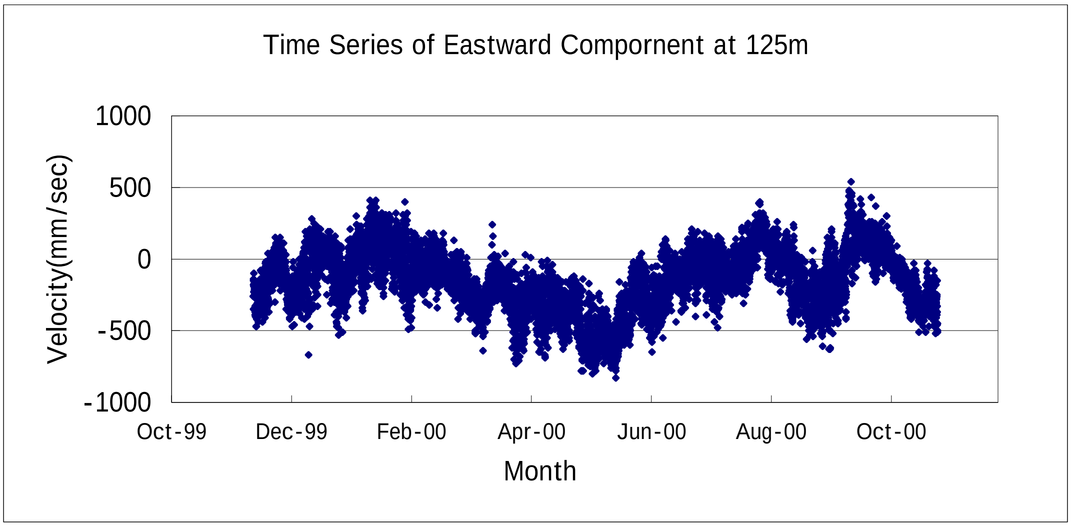


Fig7.4-2 Time series of (a)pressure,(b)temperature and (c)salinity
obtained by CTD from 12 Nov.1999 to 31 Oct.2000

(a)



(b)



(c)

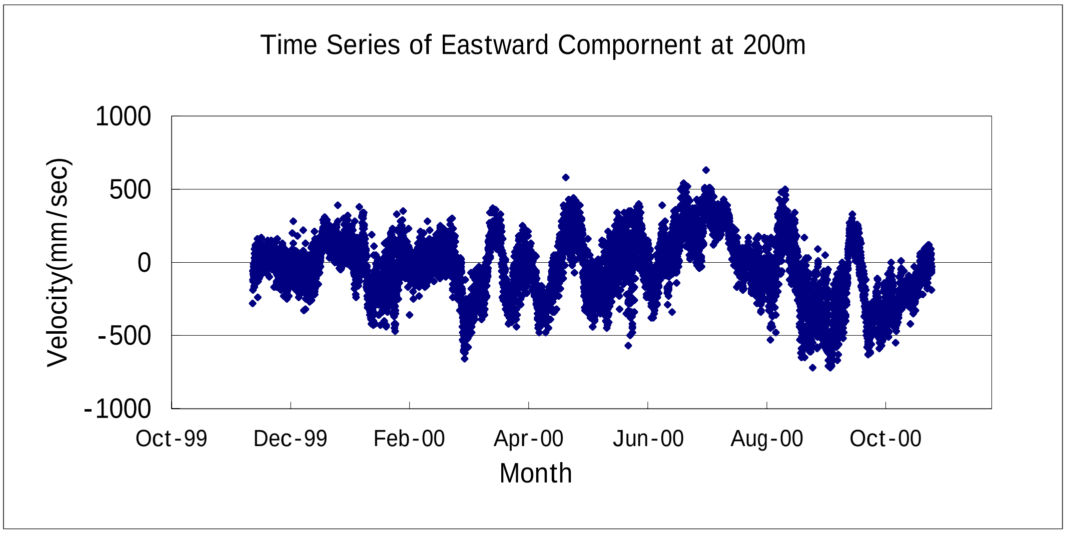
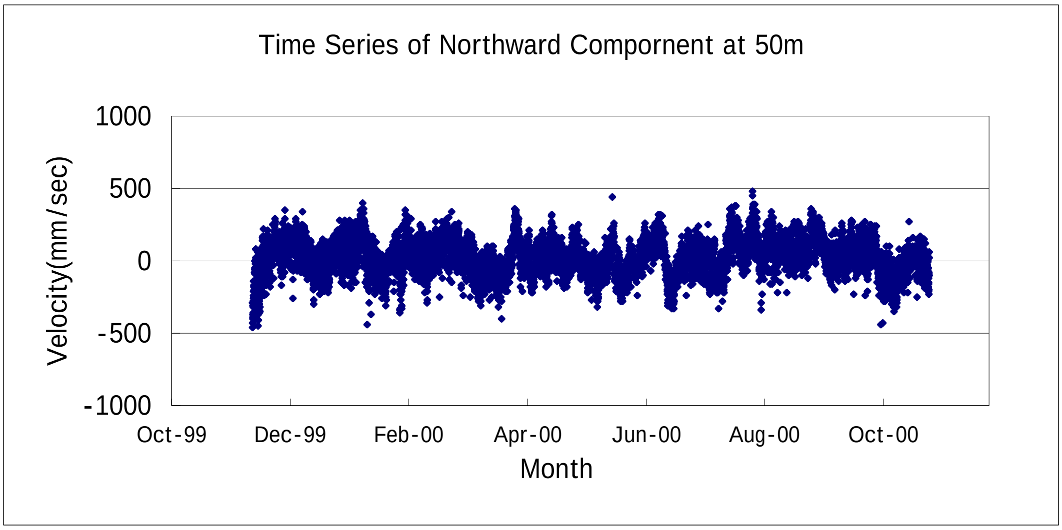
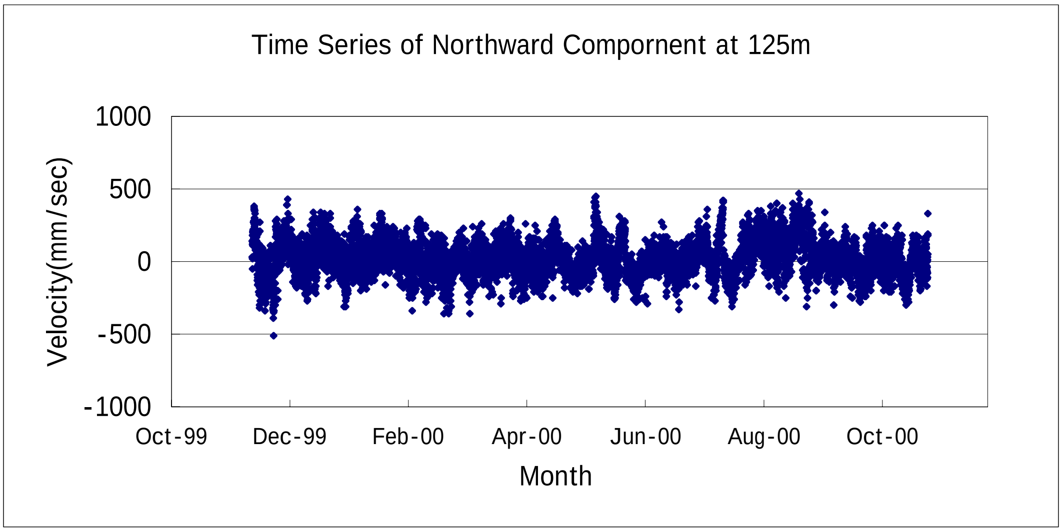


Fig.7.4-3 Time series of (a)50m depth/bin=24(b)125m depth/bin=14 (c)200m depth/bin=5 of eastward velosity from 12 Nov.1999 to 31Oct.2000

(a)



(b)



(c)

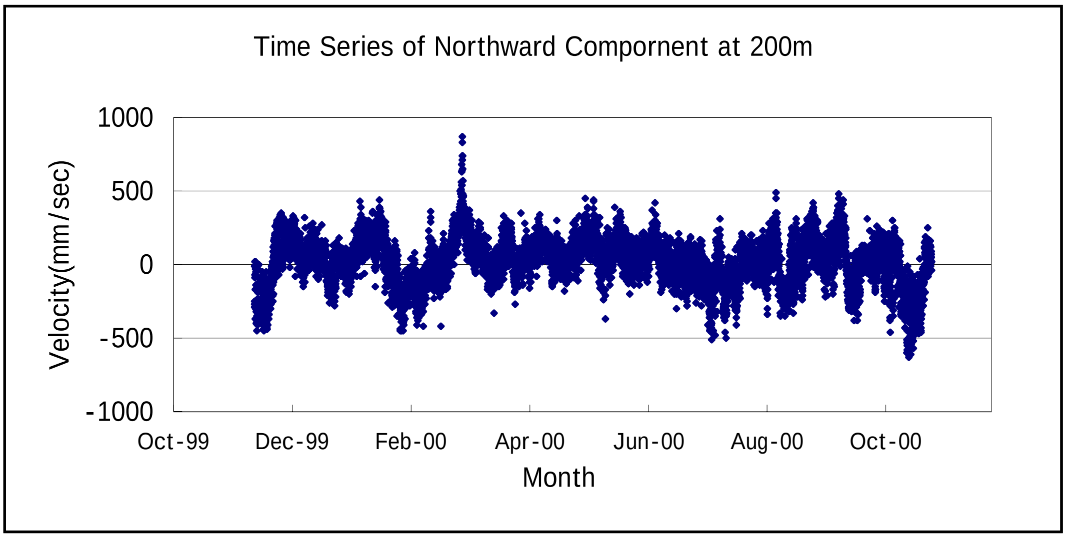


Fig.7.4-4 Time series of (a)50m depth/bin=24(b)125m depth/bin=14(c)200m depth/bin=5 of northward velocity from 12 Nov.1999 to 31Oct.2000

7.5 Profiling float deployment

(1) Personnel

Eitarou Oka (FORSGC): Principal Investigator
Hiroshi Matsuura (FORSGC)
Keisuke Mizuno (JAMSTEC)
Fumitaka Yoshiura (GODI)
Satoshi Okumura (GODI)
Wataru Tokunaga (GODI)
Masayuki Fujisaki (MWJ)

(2) Objectives

The objective of deployment is to clarify the structure and temporal and spatial variability of the North Pacific Subtropical Mode Water (STMW).

The STMW, characterized by a thermostad of about 15-18^{o}C, is formed by wintertime deep convection just south of the Kuroshio and the Kuroshio extension, and spreads away from its formation region by lateral advection. Formation and advection processes of the STMW have been studied using seasonal average of climatological data.

The Profiling floats deployed in this cruise measure vertical profiles of temperature and salinity automatically every ten days. The data from the floats will enable us to understand the formation and advection processes of the STMW with time scales much smaller than the past studies.

(3) Parameters

- water temperature, salinity, and pressure
- time-averaged current velocity at the sea surface and a depth of 2000 db, calculated from the float positions at the sea surface

(4) Methods

All the observations were made between 25^{o}N and 35^{o}N on the track from Hachinohe to the deployment point of TRITON mooring at 0^{o}, 147^{o}E in Leg 1 (Sec. 3.4).

1) Profiling float deployment

We deployed two APEX floats made by Webb Research Ltd. The two floats equip a different type of CTD sensor. One sensor is SBE-41 made by Sea-Bird Electronics Inc. which is an electrode type and the other is CTP202 by Falmouth Scientific Inc. which is an induction type. Our aim is to see the difference in deterioration between two types of conductivity sensor.

The floats are designed to drift at a specified depth (called a parking depth) for a specified period, then change their buoyancy by increasing volume and rise up to the sea surface. During their ascent, they measure temperature, salinity, and pressure. The floats remain at the sea surface for about one day, transmit their positions and the CTD data to ARGOS satellites, and then return to the parking depth by decreasing volume. Each of the ascent and descent takes about 6 hours. The parameters of the deployed floats are as follows:

ARGOS PTT ID: 28938
APEX Serial No.: 349
CTD sensor: SBE-41 made by Sea-Bird Electronics Inc.
Cycle: 10 days (Parking Depth: 213 hours, Sea Surface: 27 hours)
Target Parking Pressure: 2000 dbar
Reset Date and Time: 03:52 October 21, 2000 (GMT)
Deployed Date and Time: 05:23 October 21, 2000 (GMT)
Deployed Position: 29°59.22"N, 144°20.69"E

ARGOS PTT ID: 28940
APEX Serial No.: 392
CTD sensor: CTP202 made by Falmouth Scientific Inc.
Cycle: 10 days (Parking Depth: 213 hours, Sea Surface: 27 hours)
Target Parking Pressure: 2000 dbar
Reset Date and Time: 03:52 October 21, 2000 (GMT)
Deployed Date and Time: 05:21 October 21, 2000 (GMT)
Deployed Position: 29°59.27"N, 144°20.67"E

It should be noted that the periods for which the floats are actually at the parking depth or the sea surface are less than those specified by the periods for descent and ascent, respectively.

2) CTD observation

A CTD cast to a depth of 2000 m was made just before the deployment of floats for calibration of the float sensor (Sec. 6.2.1).

3) XCTD observation

XCTD observations to a depth of about 1000 db were made at 31 stations between 25°N and 35°N with an interval of 20 latitude minutes in order to understand the distributions of salinity and temperature around the float-deployment point and to see a meridional extension of the STMW (Sec. 6.2.2).

(5) Preliminary result

1) Sea conditions around the deployment point of floats

Distributions of temperature and salinity measured with the XCTD are shown in Figs. 7.5-1 and 7.5-2, respectively. Geostrophic velocity across the section referred to a depth of 900 db is calculated from the temperature and salinity data (Fig. 7.5-3). Westward currents exist at X02-X09, X17-X22, and X28-X31, and eastward currents at X01-X02, X09-X17, and X22-X28. The eastward current at X09-X17 almost splits into two currents at X09-X14 and X15-X17. The station X16 where the profiling floats were deployed is located in the southern eastward current. The features of current distribution are consistent with those of velocity from shipboard ADCP (Sec. 6.5).

The main thermocline between 8°C and 20°C lies at depths of about 100-700 db. The thermocline shallows greatly to the south between X01 and X09 and between X28 and X31 and to the north between X09 and X17, corresponding to the westward and eastward currents, respectively. The main halocline between 34.2 and 34.7 shows almost the same spatial change as the thermocline.

The vertical gradient of temperature in the main thermocline is at a minimum between

16°C and 18°C throughout the section. This thermostad is the STMW. Since the STMW is newly formed every winter, the thermostad structure at the time of XCTD observation is probably the least clear in a year.

The maximum and minimum salinity is found at the top and bottom of the thermocline, respectively. Salinity exceeds 34.7 at depths between 100 db and 400 db north of X23 and to the sea surface south of X24. Salinity reaches the minimum less than 34.2 at depths of 600-950 db, except at X06-X12 where the minimum lies at shallower depths of 500-850 db. The lowest salinity of 33.96 is found at a depth of 675 db at X28. The water in the salinity maximum and the minimum originates in the North Pacific Tropical Water and the North Pacific Intermediate Water, respectively.

In a surface layer at depths less than 100 db, a mixed layer exists at depths less than 50 db, and the seasonal thermocline and halocline lie in the underlying layer. Sea surface temperature is at a maximum of 28.7°C at X30, decreasing to the north, and is at a minimum of 25.5°C at X01. Sea surface salinity is greater than 34.7 south of X24, while it is mostly less than 34.5 north of X23, having the minimum less than 34.3 at X16-X18. It should be noted that the salinity from the XCTD has lower values than that from the CTD at depths less than about 30 db, due to bubbles attached to the conductivity sensor. A systematic error of salinity is also found at depths greater than about 800 db, due to unknown reasons.

The distributions of temperature, salinity, and geostrophic velocity suggest that the westward and eastward currents at X01-X09 and X09-X17 are a part of a cyclonic mesoscale eddy. Two profiling floats which were deployed on March 2000 at 30°01”N, 143°19”E both moved in a cyclonic way with a radius of about 100 km during four months after the deployment. Their movements are maybe related to this cyclonic eddy.

2) Observation with profiling float

2.1. Current velocity

a) Velocity at a 2000-m depth

The two floats made the first ascent on Oct. 30, 2000 (GMT) and transmitted the data. Their earliest positions recorded at the sea surface are 29°54.60”N, 144°04.56”E for ARGOS PTT ID 28938 and 29°54.84”N, 144°04.32”E for 28940 both at 15:39, which are about 600m apart. The floats drifted to the west-southwest for a distance of about 27km in about 9 days at the parking depth with an average speed of 3 cm s^{-1}, if their drifts during the ascent and descent are ignored.

b) Velocity at the sea surface

The last positions recorded are 29°49.62”N, 144°03.24”E at 05:34, Oct. 31 for 28938 and 29°50.76”N, 144°01.74”E at 23:55, Oct. 30 for 28940. The first and last positions yield average speed of 19 cm s^{-1} for 28938 and 29 cm s^{-1} for 28940, both toward the south-southwest.

2.2. Vertical profiles of temperature and salinity

The vertical profiles of temperature and salinity from the two floats during their ascent and from the CTD at the time of float deployment are shown in Figs. 7.5-4 and 7.5-5, respectively. Both observations are about 15 nautical miles apart in space and about 9 days in time. The temperature from both floats shows almost the same vertical change, and standard deviation of the difference in temperature at sixty-three depths between 5db and 2000db is 8.1×10^{-2} °C. The temperature from the floats shows similar vertical change to that from the CTD nine days ago except at depths less than 100 db.

The salinity from 28938 shows similar vertical change to that from the CTD. However, the original salinity from 28940 is greater than those from 28938 and the CTD by 0.11-0.26 at all depths. This must be a systematic error, and the cause will be investigated.

The original salinity from 28940 was corrected by Y. Takatsuki (JAMSTEC) with an equation

$$C = C\_orig \times 1.00062 - 0.23082,$$

where C is the conductivity (Fig. 7.5-5). The salinity profile after the correction is close to that from 28938 with standard deviation in the difference of 7.9×10^{-3}.

(6) Data archive

All data acquired through the ARGOS system is stored at FORSGC. The real-time data are provided to meteorological organizations via Global Telecommunication System (GTS) and utilized for analysis and forecasts of sea conditions.

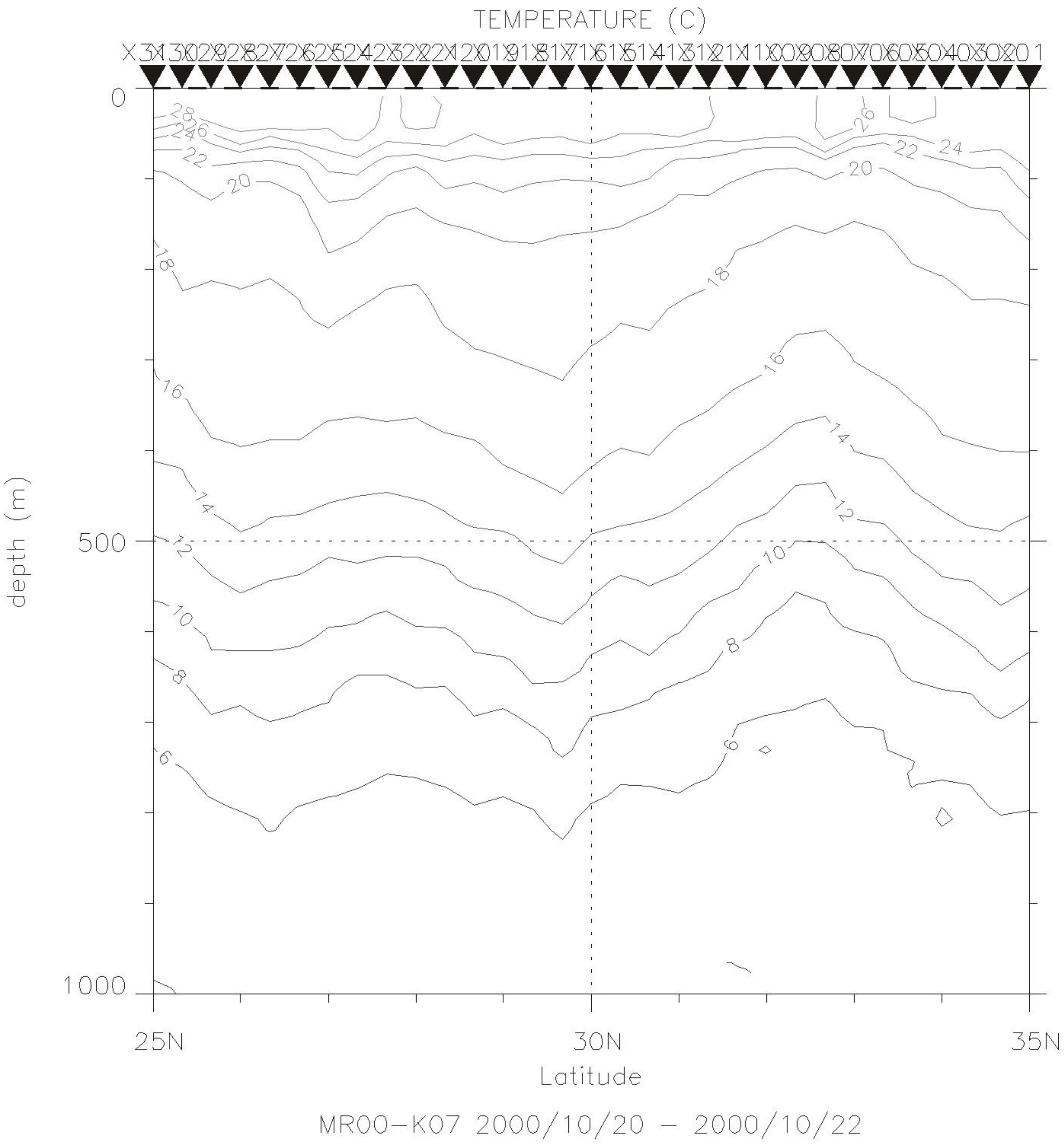


Fig. 7.5-1. Distribution of temperature (^oC) measured with the XCTD.

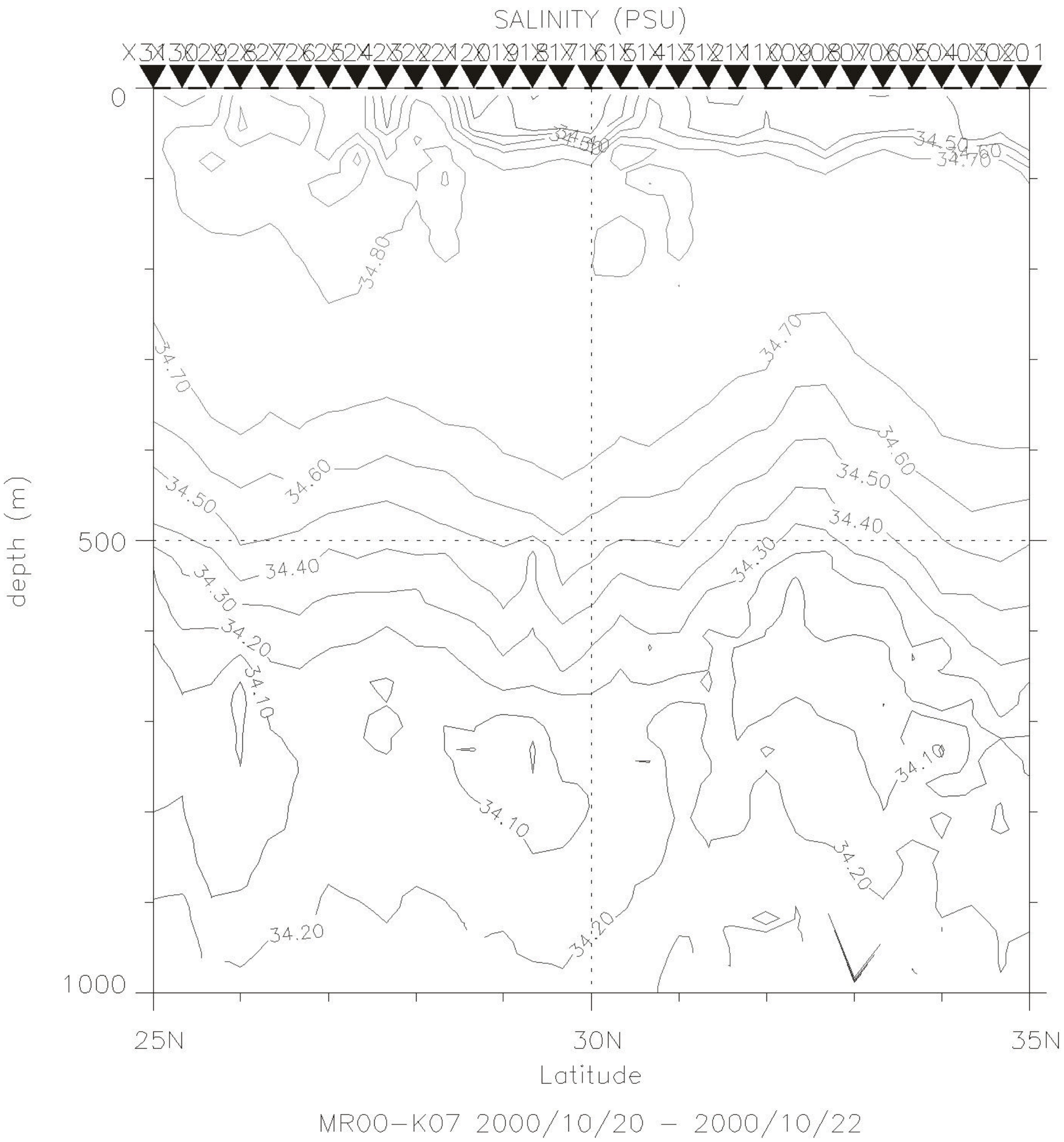


Fig. 7.5-2. Same as Fig. 7.5-1 but for salinity.

(Not shown here)

Fig. 7.5-3. Distribution of geostrophic velocity (cm s^{-1}) referred to a depth of 900 db across the XCTD section. Positive values indicate eastward velocities. (The same figure in color is shown in the Japanese edition of this report in Appendix.)

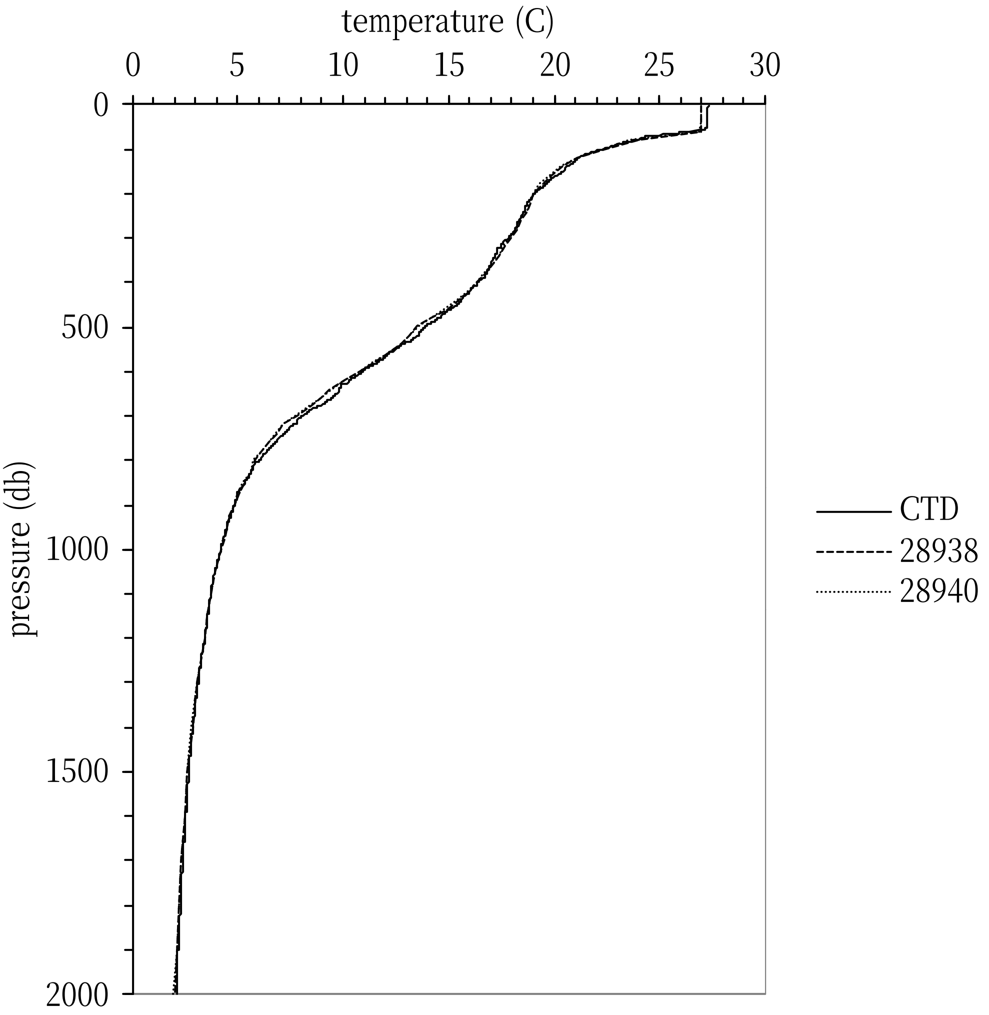


Fig. 7.5-4. Vertical profiles of temperature (°C) measured with the CTD at the time of float deployment on Oct. 21 and with the profiling floats of ARGOS PTT ID 28938 and 28940 during their first ascent on Oct. 30.

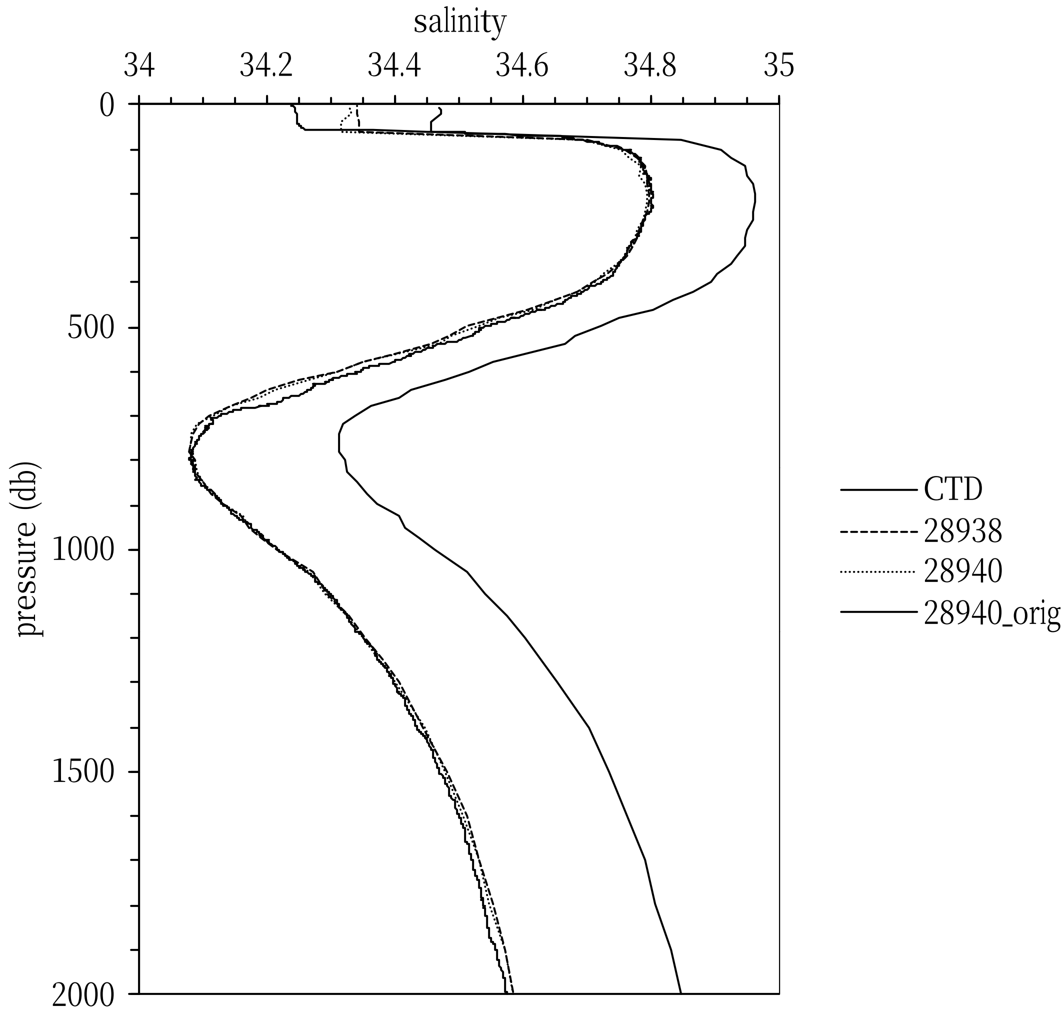


Fig. 7.5-5. Same as Fig. 7.5-4 but for salinity. The profiles from original data and corrected data are shown for 28940.

7.6. Surface drifter deployment

(1) Personnel
Yukio Masumoto (FORSGC): Principal investigator
Masayuki Fujisaki (MWJ)

(2) Objectives
The Lagrangian drifter buoys with temperature sensor are deployed in order to enhance our understanding of the surface circulation in the eastern tropical Indian Ocean. The tropical zonal current systems and the coastal currents associated with the Kelvin wave are particular interest.

(3) Drifter specification
Model: 2ANZ-1388
Make: TOYO Communication Equipment Co., LTD.
Attached Sensor: Temperature sensor

The parameters for the drifter buoy are as follows.

(a) Range and accuracy of the temperature sensor.

Parameter	Range	Accuracy
Temperature	-5 ~ 45 degree-C	+/- 0.1 degree-C

(b) Frequency and power of the transmitter.

Parameter	Frequency	Power
Transmitter	401.65 MHz	1 W

(4) Drifter deployment
We deployed seven drifters during leg-2 of the cruise. The location and the time of the deployment as well as the buoy ID numbers for ARGOS are listed in Table 7.6-1.

Table 7.6-1 Surface drifter deployment log

No.	Buoy ID	Date (mm/dd/yyyy)	Time(GMT) (hh:mm:ss)	Latitude (DD-mm.mm)	Longitude (DDD-mm.mm)
1	24222	11/13/2000	04:33:47	03-00.27 N	089-59.47 E
2	24150	11/13/2000	16:21:10	00-58.74 N	089-59.23 E
3	24122	11/14/2000	10:10:15	00-01.48 N	089-59.79 E
4	23793	11/14/2000	16:18:33	01-00.98 S	090-00.28 E
5	23732	11/15/2000	04:13:42	03-00.06 S	090-00.59 E
6	23705	11/17/2000	08:30:50	04-59.49 S	095-00.39 E
7	23733	11/19/2000	11:39:06	06-29.94 S	103-29.71 E

(5) Data distribution and data archive
The location of the drifters and the temperature data are transmitted to the Global Drifter Center via ARGOS system. All the data are archived there, and are distributed to the registered scientists. The data are also available through the FORSGC and the Data Management Office of JAMSTEC.

7.7 Sediment trap recovery

1) Personal

Hirofumi ASAHI [1)]
Hodaka KAWAHATA[2)]

1) Graduate School of Science, Kyushu University
2) Geological Survey of Japan

2) Object

The ENSO is climate event caused by the oceanographic condition. This event is one of the primary factors controlling the earth climate system, thought to have a close relation with the Western Pacific Warm Water Pool (WPWP). The understanding the system of developing of this warm water is an important factor to clarify the earth climate at the present. The sinking particle is known to be recorded the hydrographic condition when these particles were produced at the surface to subsurface water. The knowledge for the sinking process and their correlation with the environment will enable us to monitor the hydrographic condition and the transports of chemical components to the sea floor along the time scale. Thus, we set two main objects that are 1) to clarify sinking particle's relation with the hydrographic conditions and the process transporting them from the surface to the sea floor, and 2) to monitor the behavior of the WPWP from the record obtained by the sinking particles.

3) Method

The five sediment trap-mooring systems (sediment trap: SMD26S-6000; releaser: Model-L, all units are from Nichiyu Giken Cogyo Co. Ltd) have been set in the western equatorial Pacific for consecutive two years. The sampling intervals were set at 14 to 16 days (Table 2) so that 23 samples were collected for each sediment trap. Two sediment traps were moored at each system, designed to set at 1000, 2000, or 3000 m depth. In MR00K07 cruise, a system at the most western region was recovered (Table 1). The recoveries of the others and the redeployments will be occurred at MR00K08 cruise.

With samples collected, we are planning to research these factors described below.

a) Total mass flux and main chemical components [Geological Survey of Japan]
b) The flux of calcareouse shell-bearing planktons [calcareous nannoplankton: Geological Survey of Japan; foraminifer: Tohoku University]
c) The flux of siliceous shell-bearing planktons [Kyushu University]
d) Radio-nuclide (e.g.: U-238, Th-230, Pu-239+240, and Po-210) [Research Center for Radioecology, National Institute of Radiological Sciences]

4) Result

The recovery of the mooring system conducted on Nov. 2. The release command has done at 8:50 AM on that day (Table 1). The mean speed of the surfaced off were 60 m per min. (Table 3). The recovery to the ship was occurred from 9:37 AM to 11:11 AM (Table 1). All 46 samples were preserved in the refrigerator. All research described above are scheduled on the land.

Table 1 Recovered mooring array data

Evevt	Time (LST)	Position	
Released	2000/11/02 08:51	04'02.25N	135'00.79E
Recovery Start	2000/11/02 09:37	04'03.16N	135'01.01E
Recovery End	2000/11/02 11:11	04'03.24N	135'00.68E

Table 2 Sampling schedule (JST)

event#	Sampling schedule (JST)
1	1998/11/25 1:00
2	1999/12/01 1:00
3	1999/12/16 1:00
4	2000/01/01 1:00
5	2000/01/16 1:00
6	2000/02/01 1:00
7	2000/02/16 1:00
8	2000/03/01 1:00
9	2000/03/16 1:00
10	2000/04/01 1:00
11	2000/04/16 1:00
12	2000/05/01 1:00
13	2000/05/16 1:00
14	2000/06/01 1:00
15	2000/06/16 1:00
16	2000/07/01 1:00
17	2000/07/16 1:00
18	2000/08/01 1:00
19	2000/08/16 1:00
20	2000/09/01 1:00
21	2000/09/16 1:00
22	2000/10/01 1:00
23	2000/10/16 1:00
24	2000/10/23 1:00
25	-
26	-
27	-

Table 3 Slant distance and velocity of the mooring array

time (JST)	slant distance (m)	time (JST)	velocity (m/min)
8:50:00	5045	8:50:15	14.0
8:50:30	5059	8:51:15	55.0
8:52:00	5038	8:52:30	96.0
8:53:00	4983	8:53:30	77.0
8:54:00	4887	8:54:30	60.3
8:55:00	4810	8:56:30	86.0
8:58:00	4629	8:58:30	57.0
8:59:00	4543	mean	60.3
9:00:00	4486		