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R/V Mirai Cruise Report
MR03-K03
(Leg 1 and Leg 2)

June 7 – July 30, 2003
Tropical Ocean Climate Study (TOCS)

Edited by
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Leg. 1

Leg. 2

Contents

1. Cruise name and code

Tropical Ocean Climate Study
MR03-K03 (Leg 1 and Leg 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 for 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 (SST), which plays major role in driving global atmospheric circulation. 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 conditions and its variability in the eastern tropical Indian Ocean associated with Asian Monsoon and Dipole Mode variability. Asian 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 various time scales. To investigate the mechanism, we need precise and detailed data for long period. 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 and the eastern Indian Ocean. We also deployed ADCP subsurface buoys in the Pacific and the Indian Oceans during this cruise.

2.2. Overview

2.2.1 Ship

R/V MIRAI
Captain Takaaki Hashimoto

2.2.2 Cruise code

MR03-K03

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, 237-0061, Japan

2.2.5 Chief scientist

Leg1: Hideaki Hase (JAMSTEC)
Leg2: Shinya Minato (JAMSTEC)

2.2.6 Period

Leg1: June 7th, 2003 (Guam) – June 29th, 2003 (Nakagusuku)
Leg2: July 1st, 2003 (Nakagusuku) – July 30th, 2003 (Brisbane)

2.2.7 Research participants

Total 40 scientists and technical stuffs participated from 7 different institutions and companies, including 5 foreign scientists and officer from Indonesia and Malaysia.

2.3 Observation summary

TRITON buoy deployment:	7 sites
TRITON buoy recovery:	8 sites

(Deployment and recovery of TRITON buoy at 5S-95E were cancelled due to strong wind and waves.)

ADCP subsurface buoy deployment:	2 sites
ADCP subsurface buoy recovery:	3 sites

CTD (Salinity, Temperature and Depth)/ water sampling:	31 casts
XCTD (Salinity, Temperature and Depth):	129 launches
Radio sonde:	54 launches
Surface meteorology:	continuous
ADCP measurements:	continuous
Surface temperature, salinity measurements by intake method:	continuous

Other specially designed observations have been carried out successfully.

Observed oceanic and atmospheric conditions

Leg 1: Observation in the western tropical Pacific

The ocean state during the observation was calm and SST in the western tropical Pacific Ocean was almost normal. In contrast with SST, subsurface temperature showed significant variation that was warming in the tropical area and cooling in the off-equatorial latitudes compared with that observed in the previous cruise (MR02-K04) in July 2002. Along 138E, subsurface temperature between 6N and 8N was higher than that in July 2002 by up to 6 deg-C at 120m depth at 8N. Similar warming was observed between 2N and 5N along 130E, but cooling was also observed between 12N and 16N with maximum cooling up to 6 deg-C at 14N, 200m depth. We also observed change of subsurface salinity. The most remarkable increase was observed in the high salinity core layer (100m-250m) between 2N and 5N at 130E.

The shipboard ADCP data showed the strongly enhanced Mindanao Current (MC) with maximum speed exceeding 2 m/s and large meander of the North Equatorial Countercurrent (NECC). The peak velocities of these currents were nearly the same level or slightly larger than those observed in July 2002. This is consistent with that the widths of the MC and NECC are narrower than those in the last cruise. The Halmahera Eddy, which seems to shift northward, may affect the structure of these currents. The boundary currents and eddies in the western equatorial Pacific were anomalously strong in July 2002. It is noted that they are further strong in this cruise.

Leg 2: Observation in the eastern Indian Ocean

TRITON buoy at 1.5S-90E and the ADCP mooring at 90E on the equator were successfully recovered/re-deployed in the eastern Indian Ocean. However, the recovery/deployment of TRITON buoy at 5S-95E was cancelled due to the strong wind and sea rough condition. We carried out the CTD, XCTD, radio sonde and continuous shipboard measurements without significant problem.

Along 90E, the hydrographic observations indicate that the isotherm layer depth at the surface is shallower than that in the MR02-K04 cruise by up to 50 m between 5N and 5S. SST shows mostly 29-30 deg-C, and is almost same compared with that in August 2002. However, the salinity within the isotherm layer is fresher than that in August 2002 by up to 0.5 psu on the equator. The strong stratification is observed from 50 to 100 m depth along 90E.

The shipboard ADCP observation along 90E indicates the eastward surface current in the equatorial band with the maximum speed of about 1 knot. The strongest eastward surface current between 1S and 2S is not correspond with the observed easterly surface wind, which implies that the remote wind forcing around west of observation area caused the current.

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

June 7, 2003 – July 30, 2003

3.2 Ports of call

Guam, USA	(Departure; June 7, 2003)
Nakagusuku (Okinawa), Japan	(June 29 – July 1, 2003)
Brisbane, Australia	(Arrival; July 30 , 2003)

3.3 Cruise log

SMT (Ship Mean Time)	**UTC**	**Event**
Jun. 7 (Sat.)		
16:00	06:00	Departure at Guam, USA (SMT = UTC + 10)
16:45-17:00	06:45-07:00	Konpira-san
18:00-	08:00-	Start of continuous water observation
19:00-	09:00-	Start of continuous shipboard observations
Jun. 8 (Sun.)		
09:00	23:00	Safety guidance on the R/V Mirai
09:30	23:30	Boat station drill
10:15	00:15	Meeting for leg 1 observation
18:00	08:00	Safety guidance for foreign participants
22:00	12:00	Ship mean time adjustment (SMT = UTC + 9)
Jun. 9 (Mon.)		
08:22-10:35	23:22-01:35	Deployment of TRITON buoy (07-52.14 N, 136-29.44E, 3350 m)
11:15	02:15	XCTD: X001 (07-51.22 N, 136-30.14 E, 3354 m)
13:04-14:26	04:04-05:26	C01-1 (07-40.67 N, 136-40.75 E, 3136 m) CTD cast with 13 water sampling, down to 2000 m depth
15:15-16:24	06:15-07:24	C01-2 (07-40.98 N, 136-40.64 E, 3121 m) CTD cast with 13 water sampling, down to 2000 m depth
Jun. 10 (Tue.)		
08:11-10:43	23:11-01:43	Recovery of TRITON buoy (07-39.69 N, 136-41.59 E)
13:24	04:24	X002 (06-59.81 N, 136-50.33 E, 4590 m)
17:20	08:20	X003 (06-00.02 N, 137-03.89 E, 4319 m)
Jun. 11 (Wed.)		
08:23-11:34	23:23-02:34	Deployment of TRITON buoy (04-56.58 N, 137-18.07 E, 4133 m)
12:05	03:05	X004 (04-56.55 N, 137-18.04 E, 4129 m)
13:00-14:07	04:00-05:07	C02-1 (04-51.89 N, 137-17.62 E, 4112 m) CTD cast with 13 water sampling, down to 1000 m depth
14:43-15:20	05:43-06:20	C02-2 (04-51.71 N, 137-17.43 E, 4117 m) CTD cast with 12 water sampling, down to 1000 m depth

Jun. 12 (Thu.)		
08:06-11:09	23:06-02:09	Recovery of TRITON buoy (04-51.55 N, 137-16.04 E)
14:55	05:55	X005 (03-59.88 N, 137-33.50 E, 4739 m)
18:59	09:59	X006 (03-00.01 N, 137-47.99 E, 4397 m)
Jun. 13 (Fri.)		
08:21-11:01	23:21-02:01	Deployment of TRITON buoy (02-04.00 N, 138-03.85 E, 4334 m)
11:34	02:34	X007 (02-04.00 N, 138-04.61 E, 4311 m)
13:03-14:12	04:03-05:12	C03-1 (02-01.10 N, 138-06.52 E, 4179 m) CTD cast with 13 water sampling, down to 2000 m depth
14:49-15:29	05:49-06:29	C03-2 (02-01.03 N, 138-06.55 E, 4177 m) CTD cast with 12 water sampling, down to 1000 m depth
Jun. 14 (Sat.)		
08:06-10:59	23:06-01:59	Recovery of TRITON buoy (02-00.06N, 138-06.16E)
Jun. 15 (Sun.)		
07:56-10:02	22:56-01:02	C04 (02-01.09 N, 138-07.07 E, 4157 m) CTD cast with 13 water sampling, down to 3000 m depth
10:12	01:12	Deployment of ARGO profiling float (02-01.87 N, 138-08.02 E)
14:23	05:23	X008 (01-00.04 N, 138-04.01 E, 4051 m)
Jun. 16 (Mon.)		
08:21-11:13	23:21-02:13	Deployment of TRITON buoy (00-04.27N, 138-02.80 E, 4201 m)
12:08	03:08	X009 (00-03.36 N, 138-01.20 E, 4202 m)
13:07-15:06	04:07-06:06	C05-1 (00-03.26 N, 137-52.41 E, 4347 m) CTD cast with 13 water sampling, down to 3000 m depth
15:40-16:20	06:40-07:20	C05-2 (00-03.30 N, 137-51.97 E, 4339 m) CTD cast with 12 water sampling, down to 1000 m depth
Jun. 17 (Tue.)		
08:18-11:00	23:18-02:00	Recovery of TRITON buoy (00-01.97 N, 137-53.15 E)
Jun. 18 (Wed.)		
07:40-09:31	22:40-00:31	Recovery of subsurface ADCP buoy (00-00.68 S, 138-01.82 E, 3973 m)
12:20-13:41	03:20-04:41	Deployment of subsurface ADCP buoy (00-00.68 S, 138-01.75 E, 3942 m)
15:11-18:22	06:11-09:22	Free fall for CTD cable
21:50	12:50	X010 (00-19.49 N, 137-00.00 E, 4282 m)
Jun. 19 (Thu.)		
01:53	16:53	X011 (00-50.86 N, 135-58.97 E, 3984 m)
05:49	20:49	X012 (01-21.80 N, 135-00.02 E, 4309 m)
09:34	00:34	X013 (01-37.77 N, 133-59.97 E, 4828 m)
13:10	04:10	X014 (01-42.41 N, 133-00.00 E, 2944 m)
16:38	07:38	X015 (01-46.83 N, 132-00.01 E, 4181 m)
20:14	11:14	X016 (01-51.67 N, 130-58.00 E, 3959 m)

Jun. 20 (Fri.)

08:18-11:07	23:18-02:07	Deployment of TRITON buoy (01-56.48 N, 129-55.85E, 4431 m)
11:27	02:27	X017 (01-57.13 N, 129-55.60 E, 4426 m)
12:58-14:08	03:58-05:08	C06-1 (02-00.25 N, 130-00.40 E, 4411 m) CTD cast with 13 water sampling, down to 2000 m depth
14:42-15:21	05:42-06:21	C06-2 (02-00.64 N, 130-00.45 E, 4406 m) CTD cast with 12 water sampling, down to 1000 m depth

Jun. 21 (Sat.)

08:11-11:14	23:11-02:14	Recovery of TRITON buoy (02-00.07N, 130-02.34E)
14:29	05:29	X018 (03-00.05 N, 130-00.78 E, 3098 m)
17:58	08:58	Anti-piracy orientation
17:59	08:59	X019 (03-59.87 N, 130-01.95 E, 4779 m)

Jun. 22 (Sun.)

06:37-10:32	21:37-01:32	Recovery of TRITON without surface buoy (04-59.89 N, 129-56.95 E)
10:43-11:56	01:43-02:56	C07-1 (05-06.54 N, 130-03.18 E, 5404 m) CTD cast with 13 water sampling, down to 2000 m depth
13:02-13:42	04:02-04:42	C07-2 (05-01.01 N, 129-58.56 E, 5082 m) CTD cast with 12 water sampling, down to 1000 m depth
13:50	04:50	X020 (05-00.17 N, 129-59.13 E, 5061 m)
16:04	07:04	X021 (05-17.23 N, 129-30.03 E, 5054 m)
18:18	09:18	X022 (05-32.67 N, 129-00.02 E, 5382 m)
20:38	11:38	X023 (05-48.98 N, 128-30.02 E, 4925 m)
22:54	13:54	X024 (06-05.55 N, 127-59.90 E, 5278 m)
23:40	14:40	X025 (06-10.91 N, 127-50.00 E, 5583 m)

Jun. 23 (Mon.)

00:37	15:37	X026 (06-16.55 N, 127-40.00 E, 5902 m)
01:34	16:34	X027 (06-22.05 N, 127-30.00 E, 7856 m)
02:32	17:32	X028 (06-27.69 N, 127-20.00 E, 9390 m)
03:31	18:31	X029 (06-33.62 N, 127-10.01 E, 7921 m)
04:30	19:30	X030 (06-39.04 N, 127-00.02 E, 6873 m)
05:30	20:30	X031 (06-44.67 N, 126-49.99 E, 4903 m)
07:31-09:04	22:31-00:04	Recovery of subsurface ADCP buoy (06-48.97N, 126-42.59 E, 3435 m)
09:11	00:11	X032 (06-47.15 N, 126-42.35 E, 3159 m)

Jun. 24 (Tue.)

07:53-11:59	22:53-02:59	Deployment of TRITON buoy (07-55.53 N, 130-03.94 E, 5638 m)
12:26	03:26	X033 (07-55.49 N, 130-03.92 E, 5637 m)
13:16-15:00	04:16-06:00	C08-1 (07-57.75 N, 130-01.08 E, 5730 m) CTD cast with 13 water sampling, down to 3000 m depth
15:35-16:29	06:35-07:29	C08-2 (07-57.60 N, 130-00.80 E, 5720 m) CTD cast with 12 water sampling, down to 1500 m depth

Jun. 25 (Wed.)		
07:48-11:09	22:48-02:09	Recovery of TRITON buoy (07-58.65N, 130-00.39E, 5723m)
12:43-13:21	03:43-04:21	C08-3 (08-00.01 N, 130-00.66 E, 5577 m) CTD cast with 13 water sampling, down to 1000 m depth
15:15	06:15	X034 (08-29.99 N, 130-00.56 E, 5846 m)
17:11	08:11	X035 (09-00.01 N, 129-59.48 E, 5939 m)
19:08	10:08	X036 (09-30.00 N, 129-59.34 E, 6188 m)
21:04	12:04	X037 (10-00.00 N, 129-58.51 E, 5968 m)
23:00	14:00	X038 (10-30.00 N, 129-58.01 E, 5851 m)
Jun. 26 (Thu.)		
00:58	15:58	X039 (11-00.01 N, 129-57.93 E, 5827 m)
02:54	17:54	X040 (11-30.03 N, 129-57.88 E, 5721 m)
04:47	19:47	X041 (11-59.98 N, 129-57.35 E, 5801 m)
06:43	21:43	X042 (12-30.00 N, 129-57.06 E, 5801 m)
08:46	23:46	X043 (12-59.99 N, 129-56.30 E, 6002 m)
10:47	01:47	X044 (13-30.00 N, 129-55.56 E, 5722 m)
12:50	03:50	X045 (13-59.97 N, 129-54.70 E, 5726 m)
14:51	05:51	X046 (14-30.00 N, 129-53.71 E, 5896 m)
16:53	07:53	X047 (14-59.99 N, 129-54.05 E, 5022 m)
18:53	09:53	X048 (15-30.00 N, 129-53.58 E, 6078 m)
20:52	11:52	X049 (16-00.00 N, 129-53.63 E, 5253 m)
22:52	13:52	X050 (16-30.02 N, 129-52.75 E, 5266 m)
Jun. 27 (Fri.)		
06:55-11:07	21:55-02:07	Free fall for CTD cable
11:48	02:48	X051 (17-00.93 N, 129-46.57 E, 5484 m)
13:44	04:44	X052 (17-30.03 N, 129-42.06 E, 5286 m)
15:52	06:52	X053 (17-59.99 N, 129-37.34 E, 5371 m)
Jun. 28 (Sat.)		
18:00	09:00	Stop of continuous water observation Steaming
Jun. 29 (Sun.)		
10:10	01:10	Arrival at Nakagusuku (Okinawa), Japan
Jun. 30 (Mon.)		
09:00	00:00	Unloading of TRITON and ADCP mooring system Anchor at Nakagusuku
Jul. 1 (Tue.)		
09:00	00:00	Departure from Nakagusuku
11:00	02:00	Safety guidance for participants joining from Nakagusuku
11:30	02:30	Boat station drill for participants joining from Nakagusuku
13:00	04:00	Meeting for leg 2 observation
Jul. 2 (Wed.)		
23:11	14:11	Stop of continuous shipboard observations (in the EEZ of China and Vietnam)

		Steaming
Jul. 3 (Thu.)		
		Steaming
Jul. 4 (Fri.)		
22:00	13:00	Ship mean time adjustment (SMT = UTC + 8)
Jul. 5 (Sat.)		
		Steaming
Jul. 6 (Sun.)		
13:00	05:00	Anti-piracy orientation
		Steaming
Jul. 7 (Mon.)		
02:12	18:12	Re-start of continuous shipboard observation
12:10	04:10	Start of Doppler radar observation
Jul. 8 (Tue.)		
10:00	02:00	Re-start of continuous water observation
Jul. 9 (Wed.)		
01:08	17:08	X054 (06-20.03 N, 095-00.02 E, 1782 m)
03:51	19:51	X055 (05-52.99 N, 094-29.99 E, 1763 m)
06:43	22:43	X056 (05-21.21 N, 093-59.99 E, 819 m)
09:32	01:32	X057 (04-52.49 N, 093-30.00 E, 839 m)
12:20	04:20	X058 (04-24.40 N, 092-59.95 E, 4485 m)
14:00	06:00	Radio sonde observation RS001 (04.26 N, 092.85 E)
15:15	07:15	X059 (03-55.76 N, 092-29.99 E, 4261 m)
18:05	10:05	X060 (03-36.96 N, 091-59.97 E, 4120 m)
20:14	12:14	X061 (03-42.51 N, 091-29.96 E, 4065 m)
22:49	14:49	X062 (03-48.09 N, 090-59.99 E, 3173 m)
Jul. 10 (Thu.)		
01:22	17:22	X063 (03-54.40 N, 090-30.01 E, 2449 m)
06:04-07:31	22:04-23:31	C09 (04-00.05 N, 090-00.23 E, 2839 m) CTD cast with 4 water sampling, down to 2000 db depth
07:42	23:42	X064 (03-58.82 N, 090-00.66 E, 2779 m)
08:00	00:00	RS002 (03.99 N, 090.01 E)
09:39	01:39	X065 (03-30.00 N, 090-00.25 E, 2465 m)
12:13-13:30	04:13-05:30	C10 (02-59.88 N, 089-59.98 E, 2462 m) CTD cast with 4 water sampling, down to 2000 m depth
14:00	06:00	RS003 (02.98 N, 090.00 E)
15:33	07:33	X066 (02-30.00 N, 090-00.89 E, 2666 m)
17:50-19:12	09:50-11:12	C11 (01-59.67 N, 089-59.99 E, 2638 m) CTD cast with 4 water sampling, down to 2000 m depth
20:00	12:00	RS004 (01.99 N, 090.01 E)
21:33	13:33	X067 (01-29.99 N, 090-00.01 E, 2294 m)

Jul. 11 (Fri.)		
00:01-01:28	16:01-17:28	C12 (00-59.75 N, 090-00.11 E, 2306 m) CTD cast with 4 water sampling, down to 2000 m depth
02:00	18:00	RS005 (00.99 N, 090.01 E)
03:45	19:45	X068 (00-30.00 N, 090-01.95 E, 4066 m)
07:59-10:01	23:59-02:01	Recovery of subsurface ADCP buoy (00-00.37N, 090-03.38 E, 4399 m)
08:00	00:00	RS006 (00.01 N, 090.07 E)
10:04-11:31	02:32-03:57	C13 (00-00.01 S, 090-00.20 E, 4193 m) CTD cast with 4 water sampling, down to 2000 m depth
10:05	02:05	X069 (00-00.11 S, 090-02.29 E, 4353 m)
12:03	04:03	X069-2 (00-00.39 S, 090-00.61 E, 4079 m)
13:15-15:06	05:15-07:06	Deployment of subsurface ADCP buoy (00-00.37N, 090-03.35 E, 4402 m)
14:00	06:00	RS007 (00.00 N, 090.11 E)
17:55	09:55	X070 (00-30.03 S, 090-02.03 E, 3111 m)
20:00	12:00	RS008 (00.76 S, 090.02 E)
20:05	12:05	X071 (01-00.00 S, 089-59.43 E, 3122 m)
Jul. 12 (Sat.)		
02:00	18:00	RS009 (01.67 S, 090.03 E)
08:00	00:00	RS010 (01.75 S, 090.05 E)
08:18-11:12	00:18-03:12	Deployment of TRITON buoy (01-39.42 S, 089-59.60 E, 4694 m)
08:21	00:21	XCTD high-level launch test T01 (01-43.93 S, 090-02.11 E, 4655 m)
08:29	00:29	T02 (01-43.78 S, 090-02.02 E, 4683 m)
08:36	00:36	T03 (01-43.61 S, 090-01.93 E, 4683 m)
08:44	00:44	T04 (01-43.45 S, 090-01.84 E, 4657 m)
08:51	00:51	T05 (01-43.29 S, 090-01.75 E, 4644 m)
08:59	00:59	T06 (01-43.11 S, 090-01.65 E, 4640 m)
11:00	03:00	RS011 (01.69 S, 090.01 E)
14:00	06:00	RS012 (01.67 S, 090.02 E)
13:00-14:18	05:00-06:18	C14-1 (01-40.07 S, 090-00.89 E, 4678 m) CTD cast with 4 water sampling, down to 2000 m depth
15:15-16:37	07:15-08:37	C14-2 (01-35.32 S, 090-04.77 E, 4708 m) CTD cast with 4 water sampling, down to 2000 m depth
17:00	09:00	RS013 (01.58 S, 090.09 E)
20:00	12:00	RS014 (01.64 S, 090.00 E)
23:00	15:00	RS015 (01.60 S, 090.03 E)
Jul. 13 (Sun.)		
02:00	18:00	RS016 (01.59 S, 090.04 E)
05:00	21:00	RS017 (01.59 S, 090.07 E)
08:00	00:00	RS018 (01.60 S, 090.09 E)
08:13-11:24	00:13-03:24	Recovery of TRITON buoy (01-39.09 S, 090-04.47 E)
11:00	03:00	RS019 (01.63 S, 090.10 E)
14:00	06:00	RS020 (01.94 S, 090.02 E)
17:00	09:00	RS021 (01.99 S, 089.99 E)
17:46-19:01	09:46-11:01	C15 (01-59.81 S, 089-59.86 E, 4737 m) CTD cast with 4 water sampling, down to 2000 m depth

20:00	12:00	RS022 (01.99 S, 090.01 E)
21:36	13:36	X072 (02-30.00 S, 090-00.65 E, 3504 m)
23:00	15:00	RS023 (02.60 S, 090.01 E)
23:56-01:14	15:56-17:14	C16 (03-00.07 S, 089-59.99 E, 3333 m) CTD cast with 4 water sampling, down to 2000 m depth

Jul. 14 (Mon.)

02:00	18:00	RS024 (02.99 S, 090.00 E)
03:36	19:36	X073 (03-30.00 S, 089-59.69 E, 3880 m)
05:00	21:00	RS025 (03.62 S, 090.00 E)
06:00-07:19	22:00-23:19	C17 (03-59.87 S, 090-00.14 E, 3145 m) CTD cast with 4 water sampling, down to 2000 m depth
08:00	00:00	RS026 (03.99 S, 090.00 E)
09:39	01:39	X074 (04-30.00 S, 089-59.93 E, 4636 m)
11:56-13:16	03:56-05:16	C18 (04-59.90 S, 089-59.90 E, 5000 m) CTD cast with 4 water sampling, down to 2000 m depth
13:20	05:20	X075 (04-59.65 S, 089-59.60 E, 4997 m)
14:00	06:00	RS027 (05.00 S, 089.99 E)
15:38	07:38	X076 (04-59.87 S, 090-30.00 E, 5046 m)
17:53-19:11	09:53-11:11	C19 (05-00.00 S, 090-59.69 E, 4988 m) CTD cast with 4 water sampling, down to 2000 m depth
20:00	12:00	RS028 (04.99 S, 090.99 E)
21:37	13:37	X077 (05-00.31 S, 091-30.00 E, 4949 m)

Jul. 15 (Tue.)

00:03-01:20	16:03-17:20	C20 (04-59.87 S, 091-59.85 E, 5008 m) CTD cast with 4 water sampling, down to 2000 m depth
02:00	18:00	RS029 (04.99 S, 091.99 E)
03:45	19:45	X078 (04-59.75 S, 092-30.03 E, 5004 m)
06:04-07:27	22:04-23:27	C21 (04-59.72 S, 092-59.42 E, 4647 m) CTD cast with 4 water sampling, down to 2000 m depth
08:00	00:00	RS030 (04.99 S, 092.99 E)
09:51	01:51	X079 (04-59.61 S, 093-30.00 E, 4888 m)
11:00	03:00	RS031 (04.99 S, 093.54 E)
12:23-13:42	04:23-05:42	C22 (05-00.29 S, 093-58.77 E, 4971 m) CTD cast with 4 water sampling, down to 2000 m depth
14:00	06:00	RS032 (05.00 S, 093.98 E)
16:12	08:12	X080 (05-01.04 S, 094-30.93 E, 4984 m)
17:00	09:00	RS033 (05.02 S, 094.49 E)
20:00	12:00	RS034 (04.95 S, 094.97 E)
23:00	15:00	RS035 (04.92 S, 094.93 E)

Jul. 16 (Wed.)

02:00	18:00	RS036 (04.88 S, 094.84 E)
05:00	21:00	RS037 (04.91 S, 094.87 E)
08:00	00:00	RS038 (04.95 S, 094.88 E)
11:00	03:00	RS039 (04.95 S, 094.88 E)
14:00	06:00	RS040 (04.93 S, 094.89 E)
17:00	09:00	RS041 (04.92 S, 094.86 E)
20:00	12:00	RS042 (04.90 S, 094.76 E)
23:00	15:00	RS043 (04.89 S, 094.65 E)

		(Deployment of TRITON buoy was postponed due to strong wind and waves.)
Jul. 17 (Thu.)		
02:00	18:00	RS044 (04.89 S, 094.66 E)
05:00	21:00	RS045 (04.93 S, 094.73 E)
08:00	00:00	RS046 (04.93 S, 094.90 E)
08:30	00:30	T07 (04-56.12 S, 094-54.10 E, 5015 m)
08:34	00:34	T08 (04-56.11 S, 094-54.11 E, 5011 m)
11:00	03:00	RS047 (04.93 S, 094.88 E)
11:23	03:23	X081 (04-59.72 S, 095-01.53 E, 5008 m)
13:45	05:45	X082 (05-11.91 S, 095-29.99 E, 4984 m)
14:00	06:00	RS048 (05.13 S, 095.39 E)
16:06	08:06	X083 (05-22.80 S, 096-00.01 E, 4902 m)
17:00	09:00	RS049 (05.38 S, 095.99 E)
18:27	10:27	X084 (05-32.19 S, 096-29.99 E, 5298 m)
20:00	12:00	RS050 (05.59 S, 096.65 E)
20:41	12:41	X085 (05-42.41 S, 097-00.00 E, 4859 m)
22:51	14:51	X086 (05-53.23 S, 097-29.99 E, 4985 m)
		(Deployment and recovery of TRITON buoy No. 17 was cancelled due to strong wind and waves.)
Jul. 18 (Fri.)		
00:59	16:59	X087 (06-04.54 S, 098-00.01 E, 5503 m)
02:00	18:00	RS051 (06.08 S, 098.02 E)
03:14	19:14	X088 (06-15.55 S, 098-30.01 E, 5065 m)
05:21	21:21	X089 (06-26.84 S, 098-59.99 E, 5368 m)
07:34	23:34	X090 (06-38.43 S, 099-30.00 E, 4814 m)
08:00	00:00	RS052 (06.59 S, 099.40 E)
09:44	01:44	X091 (06-49.41 S, 100-00.00 E, 5055 m)
11:58	03:58	X092 (07-00.75 S, 100-30.00 E, 5476 m)
14:00	06:00	RS053 (07.10 S, 100.74 E)
14:21	06:21	X093 (07-12.46 S, 101-00.00 E, 5499 m)
16:43	08:43	X094 (07-23.67 S, 101-30.00 E, 5454 m)
19:01	11:01	X095 (07-34.05 S, 102-00.00 E, 5414 m)
20:00	12:00	RS054 (07.57 S, 102.01 E)
21:22	13:22	X096 (07-45.02 S, 102-30.00 E, 5766 m)
23:34	15:34	X097 (07-56.06 S, 102-59.99 E, 5841 m)
Jul. 19 (Sat.)		
01:46	17:46	X098 (08-07.07 S, 103-29.99 E, 5958 m)
03:57	19:57	X099 (08-17.88 S, 104-00.00 E, 5971 m)
06:09	22:09	X100 (08-28.82 S, 104-30.01 E, 6048 m)
08:20	00:20	X101 (08-39.49 S, 105-00.00 E, 6403 m)
10:38	02:38	X102 (08-50.20 S, 105-29.99 E, 6576 m)
12:57	04:57	X103 (09-00.61 S, 106-00.00 E, 6032 m)
15:16	07:16	X104 (09-11.08 S, 106-29.99 E, 5355 m)
17:33	09:33	X105 (09-21.96 S, 107-00.00 E, 5072 m)
19:40	11:40	X106 (09-27.26 S, 107-30.01 E, 4089 m)
21:44	13:44	X107 (09-32.63 S, 108-00.00 E, 3363 m)
23:44	15:44	X108 (09-38.18 S, 108-30.01 E, 3456 m)

Jul. 20 (Sun.)		
01:41	17:41	X109 (09-43.68 S, 109-00.00 E, 2832 m)
03:36	19:36	X110 (09-48.80 S, 109-30.00 E, 3163 m)
05:34	21:34	X111 (09-55.23 S, 110-00.01 E, 1361 m)
07:30	23:30	X112 (10-00.30 S, 110-30.01 E, 2451 m)
09:30	01:30	X113 (10-05.35 S, 111-00.00 E, 3165 m)
11:32	03:32	X114 (10-10.87 S, 111-30.00 E, 3287 m)
13:04	05:04	T09 (10-14.96 S, 111-51.90 E, 3813 m)
13:13	05:13	T10 (10-15.31 S, 111-53.49 E, 3883 m)
13:23	05:23	T11 (10-15.67 S, 111-55.22 E, 3893 m)
13:51	05:51	X115 (10-16.42 S, 112-00.17 E, 3736 m)
16:11	08:11	X116 (10-21.24 S, 112-30.00 E, 3016 m)
18:31	10:31	X117 (10-27.08 S, 112-59.99 E, 2406 m)
20:44	12:44	X118 (10-31.87 S, 113-30.00 E, 2227 m)
22:00	14:00	Ship mean time adjustment (SMT = UTC + 9)
Jul. 21 (Mon.)		
		Steaming
Jul. 22 (Tue.)		
		Steaming
Jul. 23 (Wed.)		
		Steaming
Jul. 24 (Thu.)		
22:00	13:00	Ship mean time adjustment (SMT = UTC + 10)
		Steaming
Jul. 25 (Fri.)		
		Steaming
Jul. 26 (Sat.)		
		Steaming
Jul. 27 (Sun.)		
09:00-11:30	23:00-01:30	Science meeting to review obtained data during leg 1 and 2
		Steaming
Jul. 28 (Mon.)		
		Steaming
Jul. 29 (Tue.)		
		Steaming
Jul. 30 (Wed.)		
11:49	01:49	Arrival at Brisbane, Australia

3.4 Cruise Track

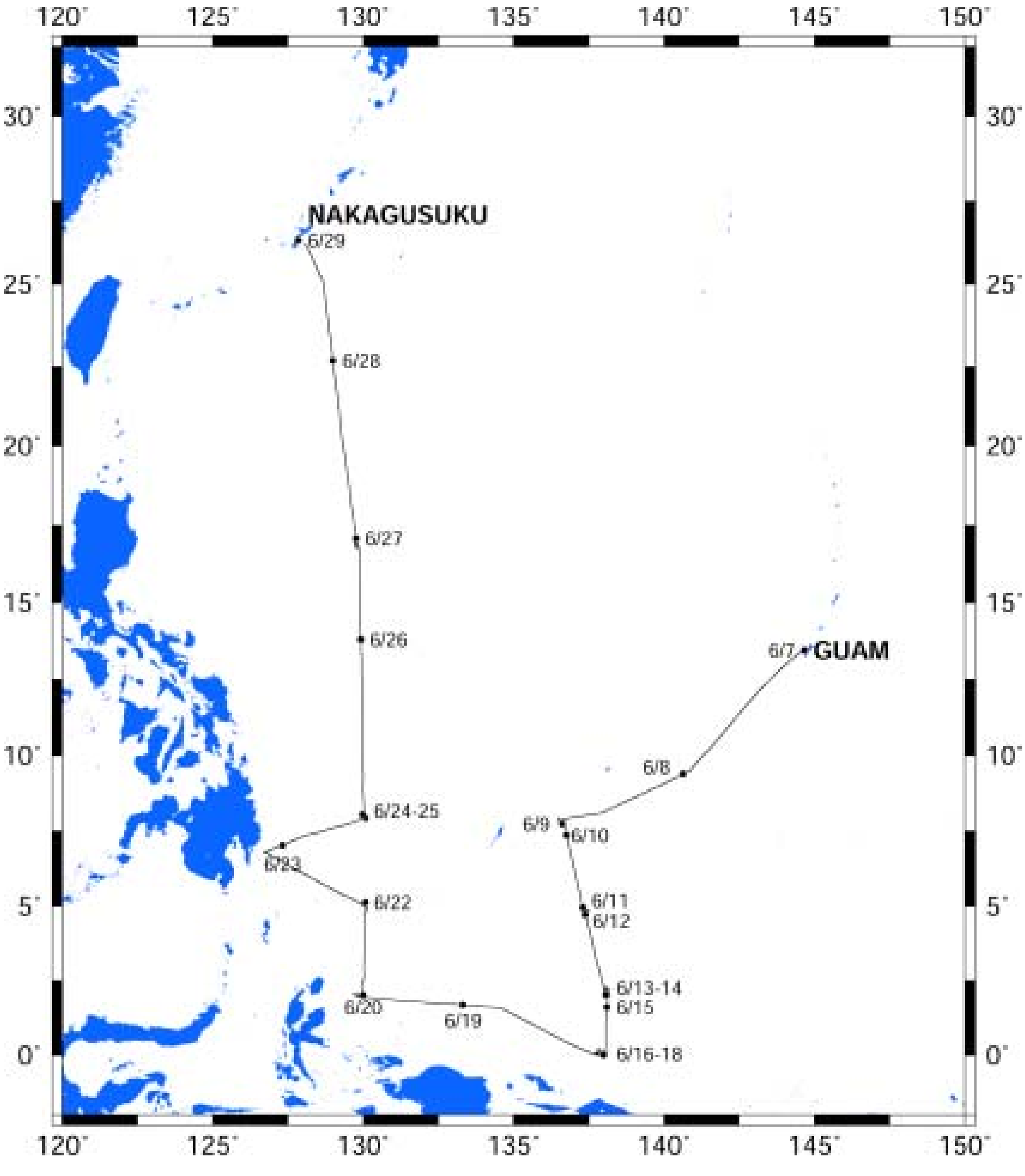

Fig.3.4-1 Cruise Track on MR03-K03 Leg1

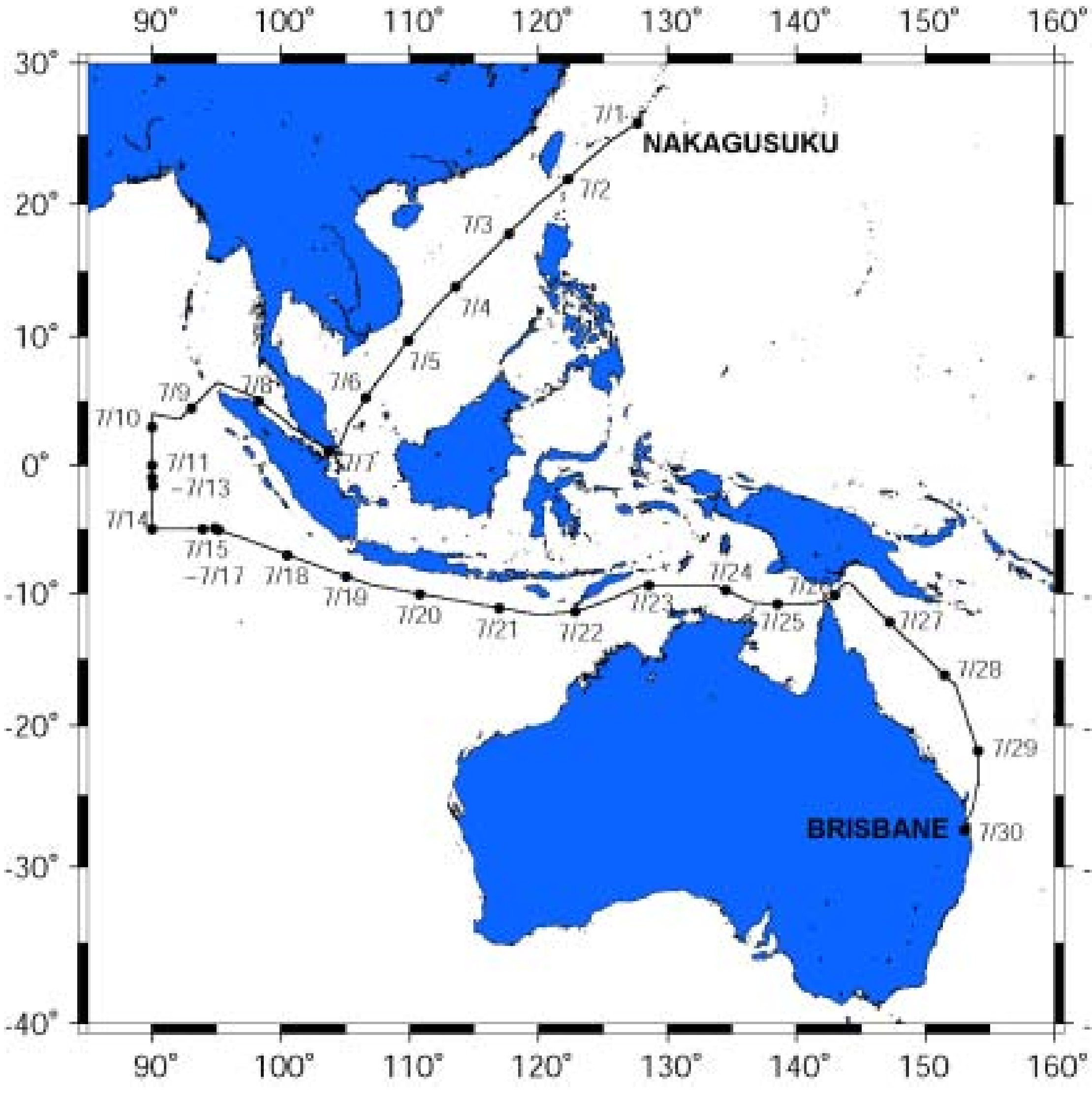

Fig.3.4-2 Cruise Track on MR03-K03 Leg2

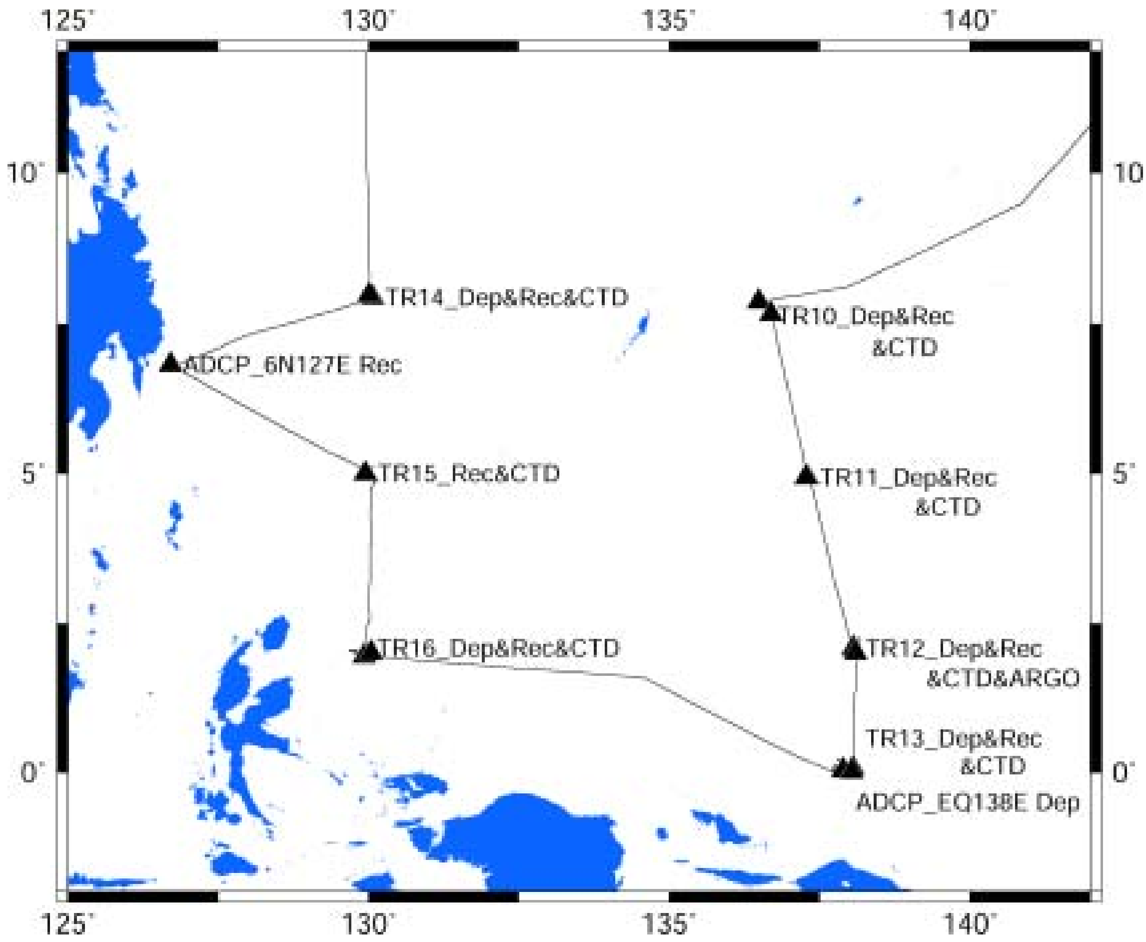

Fig.3.4-3 MR03K03 Leg1 TRITON, ADCP, CTD and ARGO

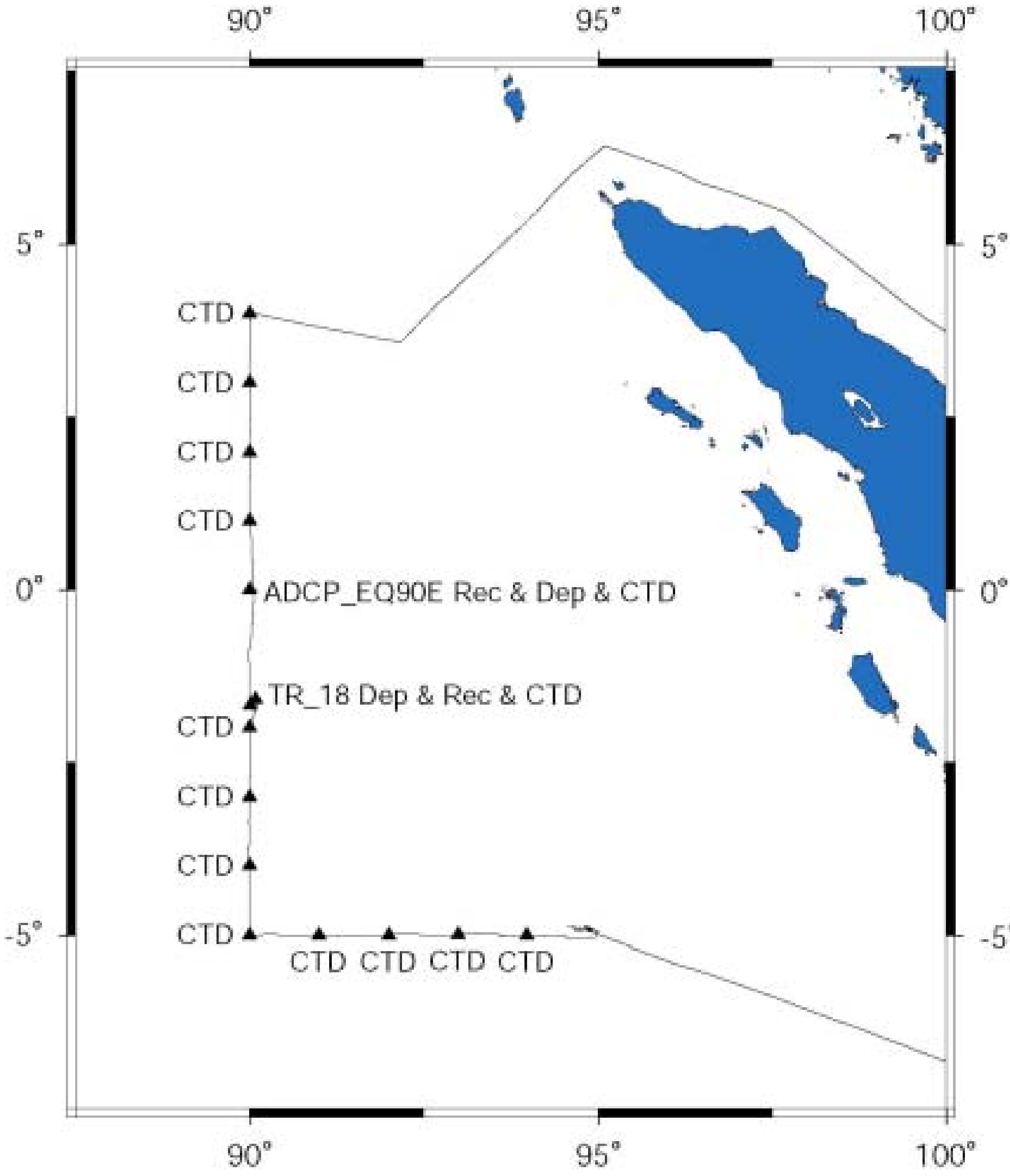

Fig.3.4-4 MR03K03 Leg2 TRITON, ADCP, CTD and ARGO

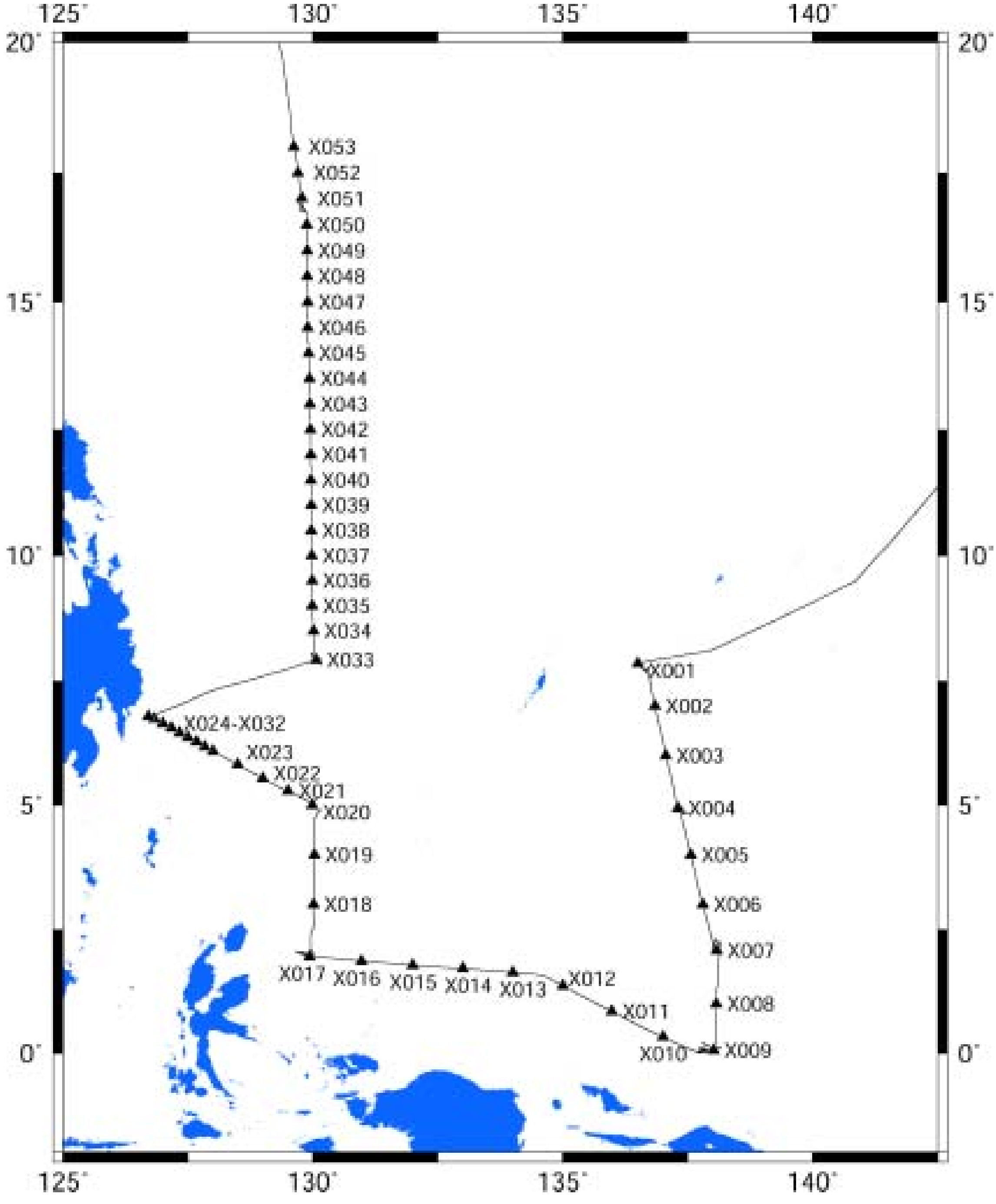

Fig.3.4-5　MR03K03 Leg1 XCTD

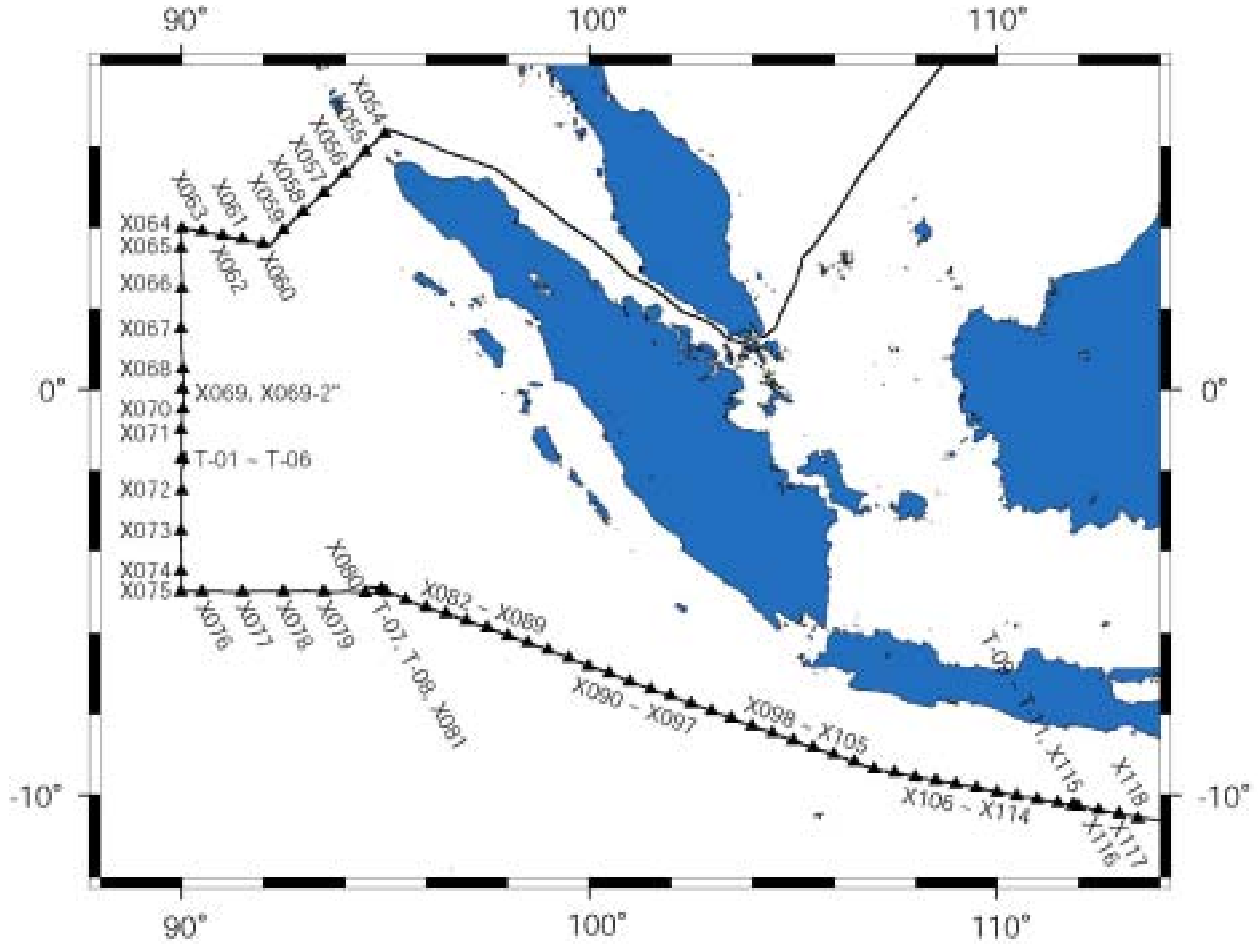

Fig.3.4-6　MR03K03 Leg2 XCTD

4. Chief scientist

<Leg 1>
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5. Participants list

5.1 R/V MIRAI scientist and technical staff

(*; leg. 1, **; leg. 2, ***; leg. 1 and leg. 2)

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Keisuke Matsumoto***	MWJ
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Wataru Tokunaga*	GODI
Norio Nagahama***	GODI
Katsuhisa Maeno*	GODI
Ryo Kimura**	GODI

5.2 R/V MIRAI crew member

Crew List (Leg1)

Takaaki Hashimoto	Master
Takahiro Sakoda	Chief Officer
Haruhiko Inoue	1st Officer
Shingo Fujita	2nd Officer
Keitaro Inoue	3rd Officer
Akiteru Ono	Chief Engineer
Nobuya Araki	1st Engineer
Kyoichi Hashimoto	2nd Engineer
Naoto Takamori	3rd Engineer
Keiichirou Shishido	C.R.Officer
Naoto Morioka	2nd.R.Officer
Kenetsu Ishikawa	Boatswain
Yasuyuki Yamamoto	Able Seaman
Kenichi Torao	Able Seaman
Keiji Yamauchi	Able Seaman
Kunihiko Omote	Able Seaman
Yukiharu Suzuki	Able Seaman
Masaru Suzuki	Able Seaman
Yosuke Kuwahara	Able Seaman
Tsuyoshi Sato	Able Seaman
Takeharu Aisaka	Able Seaman
Masashige Okada	Able Seaman
Shuji Komata	Able Seaman
Yukitoshi Horiuchi	No.1 Oiler
Kiyoharu Emoto	Oiler
Yoshihiro Sugimoto	Oiler
Toshio Matsuo	Oiler
Nobuo Boshita	Oiler
Daisuke Taniguchi	Oiler
Yasuaki Koga	Chief Steward
Yasutaka Kurita	Cook
Hitoshi Ota	Cook
Wataru Sasaki	Cook
Kozo Uemura	Cook

Crew List (Leg2)

Takaaki Hashimoto	Master
Takahiro Sakoda	Chief Officer
Shingo Fujita	1st Officer
Minoru Minamoto	2nd Officer
Keitaro Inoue	3rd Officer
Koichi Higashi	Chief Engineer
Nobuya Araki	1st Engineer
Koji Masuno	2nd Engineer
Naoto Takamori	3rd Engineer
Keiichirou Shishido	C.R.Officer
Naoto Morioka	2nd.R.Officer
Kenetsu Ishikawa	Boatswain
Hisashi Naruo	Able Seaman
Kenichi Torao	Able Seaman
Kunihiko Omote	Able Seaman
Yukiharu Suzuki	Able Seaman
Masaru Suzuki	Able Seaman
Yosuke Kuwahara	Able Seaman
Kazuyoshi Kudo	Able Seaman
Tsuyoshi Sato	Able Seaman
Tsuyoshi Monzawa	Able Seaman
Masashige Okada	Able Seaman
Shuji Komata	Able Seaman
Sadanori Honda	No.1 Oiler
Kiyoharu Emoto	Oiler
Yoshihiro Sugimoto	Oiler
Takashi Miyazaki	Oiler
Kazumi Yamashita	Oiler
Daisuke Taniguchi	Oiler
Yasuaki Koga	Chief Steward
Yasutaka Kurita	Cook
Hitoshi Ota	Cook
Tatsuya Hamabe	Cook
Wataru Sasaki	Cook

6.1 Meteorological observation

6.1.1 Surface Meteorological Observation

Satoshi Okumura	(Global Ocean Development Inc.)	- leg1 -
Wataru Tokunaga	(GODI)	- leg2 -
Norio Nagahama	(GODI)	- leg1, 2 -
Katsuhisa Maeno	(GODI)	- leg1 -
Ryo Kimura	(GODI)	- leg2 -
Not on-board:		
Kunio Yoneyama	(JAMSTEC) Principal Investigator	
R. Michael Reynolds	(Brookhaven National Laboratory, USA)	

(1) Objectives

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

(2) Methods

The surface meteorological parameters were observed throughout the MR03-K03 cruise from the departure of Guam on 7 June 2003 to arrival of Brisbane on 30 July 2003.

At this cruise, we used two systems for the surface meteorological observation.

1. Mirai meteorological observation system
2. Shipboard Oceanographic and Atmospheric Radiation (SOAR) System

(2-1) Mirai meteorological observation system

Instruments of Mirai meteorological system (SMET) are listed in Table 6.1.1-1 and measured parameters are listed in Table 6.1.1-2. Data was collected and processed by KOAC-7800 weather data processor made by Koshin-Denki, Japan. The data set has 6-second averaged.

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

SOAR system designed by BNL consists of major 3 parts.

1. Portable Radiation Package (PRP) designed by BNL – short and long wave downward radiation.
2. Zeno meteorological system designed by BNL – wind, air temperature, relative humidity, pressure, and rainfall measurement.
3. Scientific Computer System (SCS) designed by NOAA (National Oceanic and Atmospheric Administration, USA)- centralized data acquisition and logging of all data sets.

SCS recorded PRP data every 6 seconds, Zeno/met data every 10 seconds. Instruments and their locations are listed in Table 6.1.1-3 and measured parameters are listed in Table 6.1.1-4.

(3) Preliminary results

Figures 6.1.1-1 and 2 show the time series of the following parameters; Wind (SOAR), air temperature (SOAR), sea surface temperature (EPCS), relative humidity (SOAR), precipitation (SOAR), short/long wave radiation (SOAR), pressure (SOAR) and significant wave height (SMET).

(4) Data archives

The raw data obtained during this cruise will be submitted to JAMSTEC Data Management Division. Corrected data sets will also be available from K. Yoneyama of JAMSTEC.

(5) Remarks

1. We did not sample the data within foreign EEZ in South China Sea, around Guam Island, territorial waters of USA and Torres straight, territorial waters of Australia.
2. Radiometers for the upwelling radiation measurement of R/V Mirai meteorological observation system were not installed during this cruise.
3. We used EPCS (see Section 6.4.1), for sea surface temperature data.
4. PRP stopped from 0708UTC to 1124UTC 13 June 2003, due to the file shearing trouble.
5. FRSR didn't sample the data from 0745UTC 22 June to 1511UTC 24 June 2003, due to the shadowband motor trouble.
6. We stopped PRP from 0414UTC to 0418UTC and from 0607UTC to 0611UT 24 June 2003 to change the FRSR motor.

Table 6.1.1-1 Instruments and installations of Mirai meteorological system

Sensors	Type	Manufacturer	Location (altitude from surface)
Anemometer	KE-500	Koshin Denki, Japan	foremast (24m)
Thermometer	HMP45A	Vaisala, USA	compass deck (21m)
	with 43408 Gill aspirated radiation shield (R.M. Young)		
	RFN1-0	Koshin Denki, Japan	4th deck (-1m, inlet -5m) SST
Barometer	F-451	Yokogawa, Japan	weather observation room captain deck (13m)
Rain gauge	50202	R. M. Young, USA	compass deck (19m)
Optical rain gauge	ORG-115DR	Osi, USA	compass deck (19m)
Radiometer (short wave)	MS-801	Eiko Seiki, Japan	radar mast (28m)
Radiometer (long wave)	MS-202	Eiko Seiki, Japan	radar mast (28m)
Wave height meter	MW-2	Tsurumi-seiki, Japan	bow (10m)

Table 6.1.1-2 Parameters of Mirai meteorological observation system

	Parmeter	Units	Remarks
1	Latitude	degree	
2	Longitude	degree	
3	Ship's speed	knot	Mirai log, DS-30 Furuno
4	Ship's heading	degree	Mirai gyro, TG-6000, Tokimec
5	Relative wind speed	m/s	6sec./10min. averaged
6	Relative wind direction	degree	6sec./10min. averaged
7	True wind speed	m/s	6sec./10min. averaged
8	True wind direction	degree	6sec./10min. averaged
9	Barometric pressure	hPa	adjusted to sea surface level 6sec. averaged
10	Air temperature (starboard side)	degC	6sec. averaged
11	Air temperature (port side)	degC	6sec. averaged
12	Dewpoint temperature (starboard side)	degC	6sec. averaged
13	Dewpoint temperature (port side)	degC	6sec. averaged
14	Relative humidity (starboard side)	%	6sec. averaged
15	Relative humidity (port side)	%	6sec. averaged
16	Sea surface temperature	degC	6sec. averaged
17	Rain rate (optical rain gauge)	mm/hr	hourly accumulation
18	Rain rate (capacitive rain gauge)	mm/hr	hourly accumulation
19	Down welling shortwave radiation	W/m^2	6sec. averaged
20	Down welling infra-red radiation	W/m^2	6sec. averaged
21	Significant wave height (fore)	m	hourly
22	Significant wave height (aft)	m	hourly
23	Significant wave period	second	hourly
24	Significant wave period	second	hourly

Table 6.1.1-3 Instrument and installation locations of SOAR system

Sensors	Type	Manufacturer	Location (altitude from surface)
Zeno/Met			
Anemometer	05106	R.M. Young, USA	foremast (25m)
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-815DA	Osi, USA	foremast (24m)
PRP			
Radiometer (short wave)	PSP	Eiko Seiki, Japan	foremast (25m)
Radiometer (long wave)	PIR	Eiko Seiki, Japan	foremast (25m)
Fast rotating shadowband radiometer		Yankee, USA	foremast (25m)

Table 6.1.1-4 Parameters of SOAR system

	Parmeter	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	reset at 50mm
11	Precipitation (capacitive rain gauge)	mm	
12	Down welling shortwave radiation	W/m^2	
13	Down welling infra-red radiation	W/m^2	
14	Defuse irradiance	W/m^2	

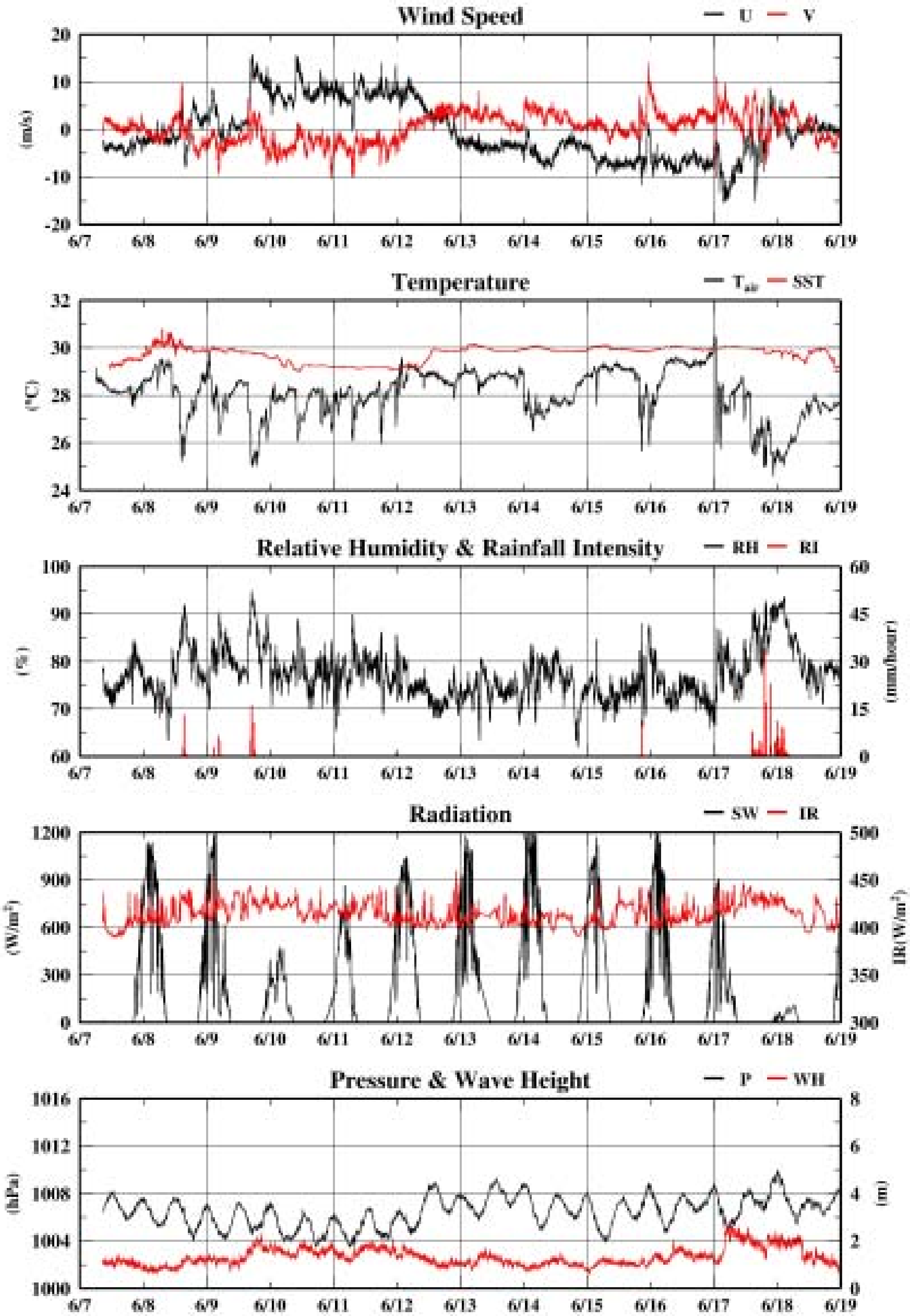


Fig6.1.1-1 Time series of surface meteorological parameters during the cruise.

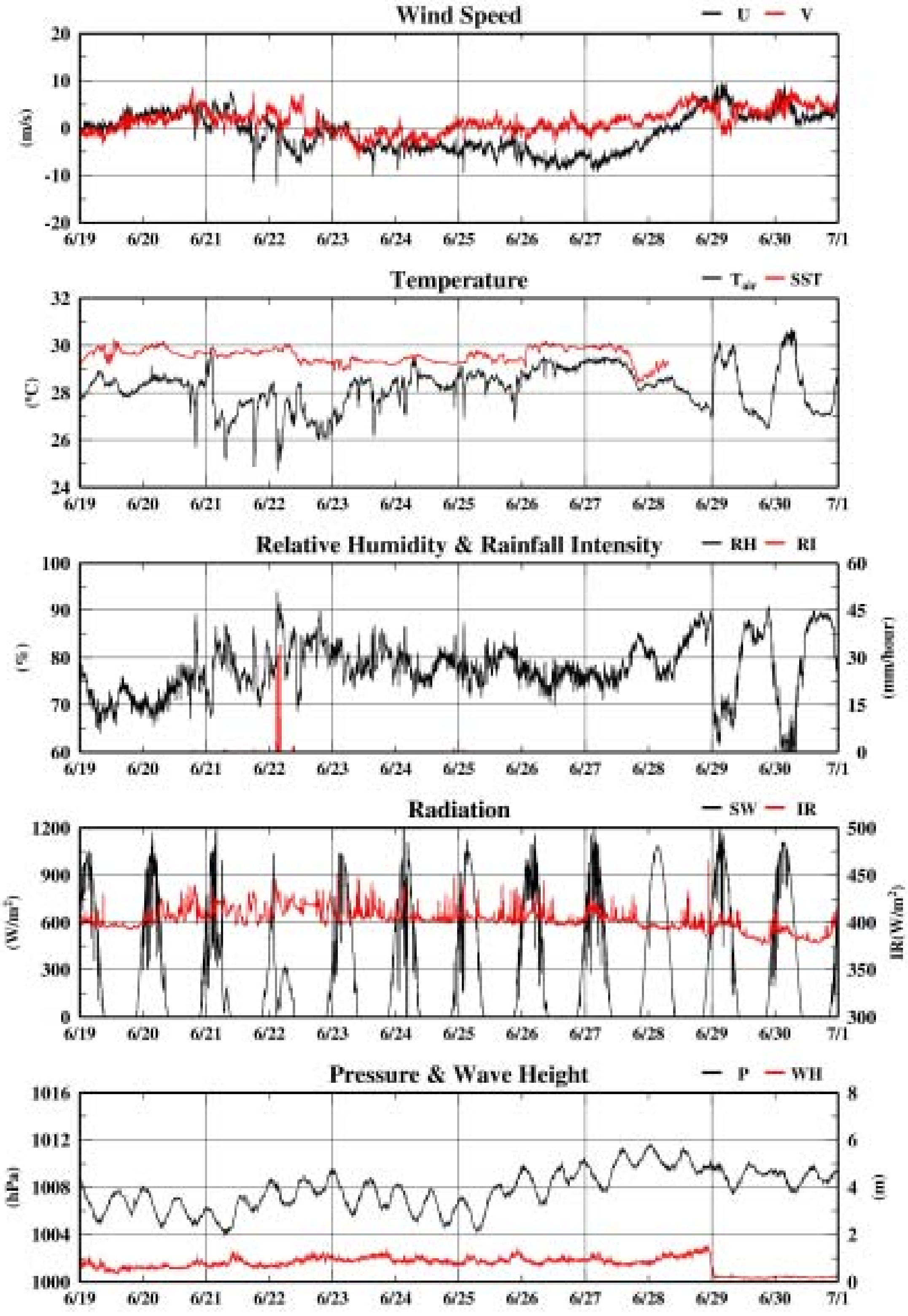


Fig6.1.1-2 Continued

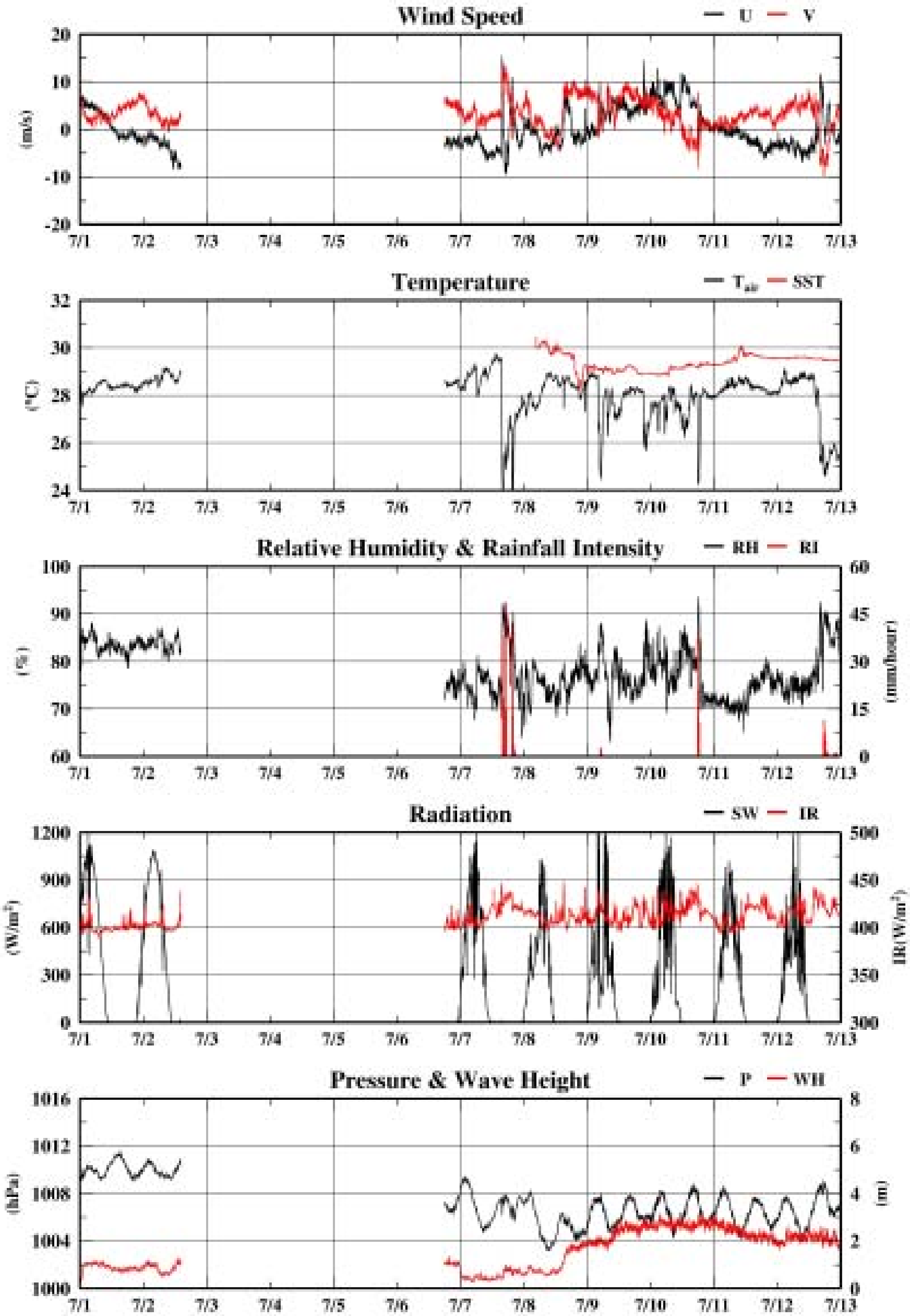


Fig6.1.1-2 Continued

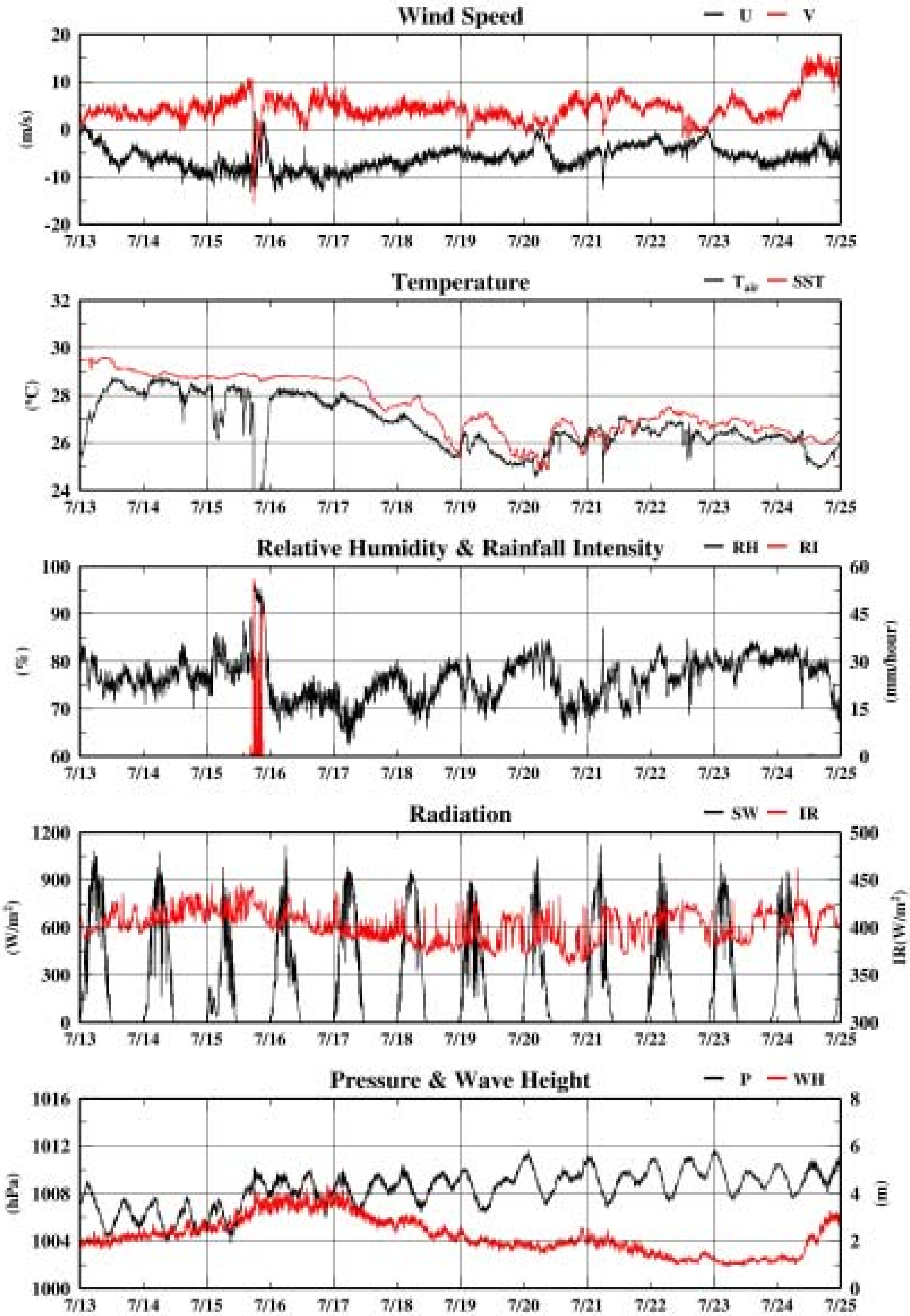


Fig6.1.1-2 Continued

6.1.2 Ceilometer Observation

Satoshi Okumura	(Global Ocean Development Inc.)	- leg2 -
Wataru Tokunaga	(GODI)	- leg1 -
Norio Nagahama	(GODI)	- leg1,2 -
Katsuhisa Maeno	(GODI)	- leg1 -
Not on-board:		- leg2 -
Kunio Yoneyama	(JAMSTEC) Principal Investigator	

(1) Objectives

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

(2) Parameters

1. Cloud base height [m].
2. Backscatter profile, sensitivity and range normalized at 30 m resolution.
3. Estimated cloud amount [oktas] and height [m]; Sky Condition Algorithm.

(3) Methods

We measured cloud base height and backscatter profile using ceilometer (CT-25K, VAISALA, Finland) throughout the MR03-K03 cruise from the departure of Guam on 7 June 2003 to arrival of Brisbane on 30 July 2003.

Major parameters for the measurement configuration are as follows;

Laser source:	Indium Gallium Arsenide (InGaAs) Diode
Transmitting wavelength:	905±5 mm at 25 degC
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
Sky Condition	0, 1, 3, 5, 7, 8 oktas (9: Vertical Visibility) (0: Sky Clear, 1:Few, 3:Scattered, 5-7: Broken, 8: Overcast)

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

(4) Preliminary results

The figure 6.1.2-1 shows the time series of the first, second and third lowest cloud base height.

(5) Data archives

The raw data obtained during this cruise will be submitted to JAMSTEC Data Management Division.

(6) Remark

We did not sample the data within foreign EEZ in South China Sea, around Guam Island, territorial waters of USA and Torres straight, territorial waters of Australia.

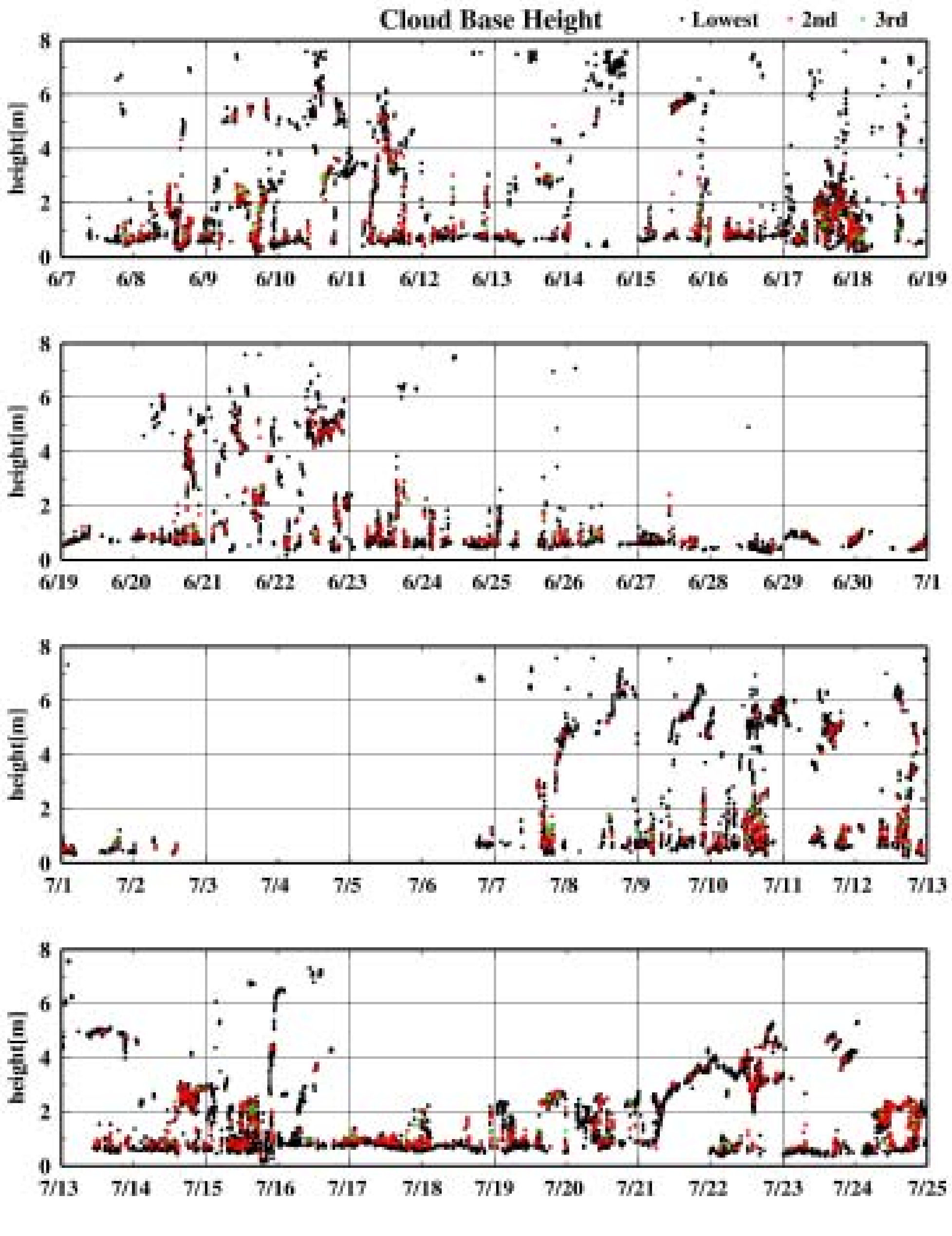


Figure 6.1.2-1 1st, 2nd and 3rd lowest cloud base height during the cruise.

6.2 CTD/XCTD

6.2.1 CTD

(1) Personnel

Hideaki Hase	(JAMSTEC): Principal Investigator (on board Leg1,2)
Kenichi Katayama	(MWJ): Operation Leader (on board Leg1)
Tomoyuki Takamori	(MWJ): Operation Leader (on board Leg2)
Masayuki Fujisaki	(MWJ): Technical staff (on board Leg1)
Takeo Matumoto	(MWJ): Technical staff (on board Leg2)
Hiroshi Matsunaga	(MWJ): Technical staff (on board Leg1)
Keisuke Wataki	(MWJ): Technical staff (on board Leg1)
Mizue Hirano	(MWJ): Technical staff (on board Leg2)
Toru Nishihashi	(MWJ): Technical staff (on board Leg2)
Mari Sakai	(MWJ): Technical staff (on board Leg2)
Yu Naito	(MWJ): Technical staff (on board Leg2)
Tomoyuki Marui	(MWJ): Technical staff (on board Leg1,2)

(2) Objective

Investigation of oceanic structure.

(3) Parameters

Temperature
Conductivity
Pressure

(4) Methods

CTD/Carousel water sampling system (CWS), which is a 12-position Carousel water sampler with CTD SBE 9plus(Sea-Bird Electronics Inc), was used during this cruise. 12-litter Niskin bottles were used for sampling seawater. The sensors attached on the CTD were one temperature sensor, conductivity sensor and pressure sensor. Salinity was calculated from measured values of pressure, conductivity and temperature. The CTD/CWS was deployed from starboard on working deck.

The CTD raw data were acquired on real time by using the Seasave-Win32 ver.5.27b, Sea-Bird Electronics, Inc. Seawater was sampled during up-cast by sending a fire command from the personal computer to check salinity data.

Total 31 casts of CTD measurements have been carried out. (See Table 6.2.1-1)

The CTD raw data was processed using SBE Data Processing-Win32 (ver.5.27b). Data processing procedures and used utilities SBE Data Processing-Win32 were as follows:

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

ROSSUM： Edit the data of water sampled to output a summary file.

WILDEDIT： Obtain an accurate estimate of the true standard deviation of the data.
Std deviation for pass 1= 10
Std deviation for pass 2= 20
Scan per block= 1000
Keep data within this distance of mean= 1
Exclude Scan Marked Bad = Check

CELLTM： Remove conductivity cell thermal mass effects from measured conductivity.
Alpha = 0.03
1/beta = 7.0

FILTER： Filter the high frequency noise on the data
Filter A = 0.15sec
Variable to Filter: Pressure: Low Pass Filter A
SECTION： Remove unnecessary data.
LOOPEDIT： Mark scan with 'bad flag', if the CTD velocity is less than 0 m/s.
Minimum Velocity Type = Fixed Minimum Velocity
Minimum CTD Velocity [m/sec] = 0.0
Exclude Scan Marked Bad = Check
BINAVG： Calculate the averaged data in every 1 db.
DERIVE： Calculate oceanographic parameters.
SPLIT： Split the data made in CNV files into up-cast and down-cast files.

Configuration file
Leg1,2: MR03K03z.con

Specifications of the sensors are listed below.
CTD system： SBE911plus CTD system
Under water unit：
Leg1･2：CTD 9plus (S/N 09P9833-0357, Sea-bird Electronics, Inc.)
Temperature sensors：
Leg1･2：SBE3-04/F Primary sensor (S/N 031524, Sea-bird Electronics, Inc.)
Calibrated Date: 15 Apr. 2003
Conductivity sensors：
Leg1･2：SBE4-04/F Primary sensor (S/N 041203, Sea-bird Electronics, Inc.)
Calibrated Date: 10 Apr. 2003
Pressure sensor：
Leg1･2：Digiquartz pressure sensor (S/N 42423)
Calibrated Date: 17 May. 1994
Deadweight test date: 18 Apr. 2003
Deck unit：
Leg1･2：SBE11 (S/N 11P9833-0344, Sea-bird Electronics, Inc.).
Carousel water sampler：
Leg1･2：SBE32 (S/N 3227443-0389, Sea-bird Electronics, Inc.).

(5) Preliminary result

Temperature and salinity profiles and sectioned diagram are shown in Fig.6.2.1-1 – Fig.6.2.1-11. Cross sections of temperature and salinity down-casting profile are shown. The temperature of surface water (300 db) was about 13 degrees about 39 degrees. The salinity of surface water (300 db) was about 33.5(PSU) from about 33.5. Note that in these figures, the correction of salinity data by sampled water is not applied.

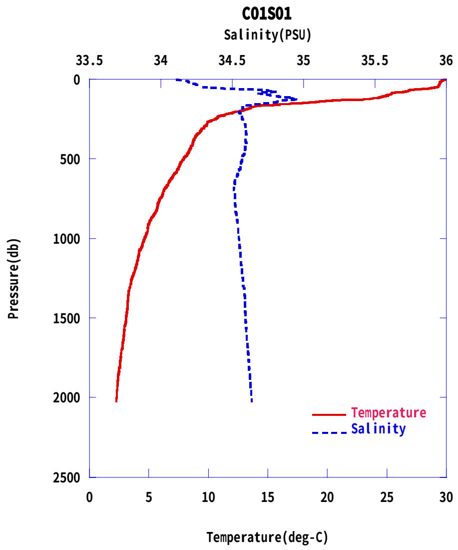
(6) Data archive

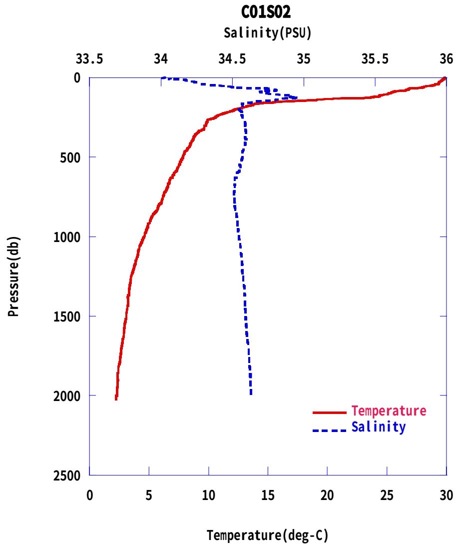
All raw and processed CTD data files were copied onto magnet-optical disk (MO). The data will be submitted to the Data Management Office (DMO), JAMSTEC, and will be opened to public via "R/V MIRAI Data Web Page" in JAMSTEC home page.

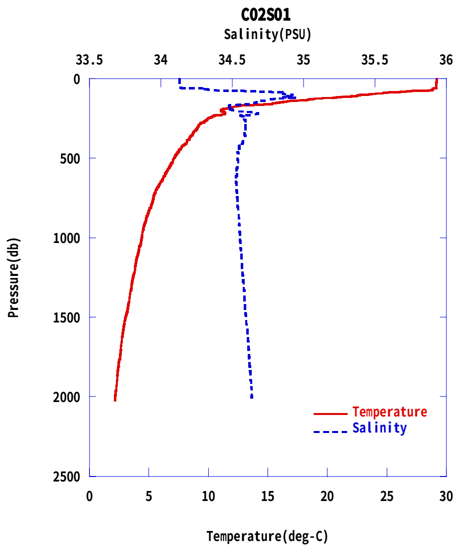
Table 6.2.1-1 CTD Cast Table

Line	St.	File Name	Lat.	Long.	Date [UTC]	Start Time	End Time	Max. Press. [db]	Max. Wire Out [m]	Depth [m]	Water Sampling	Note
Leg1	C01	C01S01	07-40.67N	136-40.75E	09.Jun.2003	04:04	05:26	2021	2008.2	3136	SP	TRITON 10002 recovery
Leg1	C01	C01S02	07-40.98N	136-40.64E	09.Jun.2003	06:15	07:24	2021	2027.2	3121	SP	
Leg1	C02	C02S01	04-51.89N	137-17.62E	11.Jun.2003	04:00	05:07	2022	2006.6	4112	SP	TRITON 11002 recovery
Leg1	C02	C02S02	04-51.71N	137-17.43E	11.Jun.2003	05:43	06:20	1008	1008.8	4117	SP	
Leg1	C03	C03S01	02-01.10N	138-06.52E	13.Jun.2003	04:03	05:12	2018	2042.0	4179	SP	
Leg1	C03	C03S02	02-01.03N	138-06.55E	13.Jun.2003	05:49	06:29	1008	1021.5	4177	SP	TRITON 12004 recovery
Leg1	C04	C04S01	02-01.09N	138-07.07E	14.Jun.2003	22:56	25:02	3038	3049.0	4157	SP	Argo Float deployed point
Leg1	C05	C05S01	00-03.26N	137-52.41E	16.Jun.2003	04:07	06:06	2960	3000.9	4347	SP	TRITON 13005 recovery
Leg1	C05	C05S02	00-03.30N	137-51.97E	16.Jun.2003	06:40	07:20	1008	1017.4	4339	SP	
Leg1	C06	C06S01	02-00.25N	130-00.40E	20.Jun.2003	03:58	05:08	2020	2013.6	4411	SP	TRITON 16003 recovery
Leg1	C06	C06S02	02-00.64N	130-00.45E	20.Jun.2003	05:42	06:21	1008	1009.9	4406	SP	
Leg1	C07	C07S01	05-06.54N	130-03.18E	22.Jun.2003	01:43	02:56	2018	2092.0	5404	SP	TRITON 15001recovery
Leg1	C07	C07S02	05-01.01N	129-58.56E	22.Jun.2003	04:02	04:42	1021	1090.9	5082	SP	
Leg1	C08	C08S01	07-57.75N	130-01.08E	24.Jun.2003	04:16	06:00	3039	3015.4	5730	SP	
Leg1	C08	C08S02	07-57.60N	130-00.80E	24.Jun.2003	06:35	07:29	1518	1515.0	5720	SP	TRITON 14001 recovery
Leg1	C08	C08S03	08-00.01N	130-00.66E	25.Jun.2003	03:43	04:21	1008	1018.5	5577	SP	
Leg2	C09	C09S01	04-00.05N	090-00.23E	09.Jul.2003	22:04	23:31	1980	1984.3	2839	S	
Leg2	C10	C10S01	02-59.88N	089-59.98E	10.Jul.2003	04:13	05:30	-	2041.9	2462	S	
Leg2	C11	C11S01	01-59.67N	089-59.99E	10.Jul.2003	09:50	11:12	2024	2038.4	2638	S	
Leg2	C12	C12S01	00-59.75N	090-00.11E	10.Jul.2003	16:01	17:28	2022	2009.3	2306	S	
Leg2	C13	C13S01	00-00.01S	090-00.20E	11.Jul.2003	02:32	03:57	2022	2007.3	4193	S	ADCP recovery & deplyment
Leg2	C14	C14S01	01-40.07S	090-00.89E	12.Jul.2003	05:00	06:18	2022	2016.1	4678	S	TRITON 18003 deployed
Leg2	C14	C14S02	01-35.32S	090-04.77E	12.Jul.2003	07:15	08:37	2022	2010.4	4708	S	TRITON 18002 recovery
Leg2	C15	C15S01	01-59.81S	089-59.86E	13.Jul.2003	09:46	11:01	2022	2005.3	4737	S	
Leg2	C16	C16S01	03-00.07S	089-59.99E	13.Jul.2003	15:56	17:14	2024	2011.9	3333	S	
Leg2	C17	C17S01	03-59.87S	090-00.14E	13.Jul.2003	22:00	23:19	2022	2010.8	3145	S	
Leg2	C18	C18S01	04-59.90S	089-59.90E	14.Jul.2003	03:56	05:16	2022	2010.1	5000	S	
Leg2	C19	C19S01	05-00.00S	090-59.69E	14.Jul.2003	09:53	11:11	2023	2014.7	4988	S	
Leg2	C20	C20S01	04-59.87S	091-59.85E	14.Jul.2003	16:03	17:20	2023	2012.8	5008	S	
Leg2	C21	C21S01	04-59.72S	092-59.42E	14.Jul.2003	22:04	23:27	2022	2019.1	4647	S	
Leg2	C22	C22S01	05-00.29S	093-58.77E	15.Jul.2003	04:23	05:42	2023	2008.8	4971	S	

SP:water sampling for salinity and POM
S:water sampling for salinity







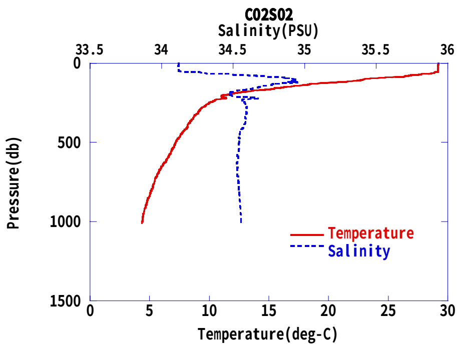


Fig6.2.1-1 Vertical profiles of temperature and salinity

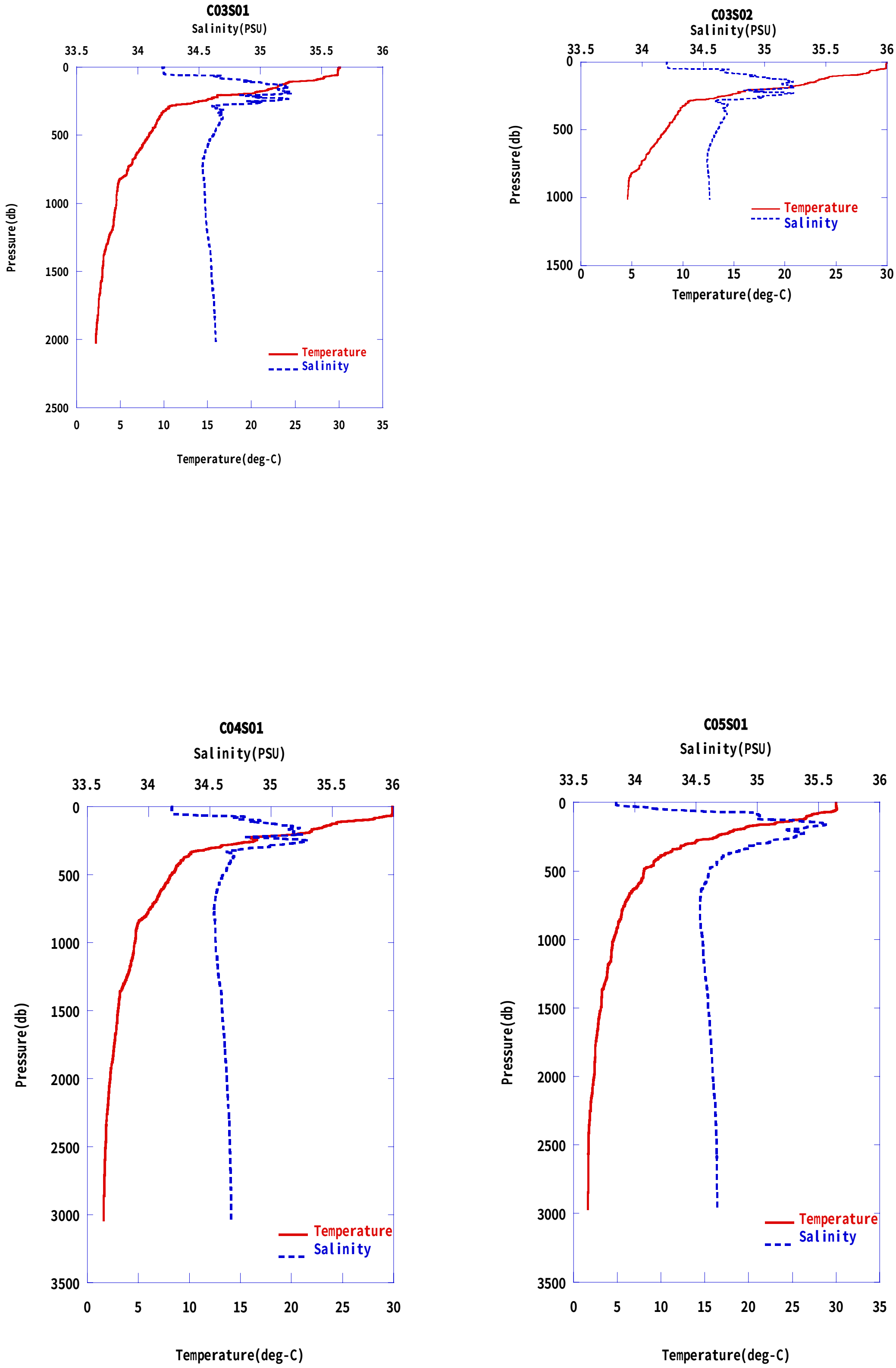


Fig6.2.1-2 Vertical profiles of temperature and salinity

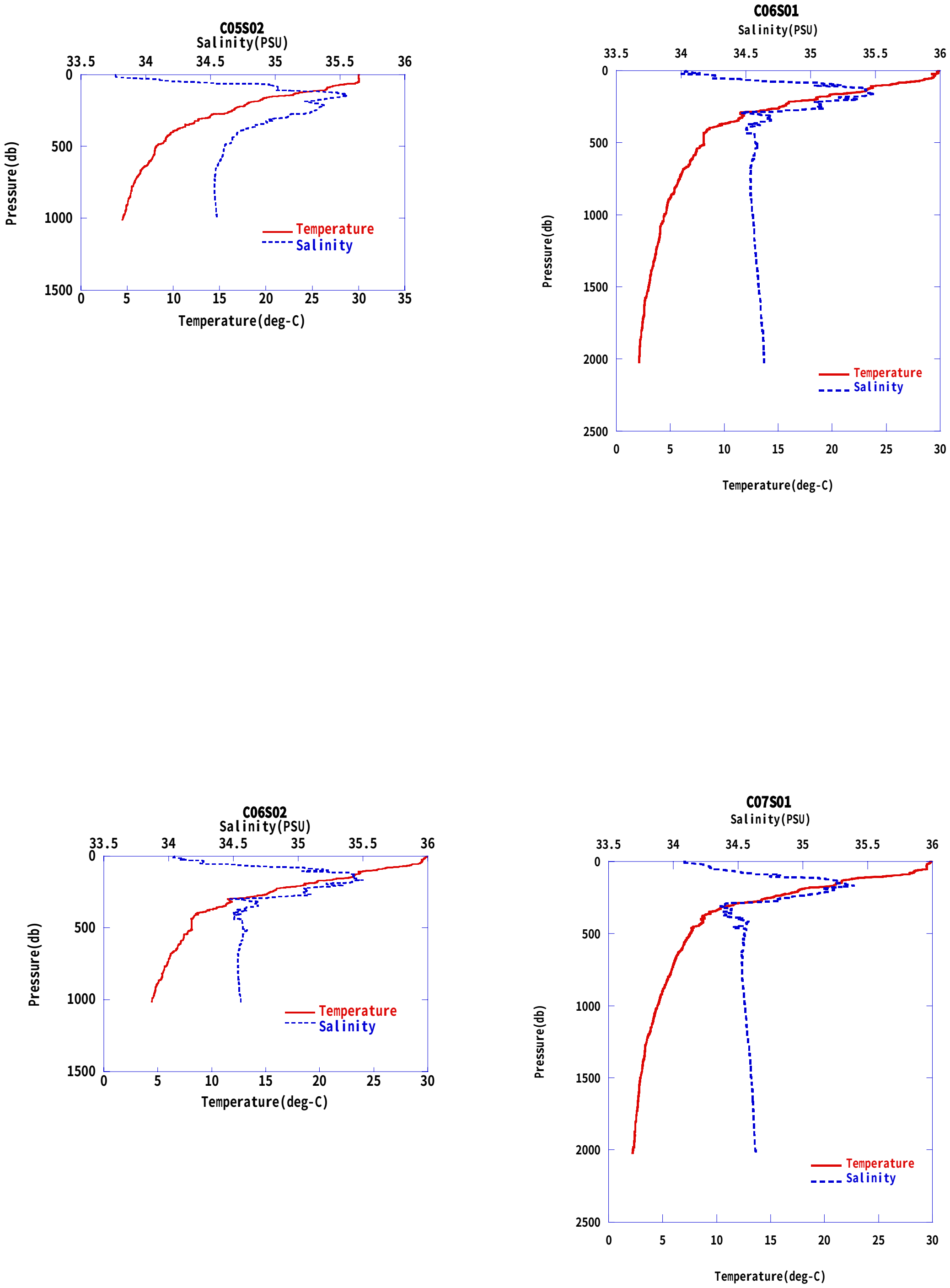


Fig6.2.1-3 Vertical profiles of temperature and salinity

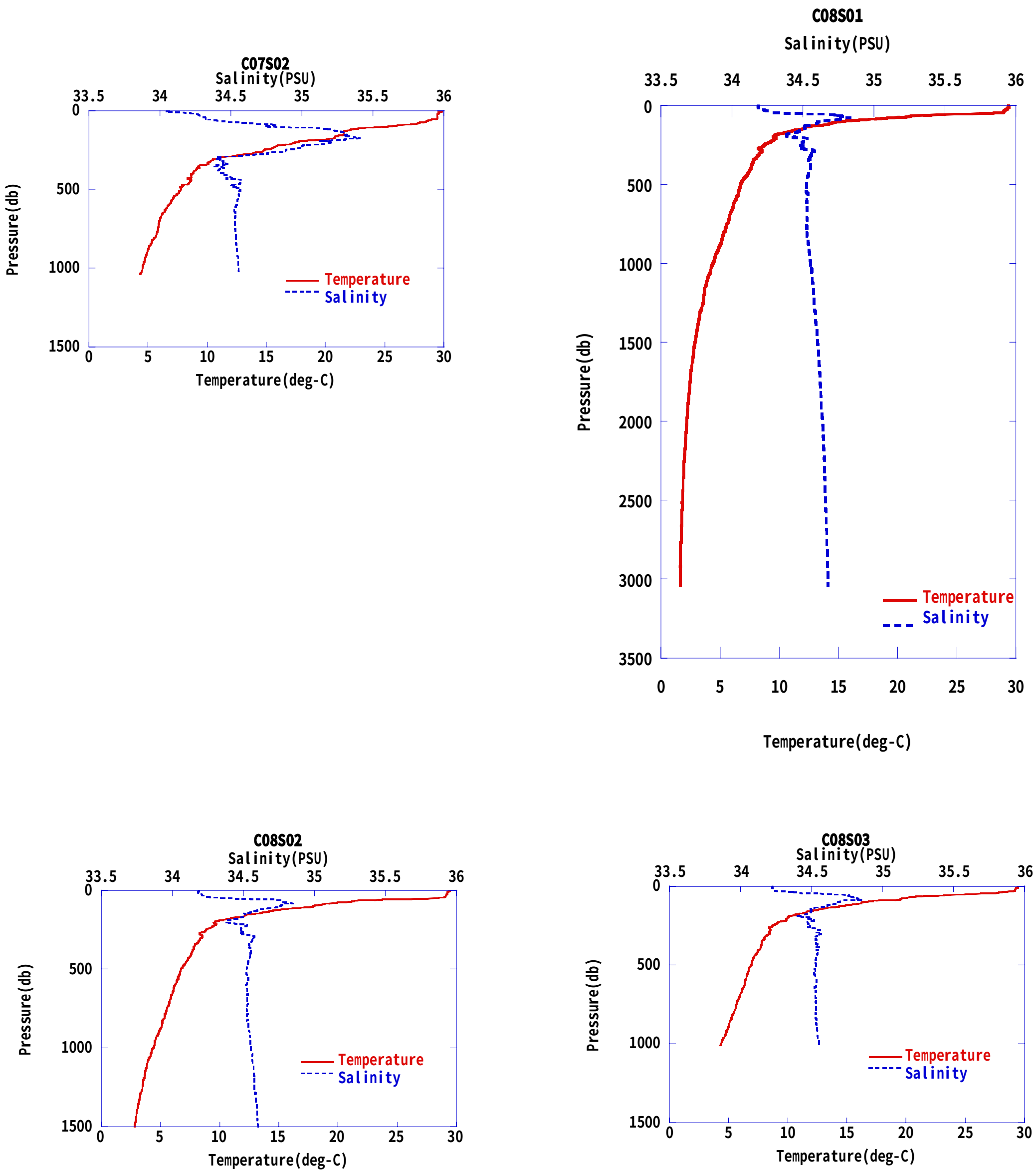


Fig6.2.1-4 Vertical profiles of temperature and salinity

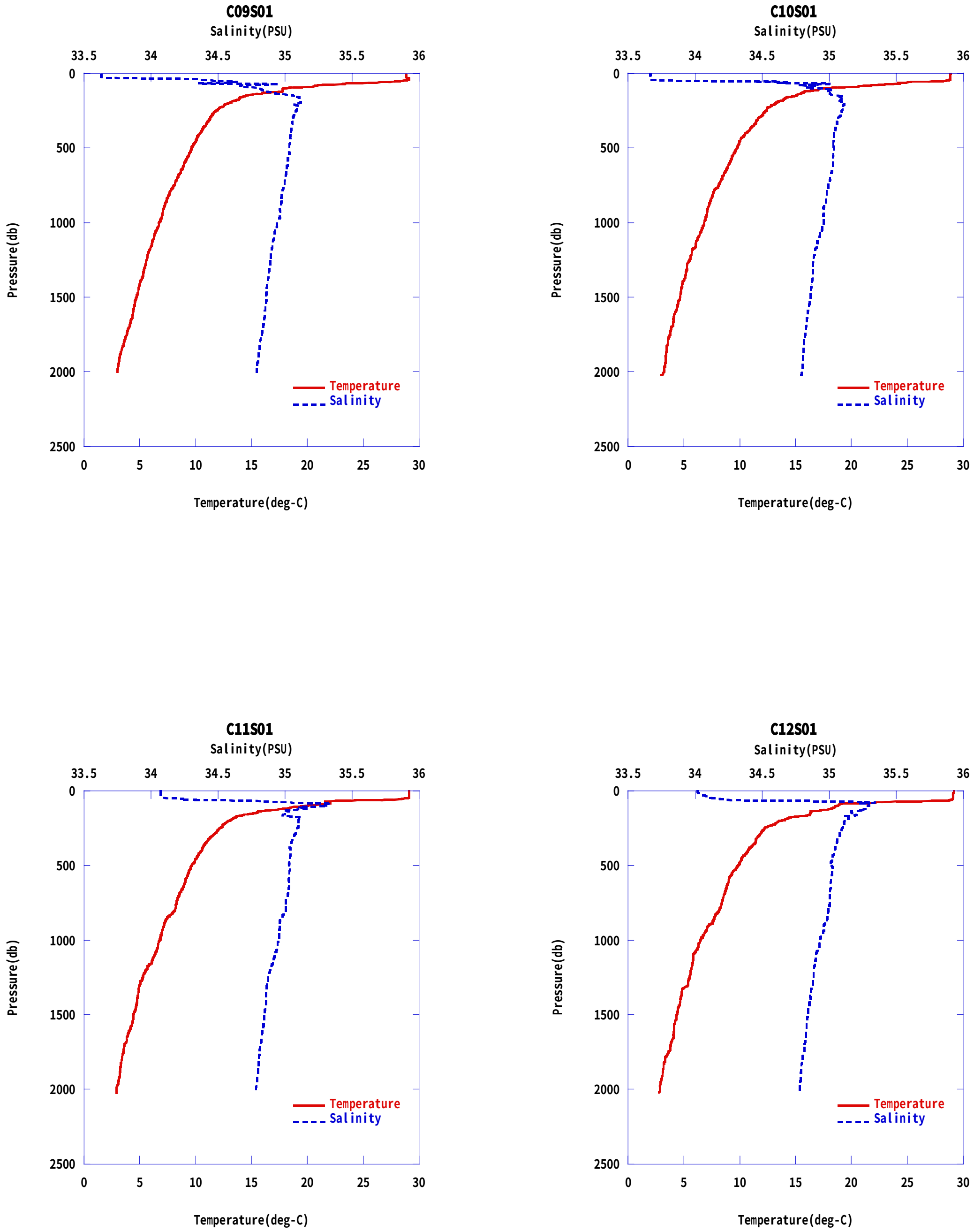


Fig6.2.1-5 Vertical profiles of temperature and salinity

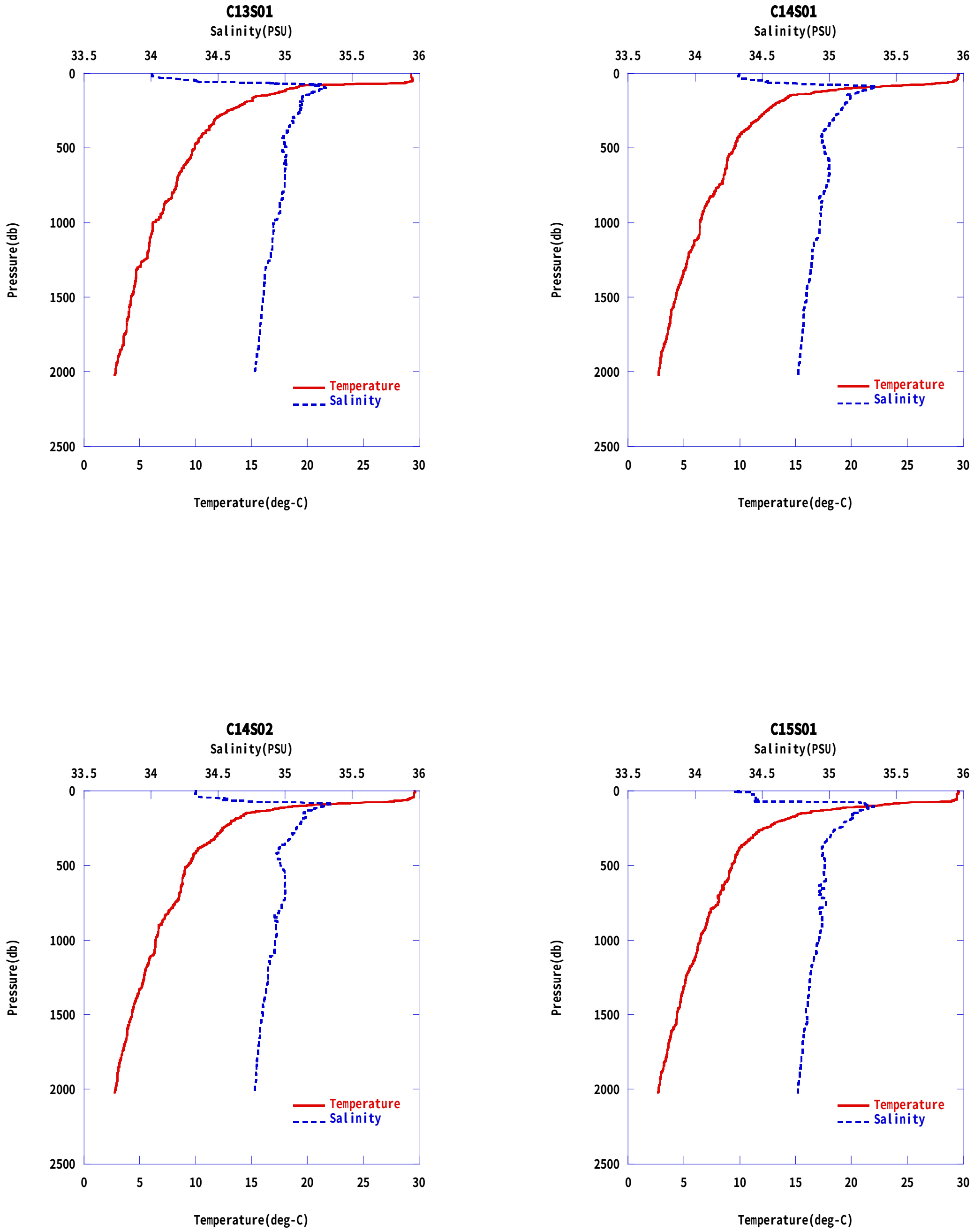


Fig6.2.1-6 Vertical profiles of temperature and salinity

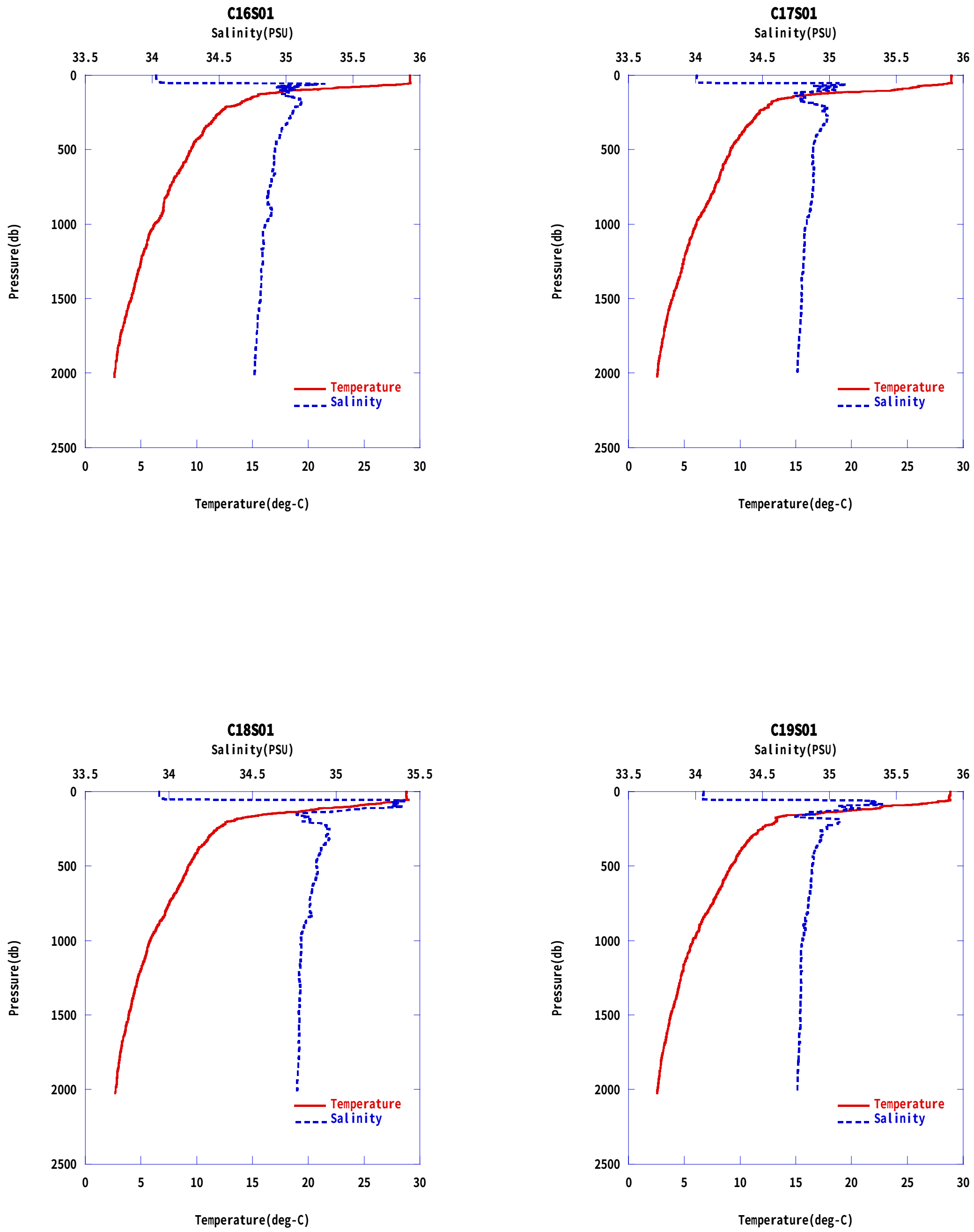


Fig6.2.1-7 Vertical profiles of temperature and salinity

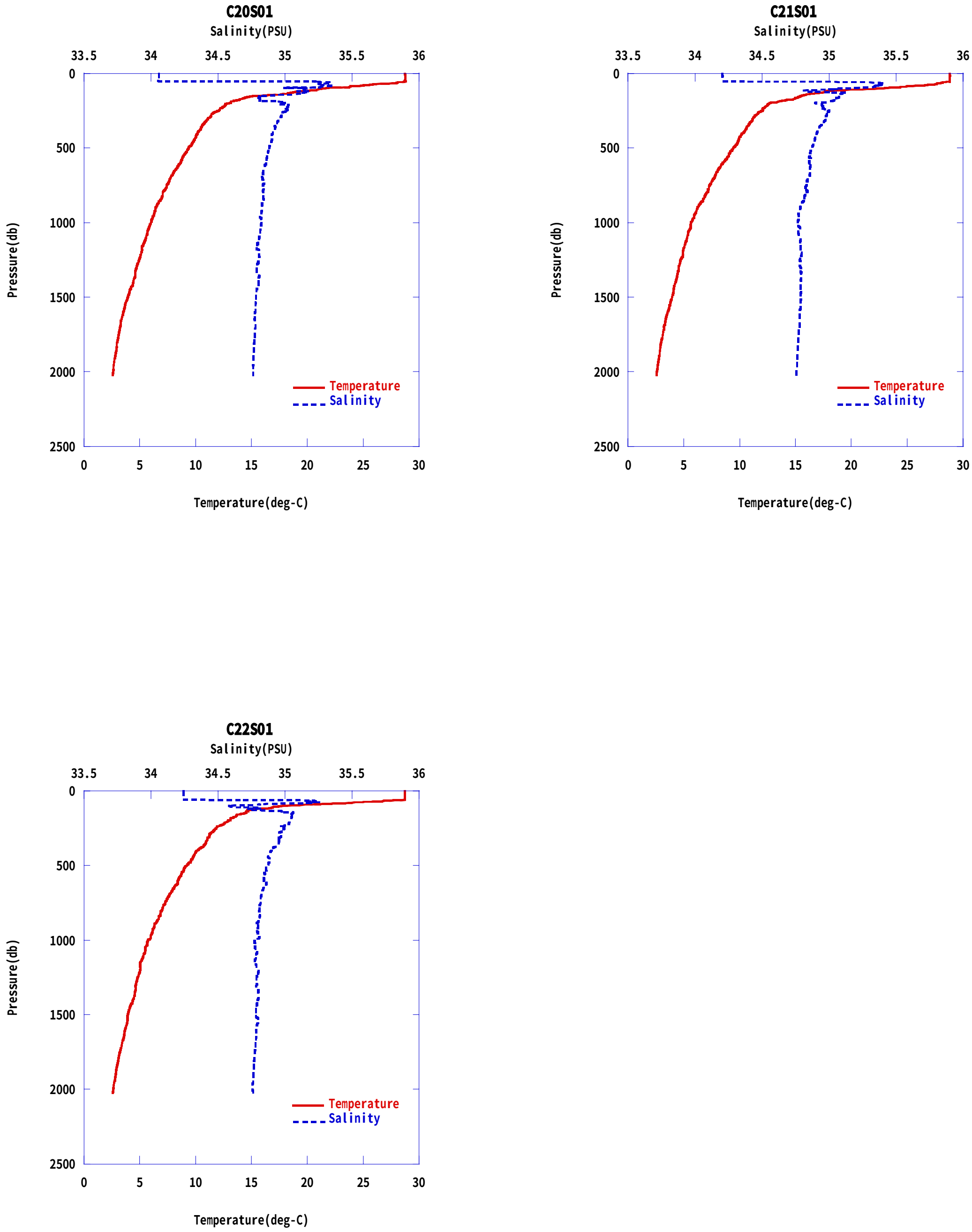
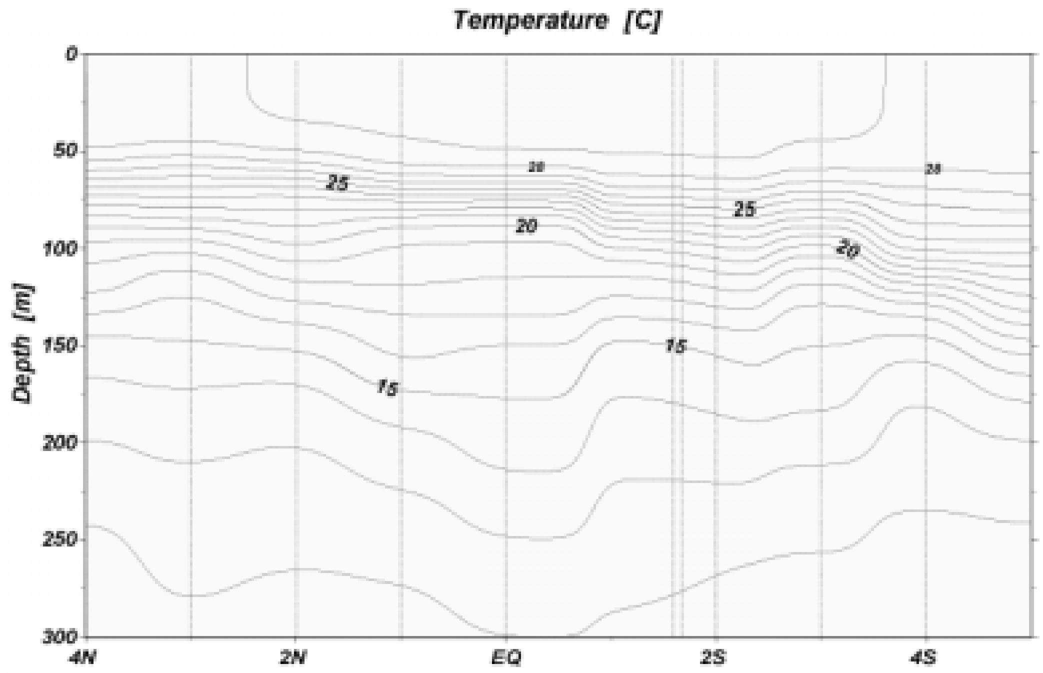


Fig6.2.1-8 Vertical profiles of temperature and salinity



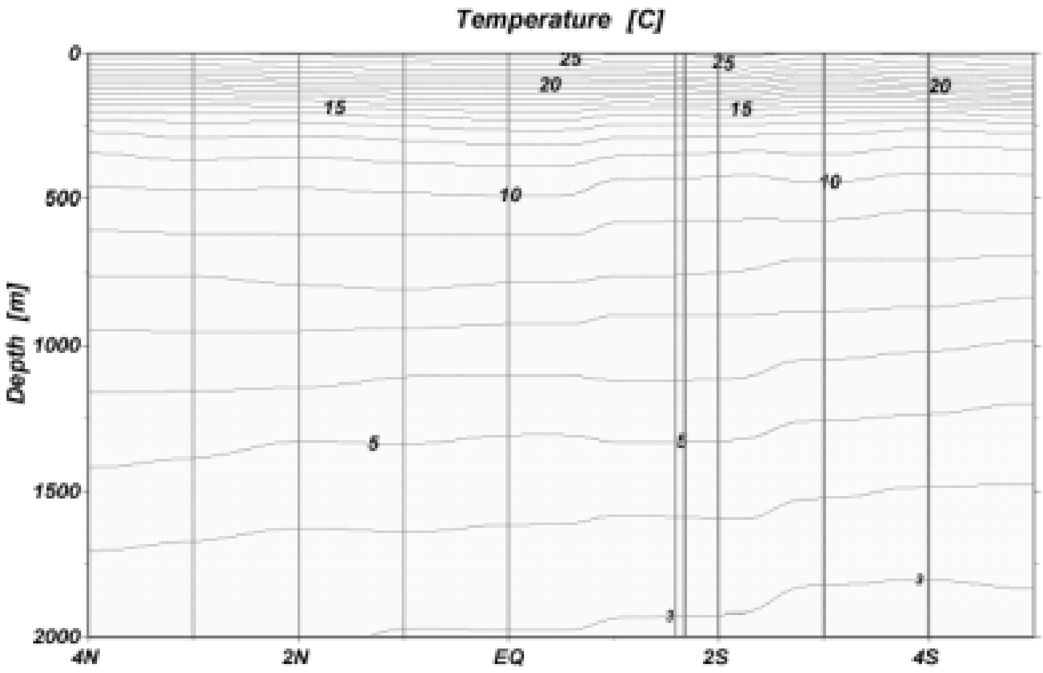


Fig 6.2.1-9 Section of Temperature along 90E

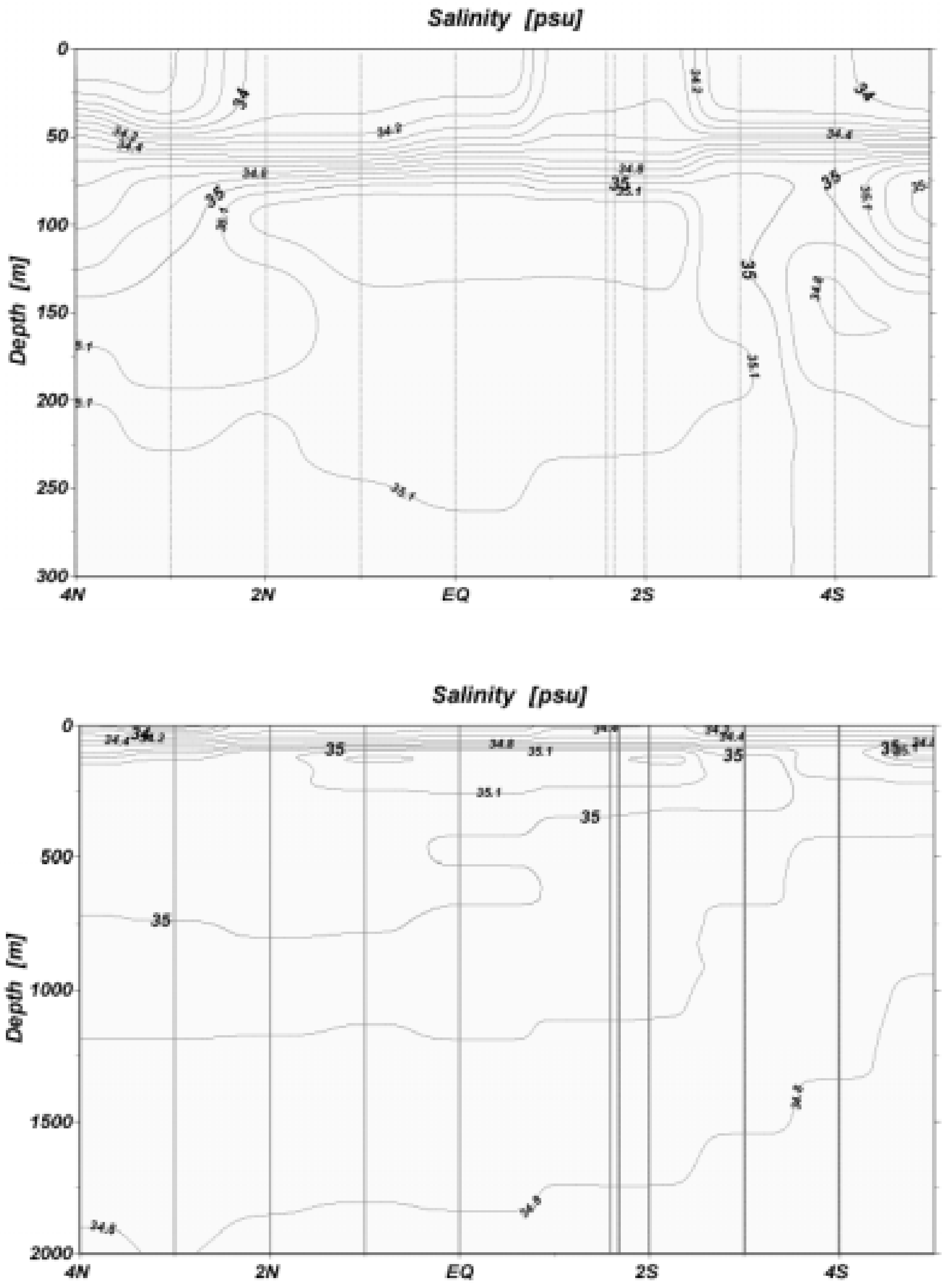


Fig 6.2.1-10 Section of Salinity along 90E

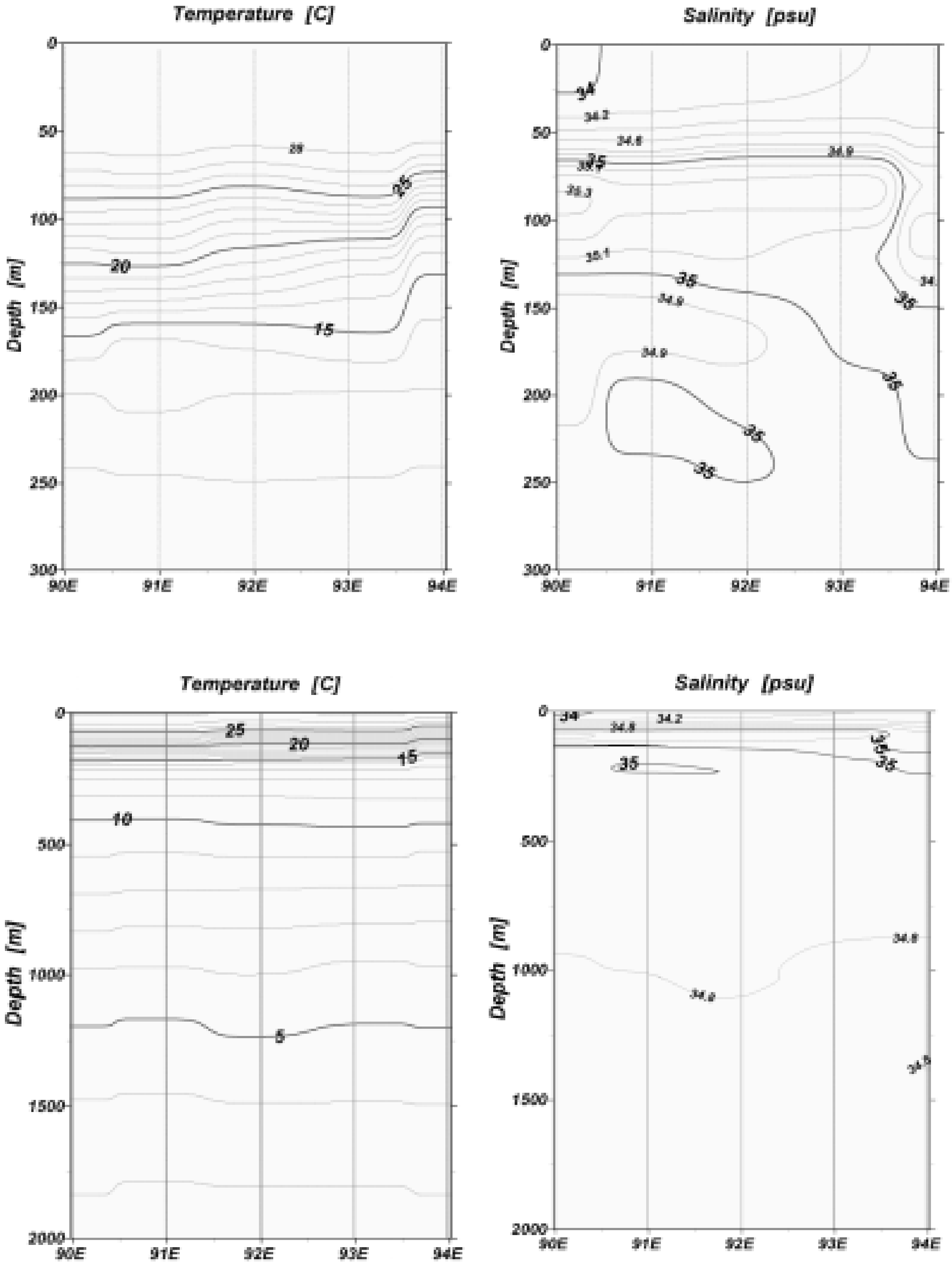


Fig 6.2.1-11 Section of Temperature and Salinity along 5S

6.2.2 XCTD observation

Hideaki Hase (JAMSTEC)	Principal Investigator (Leg1)	- Leg 1, 2 -
Shinya Minato (JAMSTEC)	Principal Investigator (Leg2)	- Leg 2
Hiroshi Matsuura (FORSGC)		- Leg 2 -
Satoshi Okumura (GODI)		- Leg 2 -
Wataru Tokunaga (GODI)		- Leg 1 -
Norio Nagahama (GODI)		- Leg 1, 2 -
Katsuhisa Maeno (GODI)		- Leg 1 -
Ryo Kimura (GODI)		- Leg 2 -

(1) Objective

Investigation of oceanic structure.

(2) Parameters

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

Parameter	Range	Accuracy
Conductivity	0 ~ 60 [mS/cm]	+/- 0.03 [mS/cm]
Temperature	-2 ~ 35 [deg-C]	+/- 0.02 [deg-C]
Depth	0 ~ 1000 [m]	5 [m] or 2 [%] (either of them is major)

(3) Methods

We observed the vertical profiles of the sea water temperature and salinity measured by XCTD-1 manufactured by Tsurumi-Seiki Co.. The signal was converted by digital converter (MK-100, Tsurumi-Seiki Co.) and was recorded by WinXCTD software (Ver.1.07, Tsurumi-Seiki Co.). We casted 118 probes (X001 – X063, X065 – X118) by automatic launcher and 1 probe (X064) by hand launcher at compass deck (height: 18m from sea-level).

(4) Observation log

Table 6.2.2-1 XCTD observation log

Station	Date	Time	Lat.	Lon.	SST	SSS	MD	WD	Probe S/N
X001	2003/06/09	02:15	07-51.23N	136-30.14E	30.02	34.142	1034	3354	02017319
X002	2003/06/10	04:24	06-59.82N	136-50.33E	29.29	34.201	1033	4590	02017322
X003	2003/06/10	08:20	06-00.03N	137-03.89E	29.28	34.267	1033	4319	02017321
X004	2003/06/11	03:05	04-56.55N	137-18.05E	29.18	34.160	1033	4129	02017318
X005	2003/06/12	05:55	03-59.88N	137-33.50E	29.19	34.392	1033	4739	02017315
X006	2003/06/12	09:59	03-00.02N	137-47.99E	29.32	34.266	1033	4397	02017312
X007	2003/06/13	02:34	02-04.00N	138-04.62E	29.94	34.173	1032	4311	02017320
X008	2003/06/15	05:23	01-00.05N	138-04.02E	30.10	34.147	1028	4051	02017311
X009	2003/06/16	03:08	00-03.36N	138-01.21E	29.95	33.840	1026	4202	02017317
X010	2003/06/18	12:50	00-19.50N	137-00.01E	29.83	33.888	1035	4282	02070190
X011	2003/06/18	16:53	00-50.87N	135-58.97E	29.96	34.154	1035	3984	02070193
X012	2003/06/18	20:49	01-21.80N	135-00.02E	29.45	34.046	1009	4309	02017314
X013	2003/06/19	00:34	01-37.78N	133-59.97E	29.31	34.249	1026	4828	02070184
X014	2003/06/19	04:10	01-42.42N	133-00.00E	29.73	34.279	1031	2944	02070191
X015	2003/06/19	07:38	01-46.83N	132-00.01E	29.93	34.270	1033	4181	02070194

X016	2003/06/19	11:14	01-51.68N	130-58.01E	29.24	33.797	1028	3959	02070192
X017	2003/06/20	02:27	01-57.13N	129-55.61E	29.96	34.035	1021	4426	02070185
X018	2003/06/21	05:29	03-00.05N	130-00.79E	29.60	34.271	1033	3098	02070195
X019	2003/06/21	08:59	03-59.87N	130-01.95E	29.51	34.307	1035	4779	02070189
X020	2003/06/22	04:50	05-00.18N	129-59.14E	29.82	34.053	1035	5061	03022136
X021	2003/06/22	07:04	05-17.24N	129-30.03E	29.98	34.049	1034	5054	03022133
X022	2003/06/22	09:18	05-32.68N	129-00.03E	29.71	34.174	1031	5382	02070186
X023	2003/06/23	11:38	05-48.99N	128-30.03E	29.32	34.358	1036	4925	03022116
X024	2003/06/22	13:54	06-05.56N	127-59.91E	29.32	34.109	1036	5278	03022139
X025	2003/06/22	14:40	06-10.92N	127-50.00E	29.25	34.272	1035	5583	03022122
X026	2003/06/22	15:37	06-16.55N	127-40.04E	29.22	34.222	1035	5902	03022123
X027	2003/06/22	16:34	06-22.05N	127-30.00E	29.23	34.157	1034	7856	03022120
X028	2003/06/22	17:32	06-27.69N	127-20.01E	29.43	34.121	1036	9390	03022119
X029	2003/06/22	18:31	06-33.62N	127-10.01E	29.38	34.200	1033	7921	03022115
X030	2003/06/22	19:30	06-39.04N	127-00.02E	29.32	34.083	1021	6873	03022117
X031	2003/06/22	20:30	06-44.67N	126-50.00E	29.46	34.218	0996	4903	03022118
X032	2003/06/23	00:11	06-47.15N	126-42.35E	29.34	34.188	1036	3159	03022130
X033	2003/06/24	03:26	07-55.49N	130-03.93E	29.48	34.201	1035	5637	03022128
X034	2003/06/25	06:15	08-30.00N	130-00.57E	29.63	34.150	1033	5846	03022135
X035	2003/06/25	08:11	09-00.01N	129-59.49E	29.72	34.176	1034	5939	03022132
X036	2003/06/25	10:08	09-30.01N	129-59.34E	29.70	34.203	1036	6188	03022127
X037	2003/06/25	12:04	10-00.01N	129-58.52E	29.48	34.351	1034	5968	02070166
X038	2003/06/25	14:00	10-30.01N	129-58.01E	29.35	34.175	1033	5851	03022138
X039	2003/06/25	15:58	11-00.02N	129-57.93E	29.59	34.063	1034	5827	03022134
X040	2003/06/25	17:54	11-30.03N	129-57.88E	29.22	33.987	1033	5721	02070157
X041	2003/06/25	19:47	11-59.99N	129-57.35E	29.38	34.171	1030	5801	03022131
X042	2003/06/25	21:43	12-30.01N	129-57.07E	29.36	34.150	1033	5801	02070163
X043	2003/06/25	23:46	12-59.99N	129-56.30E	29.45	34.156	1019	6002	03022137
X044	2003/06/26	01:47	13-30.01N	129-55.56E	29.84	34.202	1035	5722	03022121
X045	2003/06/26	03:50	13-59.98N	129-54.71E	29.86	34.191	1033	5726	03022125
X046	2003/06/26	05:51	14-30.00N	129-53.72E	29.94	34.275	1034	5896	02070164
X047	2003/06/26	07:53	14-59.99N	129-54.06E	30.08	34.204	1034	5022	03022126
X048	2003/06/26	09:53	15-30.01N	129-53.59E	30.07	34.246	1035	6078	03022124
X049	2003/06/26	11:52	16-00.01N	129-53.63E	30.07	34.517	1036	5235	03042735
X050	2003/06/26	13:52	16-30.02N	129-52.76E	30.04	34.391	1034	5266	03042736
X051	2003/06/27	02:48	17-00.94N	129-46.57E	29.95	34.560	1033	5484	03042732
X052	2003/06/27	04:44	17-30.03N	129-42.06E	29.90	34.406	1034	5286	03042733
X053	2002/06/27	06:52	18-00.00N	129-37.35E	30.01	34.561	1035	5371	03042734
X054	2003/07/08	17:08	06-20.04N	095-00.02E	29.79	32.320	1035	1782	03042846
X055	2003/07/08	19:51	05-53.00N	094-29.99E	28.93	33.180	1035	1763	03042675
X056	2003/07/08	22:43	05-21.22N	093-59.99E	29.13	32.650	0814	0819	03042674
X057	2003/07/09	01:32	04-52.50N	093-30.00E	29.21	32.793	0826	0839	03042678
X058	2003/07/09	04:20	04-24.40N	092-59.95E	29.09	33.577	1033	4485	03042679
X059	2003/07/09	07:15	03-55.76N	092-29.99E	29.15	33.435	1035	4261	03042677
X060	2003/07/09	10:05	03-36.96N	091-59.98E	28.91	33.490	1037	4120	03042676
X061	2003/07/09	12:14	03-42.51N	091-29.97E	29.01	33.411	1035	4065	03042731
X062	2003/07/09	14:49	03-48.09N	090-59.99E	29.19	33.594	1035	3173	03042845
X063	2003/07/09	17:22	03-54.40N	090-30.01E	29.17	33.682	1036	2449	03042847
X064	2003/07/09	23:42	03-58.83N	090-00.67E	28.89	33.640	1100	2779	03042841
X065	2003/07/10	01:39	03-30.00N	090-00.26E	28.93	33.605	1036	2465	03042848
X066	2003/07/10	07:33	02-30.00N	090-00.90E	29.23	33.923	1036	2666	03042842
X067	2003/07/10	13:33	01-30.00N	090-00.02E	29.27	34.050	1033	2294	03042844
X068	2003/07/10	19:45	00-30.01N	090-01.96E	29.33	33.951	1035	4066	03042840
X069	2003/07/11	02:05	00-00.12S	090-02.30E	29.32	34.025	1035	4353	03042836
X069-2	2003/07/11	04:03	00-00.39S	090-00.61E	29.36	34.019	1036	4079	03042837
X070	2003/07/11	09:55	00-30.03S	090-02.04E	29.95	34.298	1034	3111	03042838
X071	2003/07/11	12:05	01-00.01S	089-59.44E	29.78	34.162	1035	3122	03042820
X072	2003/07/13	13:36	02-30.01S	090-00.65E	29.17	34.247	1033	3504	03042821
X073	2003/07/13	19:36	03-30.01S	089-59.70E	29.06	34.116	1036	3880	03042839
X074	2003/07/14	01:39	04-30.00S	089-59.93E	28.85	34.017	1035	4636	03042818
X075	2003/07/14	05:20	04-59.66S	089-59.61E	28.85	33.940	1036	4997	03042815
X076	2003/07/14	07:38	04-59.88S	090-30.01E	29.00	34.003	1036	5046	03042822
X077	2003/07/14	13:37	05-00.31S	091-30.00E	28.75	34.040	1036	4949	03042816
X078	2003/07/14	19:45	04-59.75S	092-30.03E	28.71	34.053	1034	5004	03042819
X079	2003/07/15	01:51	04-59.61S	093-30.00E	28.80	34.251	1035	4888	03042813

X080	2003/07/15	08:12	05-01.04S	094-30.93E	28.76	34.100	1036	4984	03063457
X081	2003/07/17	03:23	04-59.73S	095-01.53E	28.71	34.042	0921	5008	03063462
X082	2003/07/17	05:45	05-11.92S	095-30.00E	28.80	34.131	1035	4984	03063465
X083	2003/07/17	08:06	05-22.81S	096-00.01E	28.75	34.200	1035	4902	03063463
X084	2003/07/17	10:27	05-32.20S	096-30.00E	28.61	34.196	1035	5298	03063460
X085	2003/07/17	12:41	05-42.42S	097-00.01E	28.38	34.202	1034	4859	03063454
X086	2003/07/17	14:51	05-53.23S	097-29.99E	27.84	34.032	1036	4985	03063452
X087	2003/07/17	16:59	06-04.54S	098-00.01E	27.66	34.092	1036	5503	03063459
X088	2003/07/17	19:14	06-15.55S	098-30.01E	27.33	34.070	1035	5065	03063466
X089	2003/07/17	21:21	06-26.84S	099-00.00E	27.51	34.271	1036	5368	03063467
X090	2003/07/17	23:34	06-38.44S	099-30.00E	27.52	34.044	1035	4814	03063464
X091	2003/07/18	01:44	06-49.41S	100-00.00E	27.64	34.074	1036	5055	03063451
X092	2003/07/18	03:58	07-00.76S	100-30.01E	27.61	34.151	1035	5476	03063448
X093	2003/07/18	06:21	07-12.46S	101-00.00E	27.86	34.228	1034	5499	03063446
X094	2003/07/18	08:43	07-23.68S	101-30.00E	27.95	34.248	1035	5454	03063450
X095	2003/07/18	11:01	07-34.05S	102-00.01E	27.30	33.450	1034	5414	03063455
X096	2003/07/18	13:22	07-45.03S	102-30.00E	27.21	33.145	1035	5766	03063470
X097	2003/07/18	15:34	07-56.06S	103-00.00E	26.98	33.655	1035	5841	03063473
X098	2003/07/18	17:46	08-07.07S	103-30.00E	26.53	33.988	1035	5958	03063445
X099	2003/07/18	19:57	08-17.88S	104-00.00E	26.21	34.139	1036	5971	03063447
X100	2003/07/18	22:09	08-28.83S	104-30.02E	25.66	34.250	1034	6048	03063453
X101	2003/07/19	00:20	08-39.49S	105-00.00E	25.59	34.180	1035	6403	03063449
X102	2003/07/19	02:38	08-50.20S	105-30.00E	26.86	34.141	1034	6576	03063444
X103	2003/07/19	04:57	09-00.61S	106-00.00E	27.05	34.193	1035	6032	03063472
X104	2003/07/19	07:16	09-11.09S	106-29.99E	27.24	34.290	1035	5355	03063474
X105	2003/07/19	09:33	09-21.97S	107-00.00E	27.21	34.295	1036	5072	03063477
X106	2003/07/19	11:40	09-27.27S	107-30.02E	27.07	34.235	1034	4089	03063468
X107	2003/07/19	13:44	09-32.64S	108-00.01E	26.65	34.159	1034	3363	03063479
X108	2003/07/19	15:44	09-38.19S	108-30.01E	26.40	34.108	1035	3456	03063475
X109	2003/07/19	17:41	09-43.68S	109-00.00E	26.00	34.157	1035	2832	03063476
X110	2003/07/19	19:36	09-48.81S	109-30.00E	25.48	34.268	1035	3163	03063478
X111	2003/07/19	21:34	09-55.23S	110-00.01E	25.60	34.245	1035	1361	03063471
X112	2003/07/19	23:30	10-00.30S	110-30.01E	25.47	34.250	1035	2451	03063956
X113	2003/07/20	01:30	10-05.35S	111-00.00E	25.44	34.293	1035	3165	03063469
X114	2003/07/20	03:32	10-10.88S	111-30.00E	25.58	34.252	1033	3287	03063960
X115	2003/07/20	05:51	10-16.42S	112-00.17E	24.98	34.331	1035	3736	03063957
X116	2003/07/20	08:11	10-21.24S	112-30.01E	25.12	34.277	1035	3016	03063461
X117	2003/07/20	10:31	10-27.08S	113-00.00E	26.48	34.117	1035	2406	03063456
X118	2003/07/20	12:44	10-31.88S	113-30.00E	26.80	34.184	1035	2227	03063959

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 Monitorring System

MD: Maximum measured depth [m]

WD: Water Depth [m]

Remarks: We casted 11 probes (T01 – T11) by hand launcher at compass deck on account of an impact test.

Table 6.2.2-2 XCTD test log

Station	Date	Time	Lat.	Lon.	SST	SSS	MD	WD	Probe S/N
T-01	2003/07/12	00:21	01-43.94S	090-02.11E	29.58	34.362	0824	4655	03063951
T-02	2003/07/12	00:29	01-43.78S	090-02.02E	29.59	34.363	0571	4683	03042814
T-03	2003/07/12	00:36	01-43.62S	090-01.94E	29.59	34.363	0881	4683	03063955
T-04	2003/07/12	00:44	01-43.45S	090-01.84E	29.59	34.366	0876	4657	03042811
T-05	2003/07/12	00:51	01-43.29S	090-01.75E	29.59	34.363	1100	4644	03042817
T-06	2003/07/12	00:59	01-43.11S	090-01.65E	29.58	34.362	0604	4640	03063958
T-07	2003/07/17	00:30	04-56.12S	094-54.10E	28.68	34.034	0289	5015	03063961
T-08	2003/07/17	00:34	04-56.11S	094-54.11E	28.68	34.030	0421	5011	03063458
T-09	2003/07/20	05:04	10-14.97S	111-51.90E	25.52	34.272	1100	3813	03063962
T-10	2003/07/20	05:13	10-15.32S	111-53.49E	25.52	34.270	1100	3883	03063963
T-11	2003/07/20	05:23	10-15.68S	111-55.23E	25.29	34.310	1100	3893	03063953

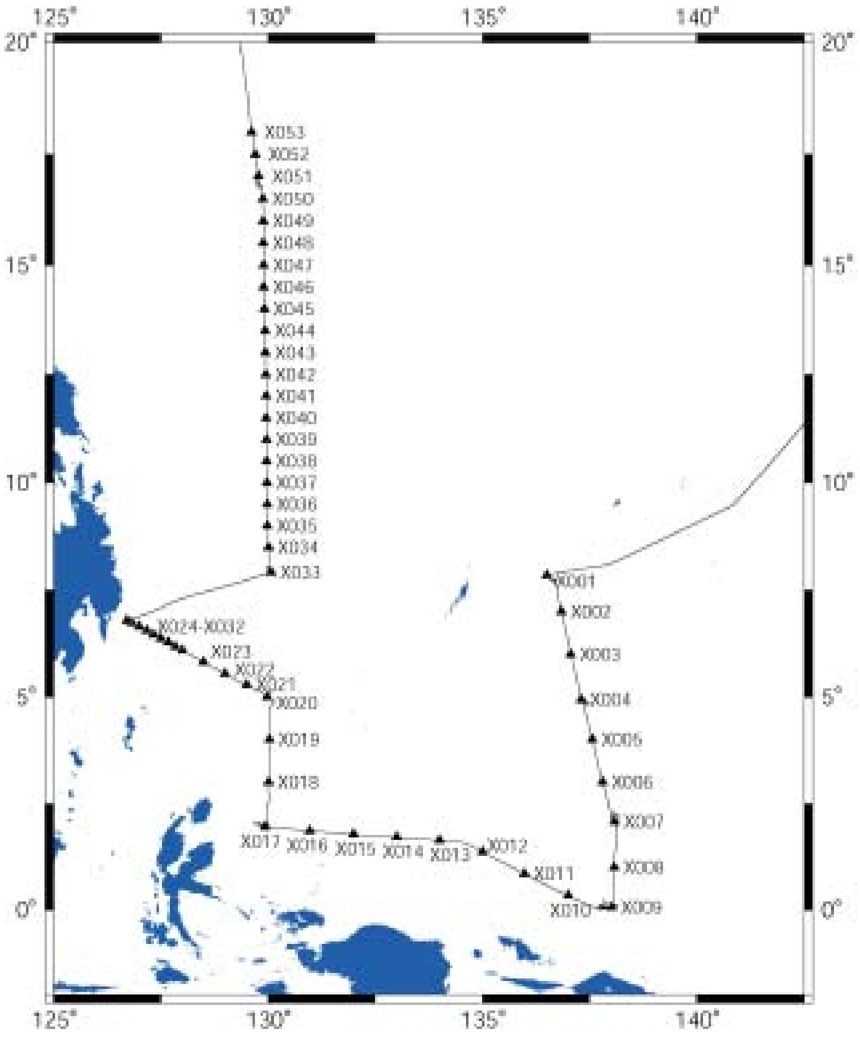


Fig.6.2.2-1 MR03-K03 Leg1 XCTD

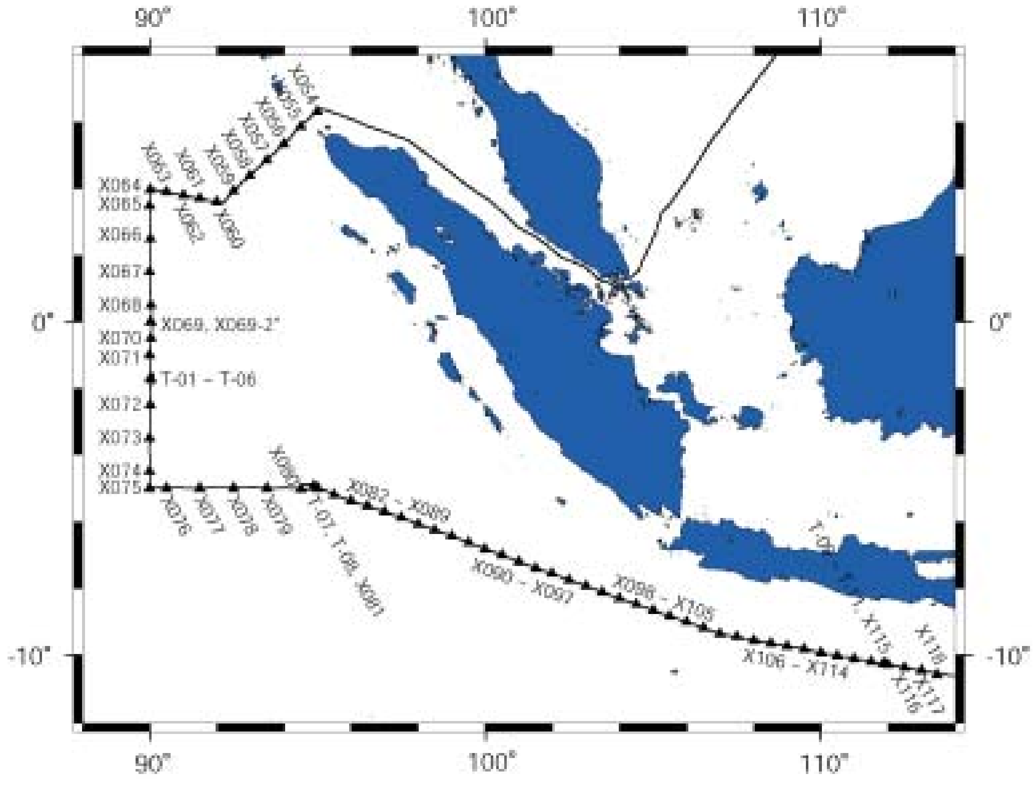


Fig.6.2.2-2 MR03-K03 Leg2 XCTD

(5) Preliminary results

Vertical sections are shown in the following figures.

(6) Data archive

XCTD data obtained during this cruise will be submitted to the JAMSTEC DMD (Data Management Division) and will be available via “R/V Mirai Data Web Page” in JAMSTEC home page.

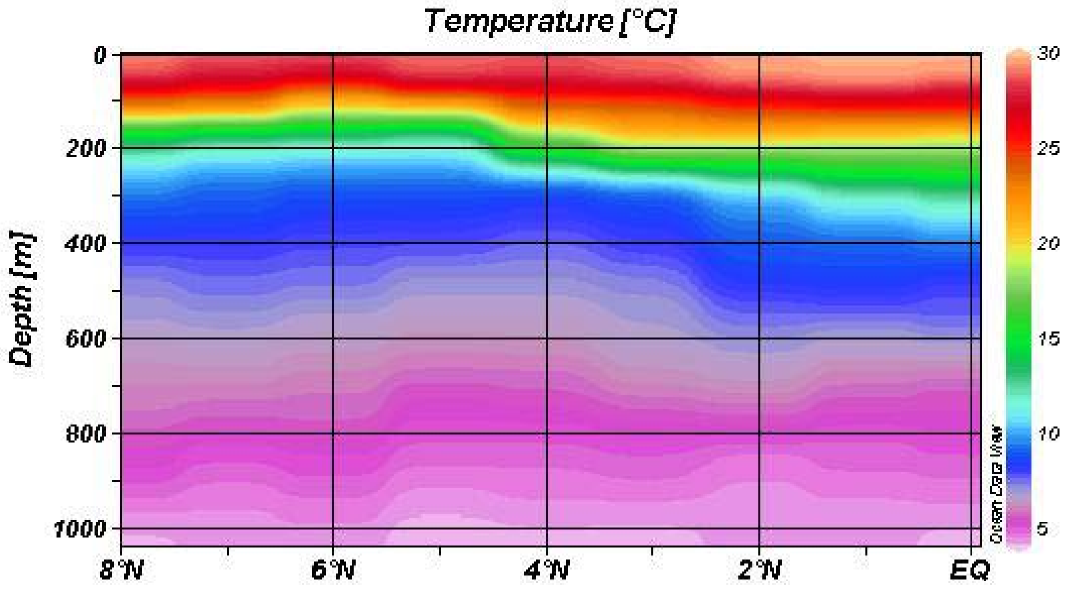


Fig.6.2.2-3 Temperature section along 138E

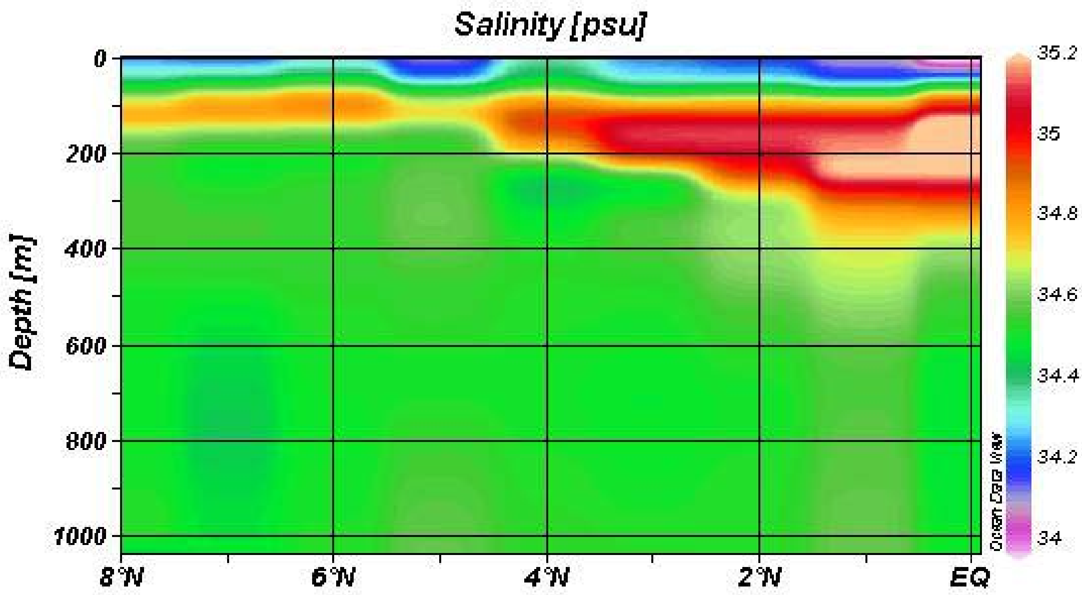


Fig.6.2.2-4 Salinity section along 138E

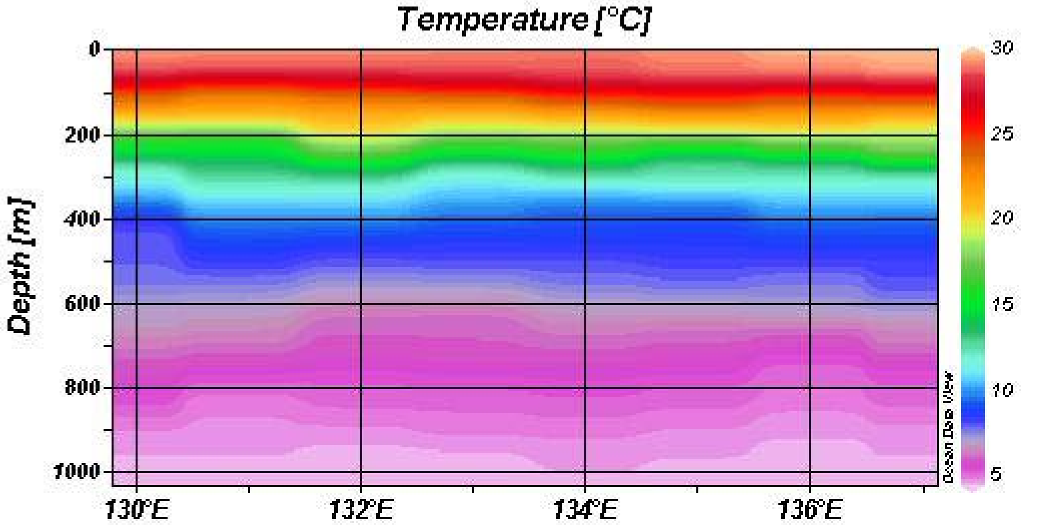


Fig.6.2.2-5 Temperature section along ship's track from EQ137E to 2N137E

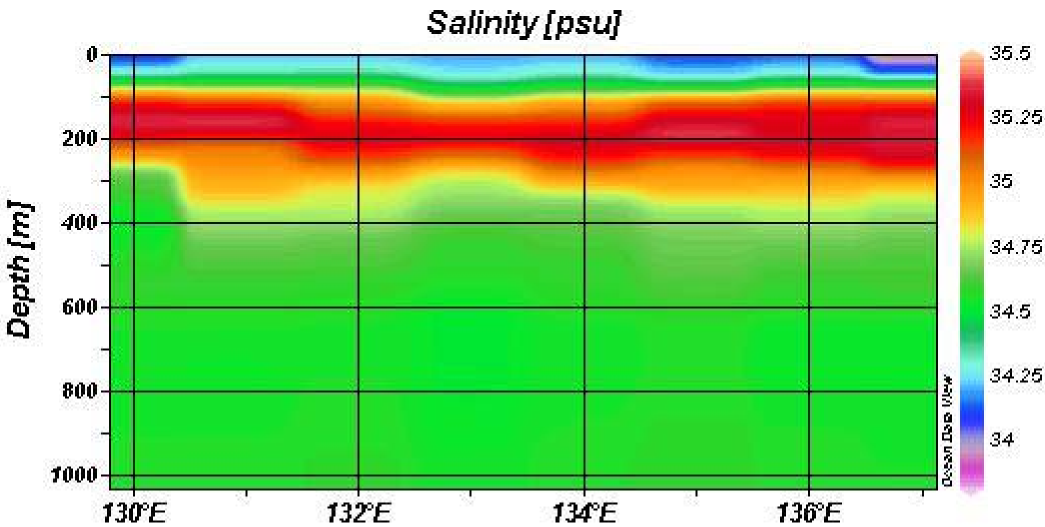


Fig.6.2.2-6 Salinity section along ship's track from EQ137E to 2N137E

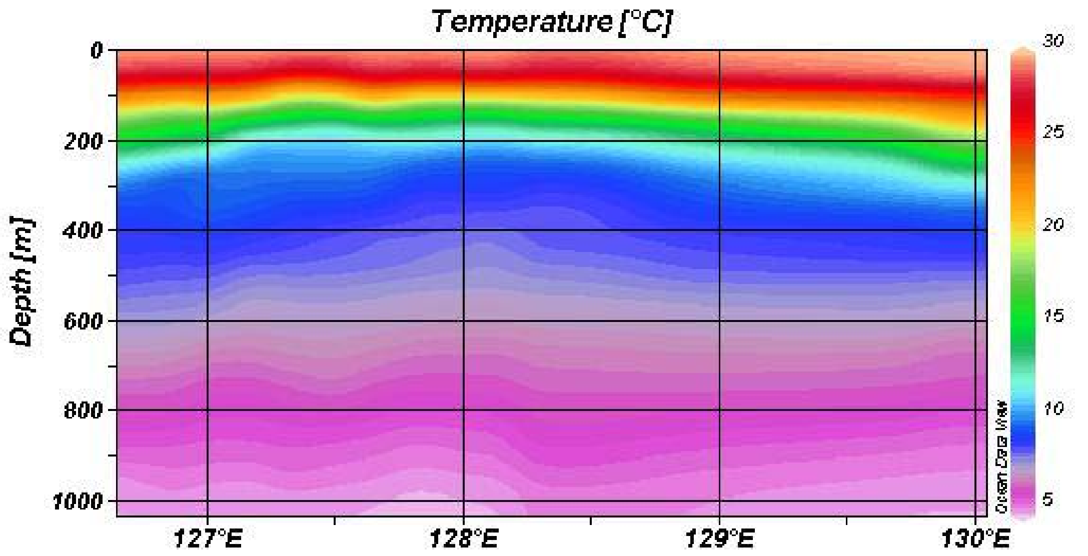


Fig.6.2.2-7 Temperature section along ship's track from 5N130E to 6-47N126-42E

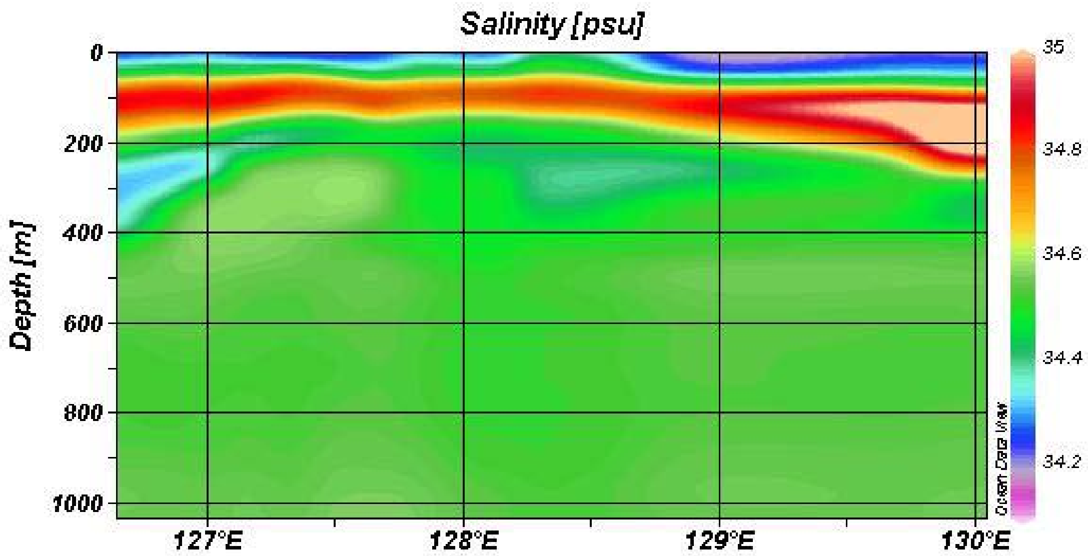


Fig.6.2.2-8 Salinity section along ship's track from 5N130E to 6-47N126-42E

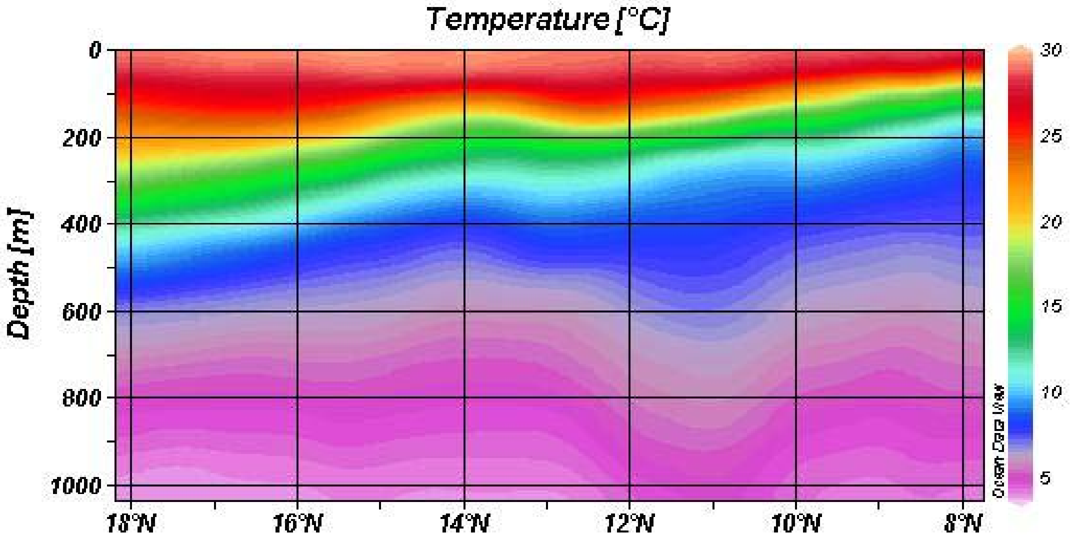


Fig.6.2.2-9 Temperature section along 130E

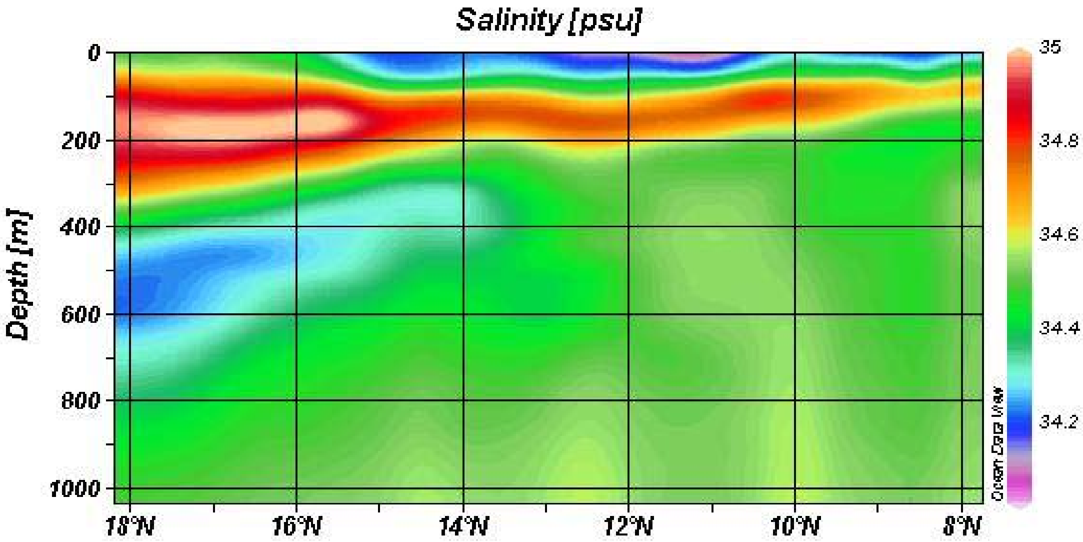


Fig.6.2.2-10 Salinity section along 130E

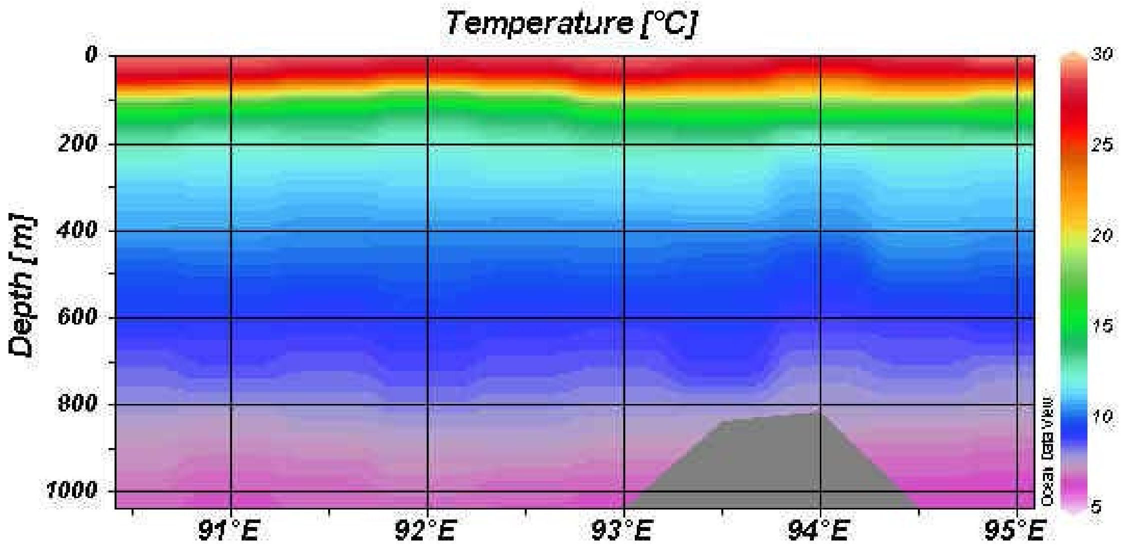


Fig.6.2.2-11 Temperature section along ship's track from 6-20N95E to 3-54S90-30E

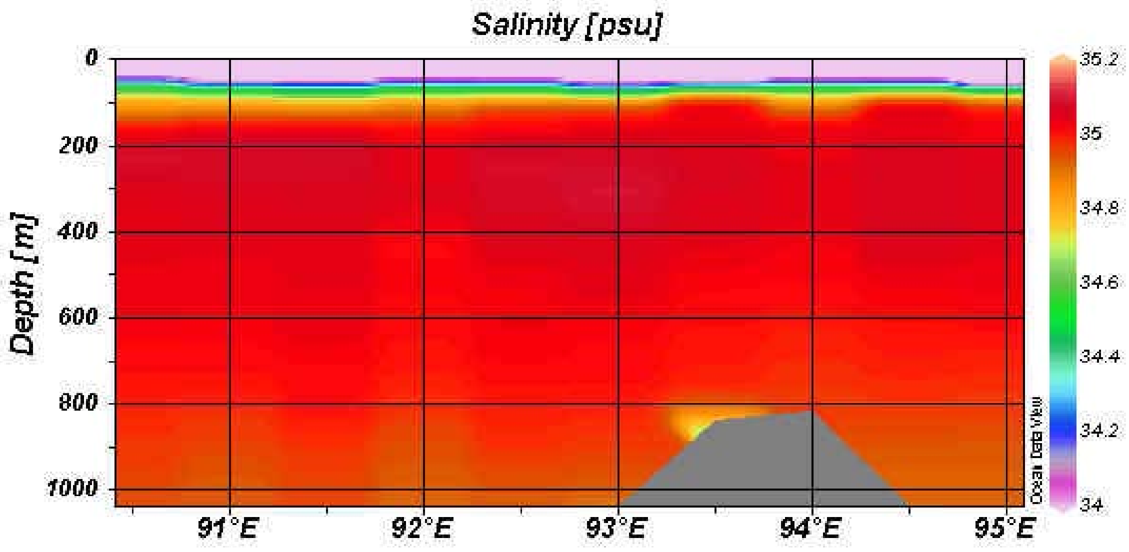


Fig.6.2.2-12 Salinity section along ship's track from 6-20N95E to 3-54S90-30E

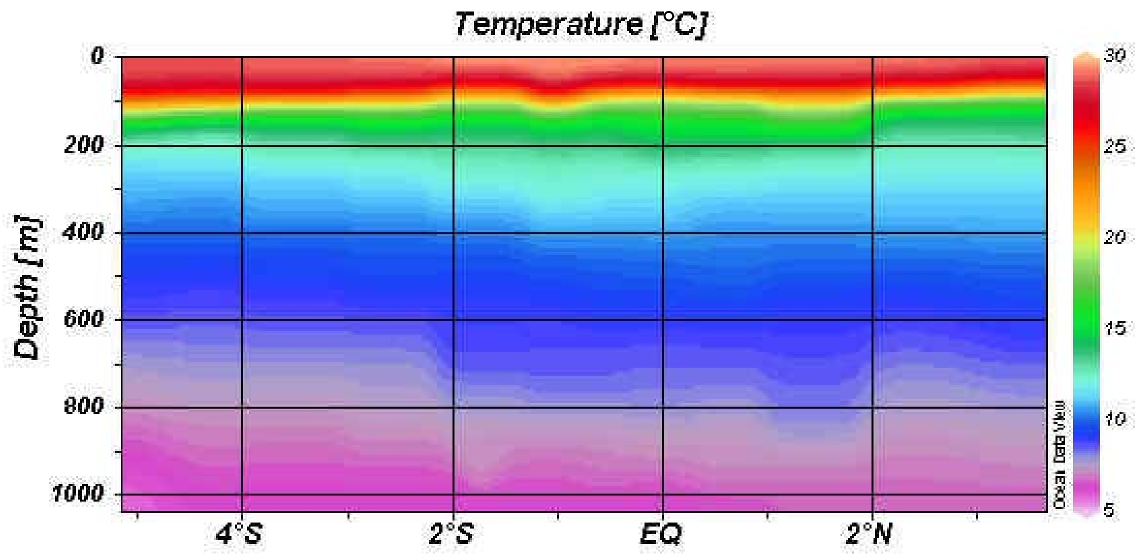


Fig.6.2.2-13 Temperature section along 90E

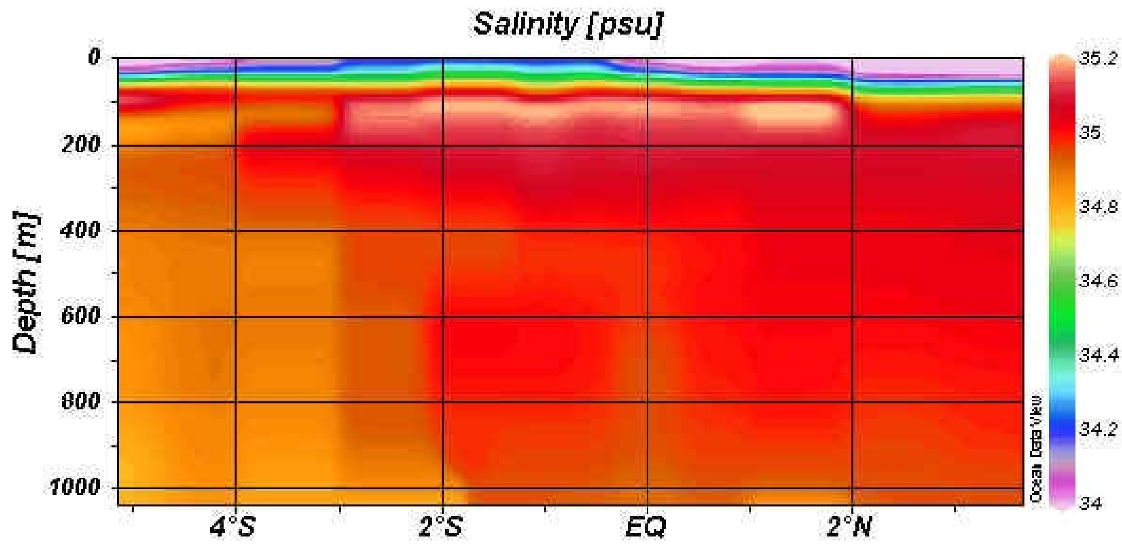


Fig.6.2.2-14 Salinity section along 90E

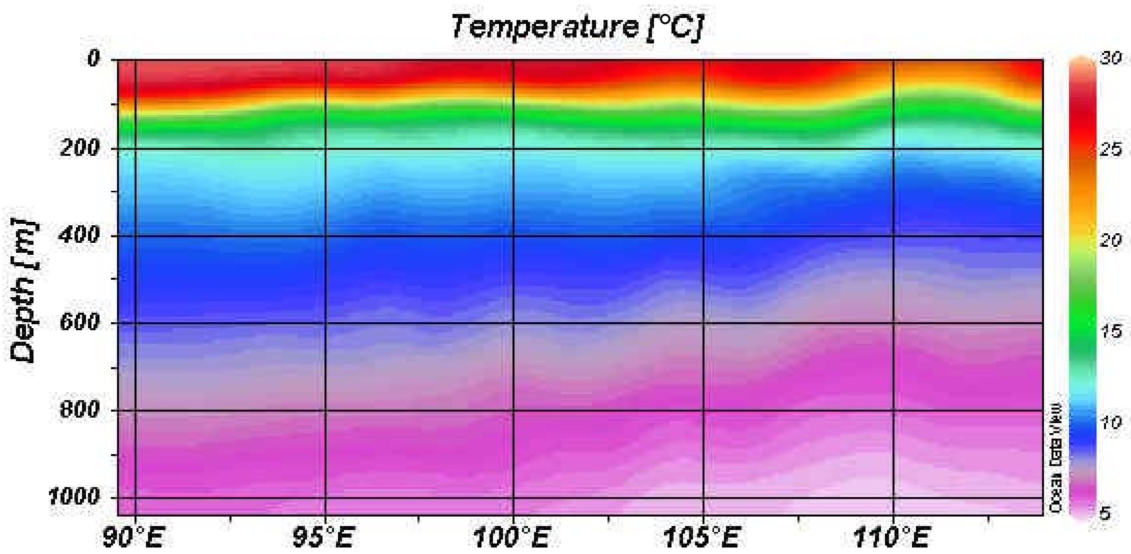


Fig.6.2.2-15 Temperature section along ship's track from 5S90E to 10S113-30E

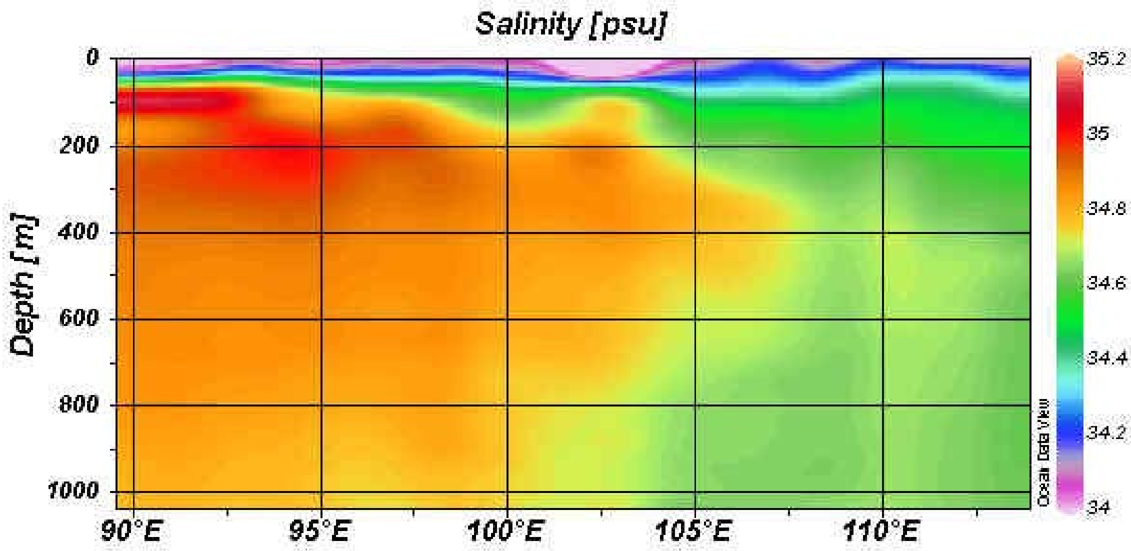


Fig.6.2.2-16 Salinity section along ship's track from 5S90E to 10S113-30E

6.3 Validation of CTD cast data

6.3.1 Salinity measurement of sampled seawater

(1) Personnel

Hideaki Hase	(JAMSTEC): Principal Investigator (on board Leg1, 2)
Takeo Matsumoto	(MWJ): Operation Leader (on board Leg 2)
Kenichi Katayama	(MWJ): Operation Leader (on board Leg 1)

(2) Objectives

To check the quality of CTD salinity.

(3) Parameters

Salinity of sampled water

(4) Method

Seawater samples were collected with a bucket for the surface, 12-liter Niskin bottles for the deepest layer and other layers. They were stored in 250ml Phoenix brown glass bottles. The salinity analysis of samples was carried out using “Guildline Autosal 8400B Salinometer”, which was modified by addition of an Ocean Scientific International peristaltic-type sample intake pump. The instrument was operated in “Autosal Room” of R/V Mirai constant temperature laboratory at a bath temperature of 24 deg-C with the laboratory set under 24 deg-C. A double conductivity ratio was defined as a median of 31 readings of the salinometer. Data collection was started after 5 seconds and it took about 10 seconds to collect 31 readings by a personal computer. The salinometer standardizations were made with IAPSO Standard Seawater batch P141, of which 10 bottles were consumed. These conductivity ratios are 0.99993 (2K 1.99986, salinity 34.997). Sub-standard seawater was also used to check the drift of the Autosal.

(5) Results

Data of all samples were shown in Table 6.3.1-1. We estimated the precision of this method using 16 pairs of duplicate samples taken by the same Niskin bottle, and compared the salinity of all samples except for surface samples to check the salinity data of CTD.

The mean standardization drift was 0.00000 by 2K. There was 1 pair of duplicate samples drawn due to bad data. The standard deviations and mean of sample pairs were shown in Table 6.3.1-2.

(6) Data archive

The data of salinity sample will be submitted to the DMO at JAMSTEC.

Table 6.3.1-1 Analysis data of all samples. Comparison Autosal and CTD

STNNBR	CASTNO	BTLNBR	CTDPRS DBAR	CTDSAL PSS-78	SALNTY PSS-78	DIFF.SAL SAL-CTD	SALNTY1 PSS-78	DIFF.SAL1 SAL-CTD
		Bucket			34.1332		99.9999	
C01	S01	9	503.6	34.5709	34.5689	-0.0020	99.9999	
C01	S01	5	1008.4	34.5496	34.5479	-0.0017	34.5482	-0.0014
C01	S01	1	2021	34.6352	34.6344	-0.0008	99.9999	
		Bucket			34.0383		99.9999	
C01	S02	9	503.3	34.5707	34.5690	-0.0017	99.9999	
C01	S02	5	1007.8	34.5524	34.5517	-0.0007	34.5517	-0.0007
C01	S02	1	2022	34.6341	34.6334	-0.0007	99.9999	
		Bucket			34.1463		99.9999	
C02	S01	9	1007.9	34.5606	34.5598	-0.0008	34.5594	-0.0012
C02	S01	1	2021.4	34.6396	34.6391	-0.0005	99.9999	
C02	S02	5	503.8	34.5434	34.5420	-0.0014	99.9999	
C02	S02	1	1008.7	34.5582	34.5591	0.0009	34.5592	0.0010
		Bucket			34.2129		99.9999	
C03	S01	9	1009	34.5531	34.5521	-0.0010	34.5518	-0.0013
C03	S01	1	2021	34.6387	34.6385	-0.0002	99.9999	
C03	S02	5	503.8	34.6161	34.6144	-0.0017	99.9999	
C03	S02	1	1008.8	34.5499	34.5512	0.0013	34.5749	0.0250
		Bucket			34.1944		99.9999	
C04	S01	9	50.2	34.1885	34.2004	0.0119	99.9999	
C04	S01	5	1515.5	34.6046	34.6034	-0.0012	34.6037	-0.0009
C04	S01	1	3038.3	34.6747	34.6736	-0.0011	34.6734	-0.0013
		Bucket			33.8547		99.9999	
C05	S01	9	1007.9	34.5501	34.5494	-0.0007	34.5496	-0.0005
C05	S01	1	2021.2	34.6366	34.6352	-0.0014	99.9999	
C05	S02	5	503.4	34.6044	34.6030	-0.0014	99.9999	
C05	S02	1	1008.3	34.5518	34.5499	-0.0019	34.5498	-0.0020
		Bucket			34.0442		99.9999	
C06	S01	9	1007.9	34.5571	34.5556	-0.0015	34.5556	-0.0015
C06	S01	1	2021.4	34.6411	34.6402	-0.0009	99.9999	
C06	S02	5	503.3	34.5969	34.5964	-0.0005	99.9999	
C06	S02	1	1008.3	34.5552	34.5556	0.0004	34.5559	0.0007
		Bucket			34.1005		99.9999	
C07	S01	9	1008.5	34.5558	34.5540	-0.0018	34.5543	-0.0015
C07	S01	1	2021	34.636	34.6348	-0.0012	99.9999	
C07	S02	5	503.5	34.5651	34.5635	-0.0016	99.9999	
C07	S02	1	1013.6	34.5534	34.5538	0.0004	34.5536	0.0002
		Bucket			34.1924		99.9999	
C08	S01	5	2020.1	34.6399	34.6380	-0.0019	34.6382	-0.0017
C08	S01	1	3039.6	34.6738	34.6721	-0.0017	99.9999	
C08	S02	5	1008.4	34.5564	34.5579	0.0015	34.5576	0.0012
C08	S02	1	1516.3	34.6054	34.6053	-0.0001	99.9999	
		Bucket			34.2336		99.9999	
C08	S03	9	49.2	34.7674	34.7674	0.0000	99.9999	
C08	S03	1	504.2	34.5291	34.5277	-0.0014	99.9999	
C09	S01	8	1009.2	34.9450	34.9437	-0.0013	99.9999	
C09	S01	7	1009.3	34.9449	34.9439	-0.0010	99.9999	
C09	S01	2	2000.6	34.7896	34.8381	0.0485	99.9999	
C09	S01	1	2000.1	34.7897	34.7907	0.0010	99.9999	
C10	S01	8	1009.0	34.9601	34.9593	-0.0008	99.9999	
C10	S01	7	1009.1	34.9601	34.9595	-0.0006	99.9999	
C10	S01	2	2020.3	34.7933	34.7946	0.0013	99.9999	
C10	S01	1	2020.2	34.7933	34.7940	0.0007	99.9999	

Table 6.3.1-1 Analysis data of all samples. Comparison Autosal and CTD

STNNBR	CASTNO	BTLNBR	CTDPRS DBAR	CTDSAL PSS-78	SALNTY PSS-78	DIFF.SAL SAL-CTD	SALNTY1 PSS-78	DIFF.SAL1 SAL-CTD
C11	S01	8	1008.9	34.9569	34.9577	0.0008	99.9999	
C11	S01	7	1008.0	34.9575	34.9563	-0.0012	99.9999	
C11	S01	2	2023.1	34.7832	34.8253	0.0421	99.9999	
C11	S01	1	2022.5	34.7833	34.7844	0.0011	99.9999	
C12	S01	8	1007.1	34.9290	34.9278	-0.0012	99.9999	
C12	S01	7	1008.1	34.9288	34.9286	-0.0002	99.9999	
C12	S01	2	2022.9	34.7776	34.7777	0.0001	99.9999	
C12	S01	1	2022.3	34.7777	34.7783	0.0006	99.9999	
C13	S01	8	1007.9	34.9192	34.9193	0.0001	99.9999	
C13	S01	7	1008.0	34.9193	34.9191	-0.0002	99.9999	
C13	S01	2	2021.7	34.7751	34.7754	0.0003	99.9999	
C13	S01	1	2020.3	34.7754	34.7762	0.0008	99.9999	
C14	S01	8	1008.1	34.9320	34.9309	-0.0011	99.9999	
C14	S01	7	1007.8	34.9320	34.9301	-0.0019	99.9999	
C14	S01	2	2022.5	34.7712	99.9999		99.9999	
C14	S01	1	2021.2	34.7712	34.7722	0.0010	99.9999	
C14	S02	8	1006.9	34.9303	34.9290	-0.0013	99.9999	
C14	S02	7	1007.9	34.9303	34.9290	-0.0013	99.9999	
C14	S02	2	2022.2	34.7737	34.7740	0.0003	99.9999	
C14	S02	1	2022.3	34.7737	34.7742	0.0005	99.9999	
C15	S01	8	1009.3	34.9191	34.9176	-0.0015	99.9999	
C15	S01	7	1008.7	34.9191	34.9174	-0.0017	99.9999	
C15	S01	2	2021.6	34.7695	34.7705	0.0010	99.9999	
C15	S01	1	2019.8	34.7695	34.7718	0.0023	99.9999	
C16	S01	8	1007.7	34.8475	34.8471	-0.0004	99.9999	
C16	S01	7	1007.5	34.8473	34.8465	-0.0008	99.9999	
C16	S01	2	2023.4	34.7642	34.7653	0.0011	99.9999	
C16	S01	1	2022.2	34.7640	34.7655	0.0015	99.9999	
C17	S01	8	1009.4	34.8265	34.8259	-0.0006	99.9999	
C17	S01	7	1009.0	34.8266	34.8259	-0.0007	99.9999	
C17	S01	2	2020.4	34.7623	99.9999		99.9999	
C17	S01	1	2021.2	34.7625	34.7626	0.0001	99.9999	
C18	S01	8	1008.1	34.7898	34.7899	0.0001	99.9999	
C18	S01	7	1008.0	34.7900	34.7897	-0.0003	99.9999	
C18	S01	2	2021.5	34.7658	34.7665	0.0007	99.9999	
C18	S01	1	2021.7	34.7658	34.7669	0.0011	99.9999	
C19	S01	8	1009.2	34.7999	34.8035	0.0036	99.9999	
C19	S01	7	1010.9	34.7998	34.8015	0.0017	99.9999	
C19	S01	2	2021.9	34.7603	34.7616	0.0013	99.9999	
C19	S01	1	2021.8	34.7602	34.7614	0.0012	99.9999	
C20	S01	8	1007.8	34.8277	99.9999		99.9999	
C20	S01	7	1008.0	34.8276	34.8255	-0.0021	34.8261	-0.0015
C20	S01	2	2022.8	34.7602	34.7608	0.0006	99.9999	
C20	S01	1	2022.2	34.7602	34.7543	-0.0059	99.9999	
C21	S01	8	1008.4	34.7687	34.7689	0.0002	99.9999	
C21	S01	7	1007.7	34.7690	34.7695	0.0005	99.9999	
C21	S01	2	2022.0	34.7581	34.7587	0.0006	99.9999	
C21	S01	1	2022.6	34.7581	34.7596	0.0015	99.9999	
C22	S01	8	1008.1	34.7766	34.7762	-0.0004	99.9999	
C22	S01	7	1007.3	34.7765	34.7756	-0.0009	99.9999	
C22	S01	2	2022.7	34.7594	34.7606	0.0012	99.9999	
C22	S01	1	2022.4	34.7595	34.7600	0.0005	99.9999	

99.9999 : No sample

Bad sample

	Average	Standard deviation
All Data	0.0008	0.0068
Removed Data	-0.0002	0.0017

6.4.1 Continuous monitoring of surface seawater (EPCS)

(1) Personnel
Hideaki HASE (JAMSTEC) Principal Investigator (Leg.1)
Shinya MINATO (JAMSTEC) Principal Investigator (Leg.2)
Keisuke WATAKI (Marine Works Japan Ltd.) (Leg.1)
Masaki MORO (Marine Works Japan Ltd.) (Leg.2)

(2) Objective
Measurement of temperature, salinity, dissolved oxygen and fluorescence in the sea surface water.

(3) Methods
EPCS (Nippon Kaiyo co.,Ltd.) is designed to continuously measure temperature, salinity, dissolved oxygen, fluorescence and particle size of plankton in near-surface seawater. This system is placed in the "*sea surface monitoring laboratory*" of R/V Mirai, and is connected to the shipboard LAN-system. The data is stored every minute in a hard disk with the time and the position of the ship and it is also displayed on the monitor of the PC.

Near-surface seawater is continuously pumped up to the laboratory and flows into the *EPCS* through a vinyl-chloride pipe. Several valves in the system control the flow rate to be 12L/min, however in the fluorometer the flow rate is set to be approximately 0.3L/min. The flow rate is monitored by two flow meters and each of them are checked by marine technicians everyday.

In order to verify the sensitivity of the salinity monitor, approximately 250ml of near-surface seawater was collected once a day from a valve set next to the salinity monitor. The collected water samples were later analyzed by Autosal Guildline 8400B.

Specifications of each of the sensors in this system are listed below.

a) Temperature and salinity sensor

SEACAT THERMOSALINOGRAPH

Model:	SBE-21, SEA-BIRD ELECTRONICS, INC.	
Serial number:	2118859-2641	
Measurement range:	Temperature -5 to +35℃,	Salinity0 to 6.5 S m-1
Accuracy:	Temperature 0.01 ℃ 6month-1,	Salinity0.001 S m-1 month-1
Resolution:	Temperature 0.001℃,	Salinity0.0001 S m-1

b) Bottom of ship thermometer

Model:	SBE 3S, SEA-BIRD ELECTRONICS, INC.
Serial number:	032607
Measurement range:	-5 to +35℃
Resolution:	±0.001℃
Stability:	0.002 ℃ year-1

c) Dissolved oxygen sensor

Model:	2127A, Orbisphere Laboratories Japan INC.
Serial number:	44733
Measurement range:	0 to 14 ppm
Accuracy:	±1% at 5 ℃ of correction range
Stability:	1% month-1

d) Fluorometer

Model:	10-AU-005, TURNER DESIGNS

Serial number: 5562 FRXX
Detection limit: 5 ppt or less for chlorophyll a
Stability: 0.5% month-1 of full scale

e) Particle size sensor
Model: P-05, Nippon Kaiyo LTD.
Serial number: P5024
Measurement range: 0.02681 mmt to 6.666 mm
Accuracy: ±10% of range
Reproducibility: ±5%
Stability: 5% week-1

f) Flow meter
Model: EMARG2W, Aichi Watch Electronics LTD.
Serial number: 8672
Measurement range: 0 to 30 l min-1
Accuracy: ±1%
Stability: ±1% day-1

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

Leg1: From 00:00-8/June/2003 to 08:59-28/June/2003. During this period, the Fluorometer was turned off from 23:44-19/June/2003 to 1:08-20/June/2003 in order to have the flow-cell cleaned.

Leg2: From 05:00-8/July/2003 to 14:00-25/July/2003 and from 13:30-26/July/2003 to 08:00-29/July/2003. During this period, the Fluorometer was turned off from 06:37-18/July/2003 to 8:00-18/July/2003 in order to have the flow-cell cleaned.

(4) Preliminary Result

Figure 6.3-1 to 4 show the time series of the salinity, temperature, dissolved oxygen and fluorescence for Leg.1, respectively. The same contents for Leg.2 are shown in Fig. 6.3-5 to 8 in the same order as in Leg.1.

The correlation between the results of the salinity measured by EPCS and by Autosal for Leg.1 is given in Figure 6.3-9 and is given in Figure 6.3-10 for Leg.2.

(5) Data archive

The data is stored in a magnetic optical disk, which will be submitted to the Data Management Office (DMO) of JAMSTEC and will be opened to public via “ R/V MIRAI Data Web Page ” in the homepage of JAMSTEC.

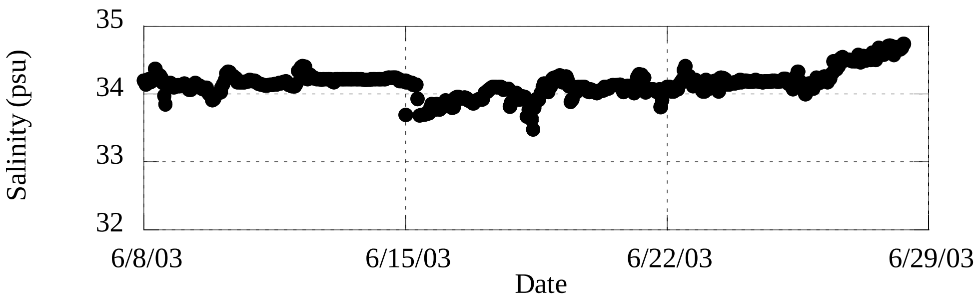


Figure 6.3-1.　Time series of salinity in the sea surface water during Leg.1.

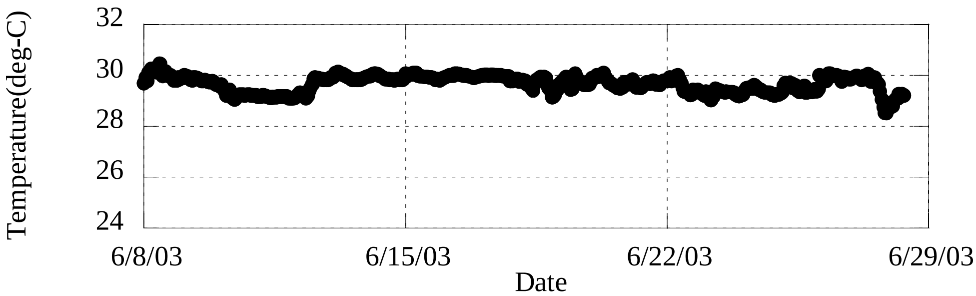


Figure 6.3-2.　Time series of temperature in the sea surface water during Leg.1.

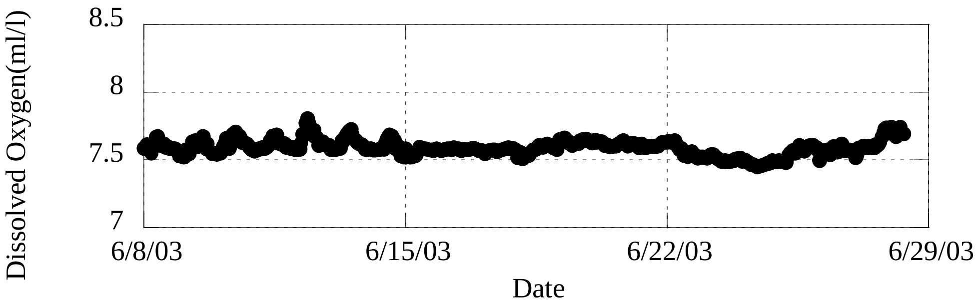


Figure 6.3-3.　Time series of dissolved oxygen in the sea surface water during Leg.1.

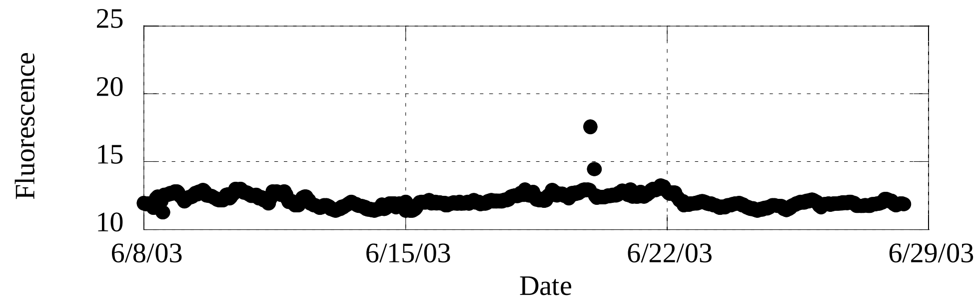


Figure 6.3-4.　Time series of fluorescence in the sea surface water during Leg.1.

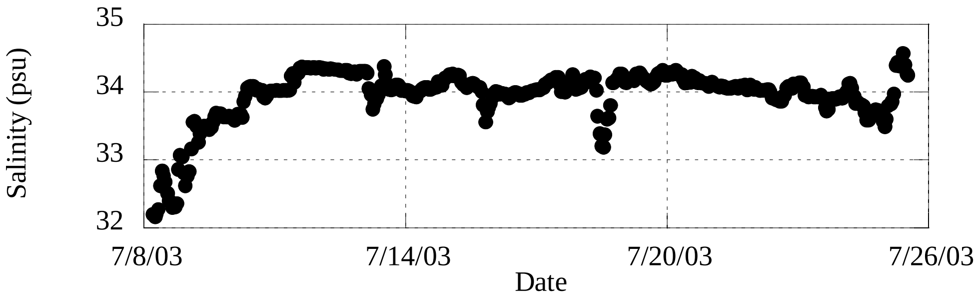


Figure 6.3-5. Time series of salinity in the sea surface water during Leg.2.

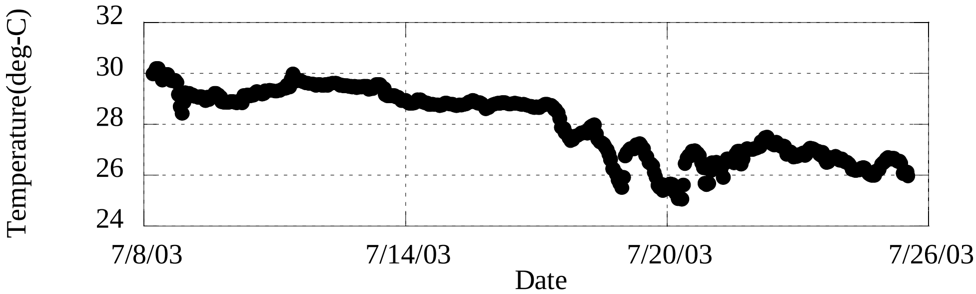


Figure 6.3-6. Time series of temperature in the sea surface water during Leg.2.

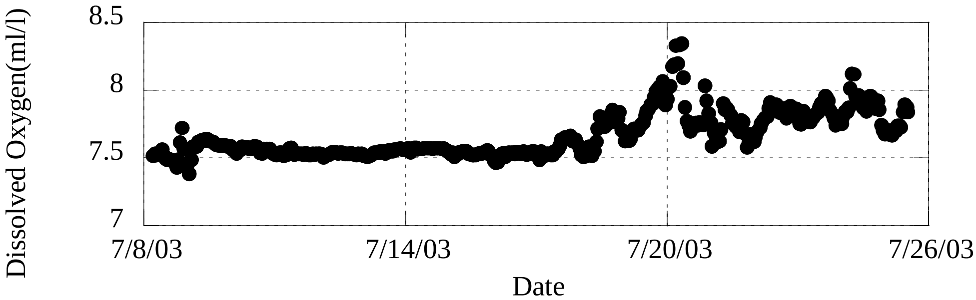


Figure 6.3-7. Time series of dissolved oxygen in the sea surface water during Leg.2.

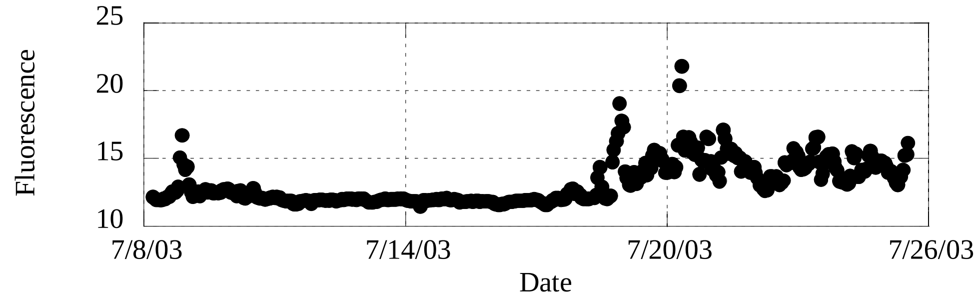


Figure 6.3-8. Time series of fluorescence in the sea surface water during Leg2.

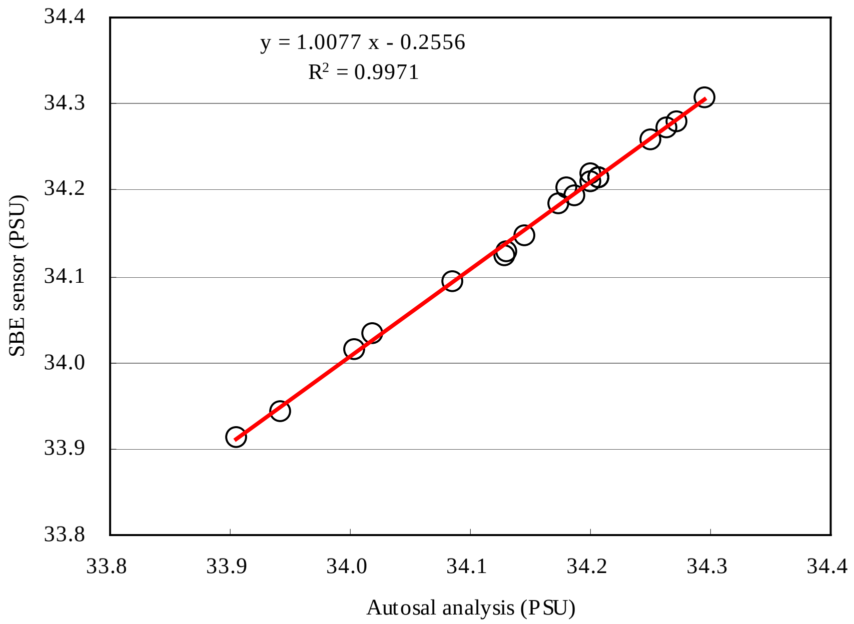


Figure 6.3-9. The correlation between the results of the salinity measured by EPCS and by Autosal during Leg.1.

6.5 Shipboard ADCP

Hideaki Hase	(JAMSTEC): Principal Investigator
Satoshi Okumura	(GODI)
Wataru Tokunaga	(GODI)
Norio Nagahama	(GODI)
Katsuhisa Maeno	(GODI)
Ryo Kimura	(GODI)

(1) Parameters

Current velocity of each depth cell [cm/s]
Echo intensity of each depth cell [dB]

(2) Methods

Upper ocean current measurements were made throughout MR03-K03 Leg1 cruise from Guam, USA on 7 June 2003 to Brisbane, Australia on 30 July 2003 using the hull-mounted Acoustic Doppler Current Profiler (ADCP) system that is permanently installed on the R/V MIRAI. The system consists of following components;

1) a 75 kHz Broadband (coded-pulse) profiler with 4-beam Doppler sonar operating at 76.8 kHz (VM-75; RD Instruments, USA), mounted with beams pointing 30 degrees from the vertical and 45 degrees azimuth from the keel;
2) the Ship's main gyro compass (TG-6000; Tokimec, Japan), continuously providing ship's heading measurements to the ADCP;
3) a GPS navigation receiver (Leica MX9400) providing position fixes;
4) an IBM-compatible personal computer running data acquisition software (VmDas version 1.3 ; RD Instruments, USA).

The ADCP was configured for 16-m processing bin, a 8-m blanking interval. The sound speed is calculated from temperature at the transducer head. The transducer depth was 6.5 m; 40 velocity measurements were made at 16-m intervals starting 31 m below the surface. Every ping was recorded as raw ensemble data (.ENR). Also, 60 seconds and 300 seconds averaged data were recorded as short-term average (.STA) and long-term average (.LTA) data, respectively. Major parameters for the measurement (Direct Command) are as follows:

VM-ADCP Configuration

Bottom-Track Commands

BP = 000 ----------------- Pings per Ensemble (July 25 to 30 BP=001)

Environmental Sensor Commands

EA = +00000 -------------- Heading Alignment (1/100 deg)
EB = +00000 -------------- Heading Bias (1/100 deg)
ED = 00065 --------------- Transducer Depth (0 - 65535 dm)
EF = +0001 --------------- Pitch/Roll Divisor/Multiplier (pos/neg) [1/99 - 99]
EH = 00000 --------------- Heading (1/100 deg)
ES = 35 ------------------ Salinity (0-40 pp thousand)
EX = 00000 --------------- Coord Transform (Xform:Type; Tilts; 3Bm; Map)

EZ = 1020001 ------------- Sensor Source (C;D;H;P;R;S;T)

Timing Commands

TE = 00:00:02.00 --------- Time per Ensemble (hrs:min:sec.sec/100)
TP = 00:02.00 ------------ Time per Ping (min:sec.sec/100)

Water-Track Commands

WA = 255 ----------------- False Target Threshold (Max) (0-255 counts)
WB = 1 ------------------- Mode 1 Bandwidth Control (0=Wid,1=Med,2=Nar)
WC = 064 ----------------- Low Correlation Threshold (0-255)
WD = 111 111 111 --------- Data Out (V;C;A PG;St;Vsum Vsum^2;#G;P0)
WE = 5000 ---------------- Error Velocity Threshold (0-5000 mm/s)
WF = 0800 ---------------- Blank After Transmit (cm)
WG = 001 ----------------- Percent Good Minimum (0-100%)
WI = 0 ------------------- Clip Data Past Bottom (0=OFF,1=ON)
WJ = 1 ------------------- Rcvr Gain Select (0=Low,1=High)
WM = 1 ------------------- Profiling Mode (1-8)
WN = 040 ----------------- Number of depth cells (1-128)
WP = 00001 --------------- Pings per Ensemble (0-16384)
WS = 1600 ---------------- Depth Cell Size (cm)
WT = 0000 ---------------- Transmit Length (cm) [0 = Bin Length]
WV = 999 ----------------- Mode 1 Ambiguity Velocity (cm/s radial)

(4) Preliminary result

Fig. 6.5-1 show 1-hourly averaged current vectors along cruise track. The data was processed using CODAS (Common Oceanographic Data Access System), developed at the University of Hawaii.

(5) Data archive

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

(6) Remarks

We did not collect data around Guam Island, territorial waters of USA, Torres straight, territorial waters of Australia, and South China Sea.

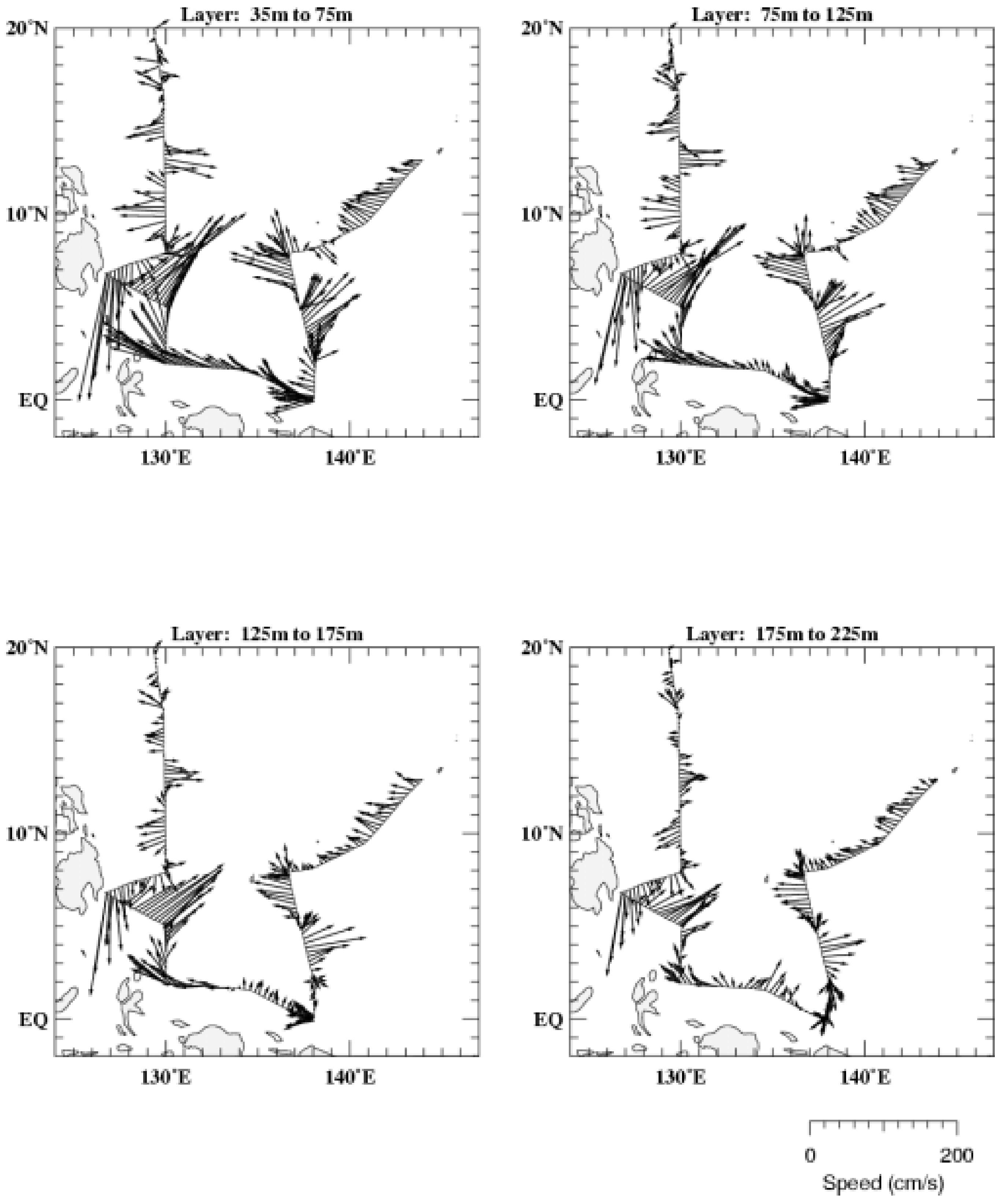
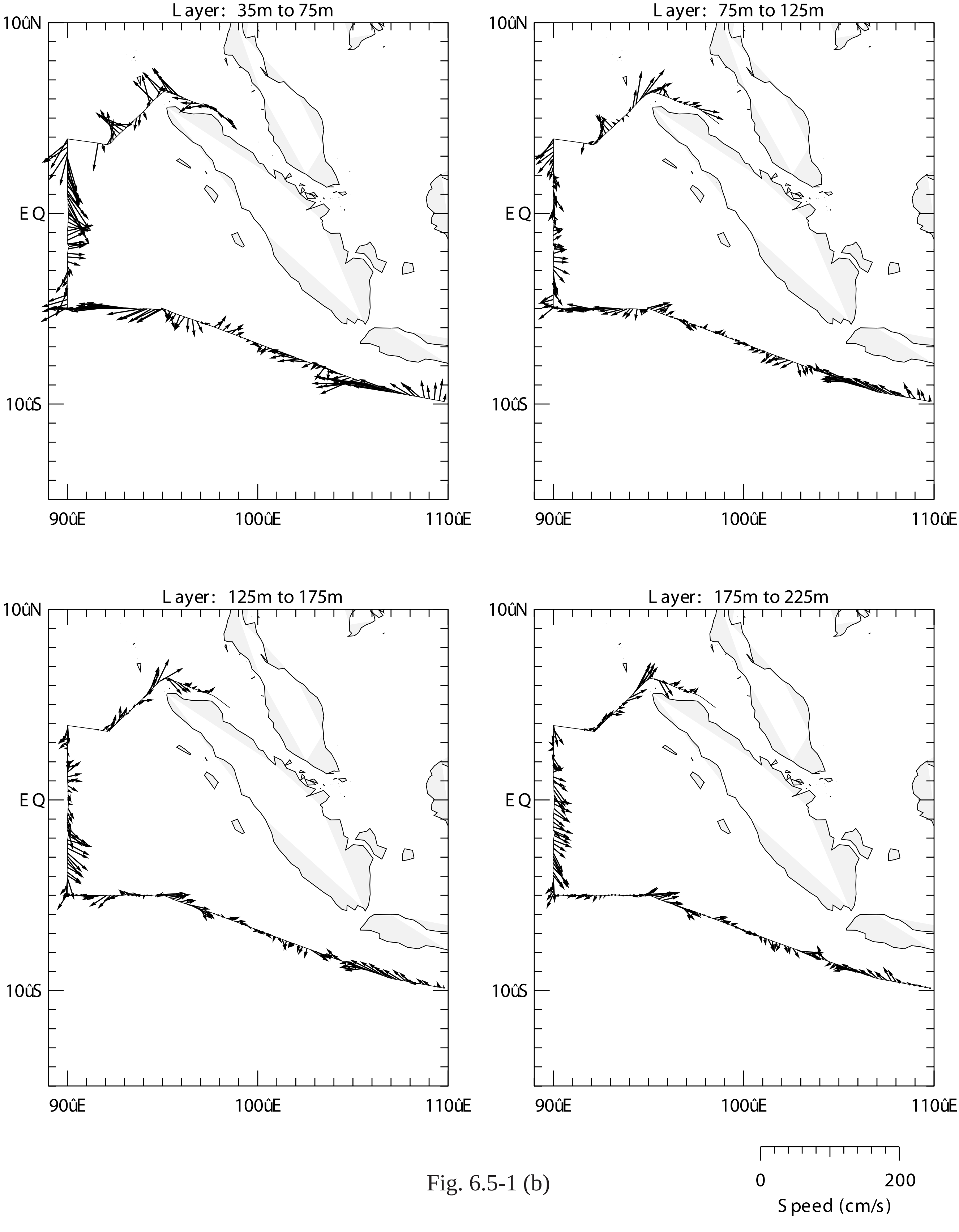
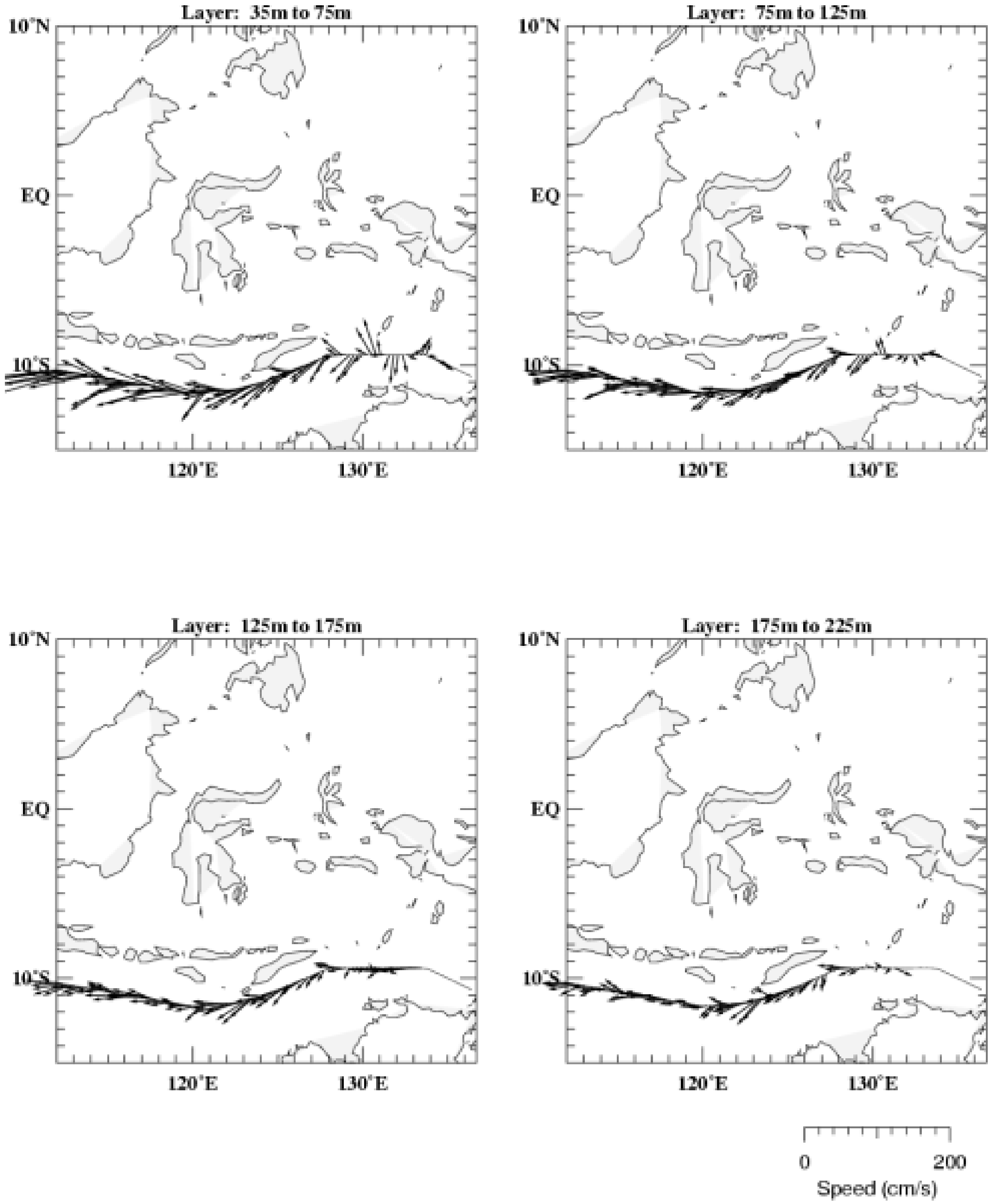

Layer: 35m to 75m
Layer: 75m to 125m
Layer: 125m to 175m
Layer: 175m to 225m
20°N
10°N
EQ
130°E
140°E
0
200
Speed (cm/s)

Fig. 6.5-1 (a)



Layer: 35m to 75m
Layer: 75m to 125m
Layer: 125m to 175m
Layer: 175m to 225m
10ûN
EQ
10ûS
90ûE
100ûE
110ûE
0
200
Speed (cm/s)

Fig. 6.5-1 (b)



Layer: 35m to 75m
Layer: 75m to 125m
Layer: 125m to 175m
Layer: 175m to 225m
10°N
EQ
10°S
120°E
130°E
0
200
Speed (cm/s)

Fig. 6.5-1 (c)

6.6 Underway geophysics
6.6.1 Sea Surface Gravity

Satoshi Okumura	(Global Ocean Development Inc.)	- Leg2 -
Wataru Tokunaga	(GODI)	- Leg1 -
Norio Nagahama	(GODI)	- Leg1, 2 -
Katsuhisa Maeno	(GODI)	- Leg1 -
Ryo Kimura	(GODI)	- Leg2 -
Not on-board:		
Toshiya Fujiwara	(JAMSTEC): Principal investigator	

(1) Introduction

The difference of local gravity is an important parameter in geophysics and geodesy. We collected gravity data at the sea surface during the MR03-K03 cruise from Guam, USA on 7 June 2003 to Brisbane, Australia on 30 July 2003.

(2) Parameters

Relative Gravity [mGal]

(3) Data Acquisition

We have measured relative gravity using LaCoste and Romberg air-sea gravity meter S-116 (LaCosat and Romberg Gravity Meters, Inc.) during this cruise. To convert the relative gravity to absolute one, we measured gravity, using portable gravity meter (Scintrex gravity meter CG-3M), at Sekinehama Port, Yokohama Port and Nakagusuku Port as reference points.

(4) Preliminary Results

Absolute gravity shown in Tabel 6.6.1-1

(5) Data Archives

Gravity data obtained during this cruise will be submitted to the JAMSTEC Data Management Division, and archived there.

(6) Remarks

We did not sample the data within foreign EEZ in South China Sea, around Guam Island, territorial waters of USA, Torres straight, territorial waters of Australia.

Table 6.6.1-1

No.	Date	U.T.C.	Port	Absolute Gravity [mGal]	Sea Level [cm]	Draft [cm]	Gravity at Sensor *[1] [mGal]	L&R *[2] Gravity [mGal]
#01	May/18	01:04	Sekinehama	980371.85	354	625	980372.98	12666.6
$\#02_A$	May/20	02:42	Yokohama	979741.25	318	630	979742.27	12036.6
$\#02_B$	May/20	06:21	Yokohama	979741.25	321	665	979742.30	12036.7
#03	June/7	02:37	Guam	-----	232	645	-----	10815.2
#04	June/30	04:12	Nakagusuku	979114.12	380	621	979115.33	11409.9
#05	July/31	22:53	Brisbane	979150.70	404	660	979152.00	11447.7

*[1]: Gravity at Sensor = Absolute Gravity + Sea Level*0.3086/100 + (Draft-530)/100*0.0431
*[2]: LaCoste and Romberg air-sea gravity meter S-116

Period : May/20 06:21 – June/30 04:12

Differential	G at sensor	L&R value
No.4 - $No.2_B$	-626.97 mGal ---(a)	-626.8 mGal ---(b)
L&R drift value (b)-(a)	0.17 mGal	40.91 days
Daily drift ratio	**0.004 mGal/day**	

Period : June/30 04:12 – July 31 22:53

Differential	G at sensor	L&R value
No.5 - No.4	36.65 mGal ---(a)	37.88 mGal ---(b)
L&R drift value (b)-(a)	1.23 mGal	37.78 days
Daily drift ratio	**0.0389 mGal/day**	

6.6.2 Sea Surface Three-Component Magnetic Field

Satoshi Okumura	(Global Ocean Development Inc.)	- leg2 -
Wataru Tokunaga	(GODI)	- leg1 -
Norio Nagahama	(GODI)	- leg1,2 -
Katsuhisa Maeno	(GODI)	- leg1 -
Ryo Kimura	(GODI)	- leg2 -
Not on-board:		
Toshiya Fujiwara	(JAMSTEC): Principal investigator	

(1) Introduction

Measurements of magnetic force on the sea is required for the geophysical investigations of marine magnetic anomaly caused by magnetization in upper crustal structure. We measured geomagnetic field using a three-component magnetometer during the MR03-K03 cruise from Guam, USA on 7 June 2003 to Brisbane, Australia on 30 July 2003.

(2) Parameters

Three-component magnetic force [nT]
Ship's attitude [1/100 deg]

(3) Method Data Acquisition

A sensor of three-component fluxgate magnetmeter is set on the top of foremast. Sampling is controlled by 1pps (pulse per second) standard clock of GPS signals. Every one-second record is composed of navigation information, 8 Hz three-component of magnetic force, and VRU (Vertical Reference Unit) data.

For calibration of the ship's magnetic effect, we made a running like a "Figure of 8" (a pair of clockwise and anti-clockwise rotation). This calibration carried out 16 June 2003, 08:57 to 09:17 about at 00-05S, 137-50E.

(4) Preliminary Results

The results will be published after primary processing.

(5) Data Archives

Magnetic force data obtained during this cruise will be submitted to the JAMSTEC Data Management Division, and archived there.

(6) Remarks

We did not sample the data within foreign EEZ in South China Sea, around Guam Island, territorial waters of USA and Torres straight, territorial waters of Australia.

6.6.3 Swath Bathymetry

Satoshi Okumura	(Global Ocean Development Inc.)	- Leg2 -
Wataru Tokunaga	(GODI)	- Leg1 -
Norio Nagahama	(GODI)	- Leg1, 2 -
Katsuhisa Maeno	(GODI)	- Leg1 -
Ryo Kimura	(GODI)	- Leg2 -
Not on-board:		
Toshiya Fujiwara	(JAMSTEC): Principal investigator	

(1) Introduction

R/V MIRAI equipped a Multi Narrow Beam Echo Sounding system (MNBES), SEABEAM 2112.004 (SeaBeam Instruments Inc.) The main objective of MNBES survey is collecting continuous bathymetry data along ship's track to make a contribution to geological and geophysical investigations and global datasets. We had carried out bathymetric survey during the MR03-K03 cruise from Guam, USA on 7 June 2003 to Brisbane, Australia on 30 July 2003.

In addition, we surveyed estimate developing position depth of TRITON buoy, and we measured depth of fixed TRITON buoy anchor position at TRITON buoy deployment sites.

(2) Data Acquisition

The "SEABEAM 2100" on R/V MIRAI was used for bathymetry mapping during the this cruise. To get accurate sound velocity of water column for ray-path correction of acoustic multibeam, we used Surface Sound Velocimeter (SSV) data at the surface (6.2m) sound velocity, and the others depth sound velocity calculated temperature and salinity profiles from CTD and XCTD data by the equation in Mackenzie (1981) during the cruise.

System configuration and performance of SEABEAM 2112.004,

Frequency:	12 kHz
Transmit beam width:	2 degree
Transmit power:	20 kW
Transmit pulse length:	3 to 20 msec.
Depth range:	100 to 11,000 m
Beam spacing:	1 degree athwart ship
Swath width:	150 degree (max)
	120 degree to 4,500 m
	100 degree to 6,000 m
	90 degree to 11,000 m
Depth accuracy:	Within < 0.5% of depth or +/-1m, whichever is greater, over the entire swath.
	(Nadir beam has greater accuracy; typically within < 0.2% of depth or +/-1m, whichever is greater)

(3) Preliminary Results

The results will be published after primary processing.

(4) Data Archives

Data obtained during this cruise will be submitted to the JAMSTEC Data Management Division, and archived there.

(5) Remarks

We did not collect data within foreign EEZ in South China Sea, around Guam Island, territorial waters of USA and Torres straight, territorial waters of Australia. We also stopped pinging in the shallow sea area.

We could not collect data from 0122UTC to 0257UTC 12 June and from 0035UTC to 0346UTC 25 June, due to the logging work station trouble.

6.7 Satellite image acquisition
6.7.1 Ocean color

(1) Personnel

Ichio Asanuma	JAMSTEC	Principal investigator, not onboard
Wataru Tokunaga	GODI	leg.1
Katsuhisa Maeno	GODI	leg.1
Norio Nagahama	GODI	leg.1 and leg.2
Satoshi Okumura	GODI	leg.2
Ryo Kimura	GODI	leg.2

(2) Objective

It is our objectives to collect the data of chlorophyll-a distribution in a high spatial resolution from Sea Wide Field of View Sensor (Sea WiFS) on the OrbView-2 polar orbit satellite and to build a time and depth resolved primary productivity model.

(3) Method

We receive the down link High Resolution Picture Transmission (HRPT) signal from OrbView-2 by receiving station on the R/V Mirai. Our receiving station is the TeraScan receiving system, which has 1.2m antenna in the redome, the down converter, the bit synchronizer, the frame synchronizer, and the workstation to control antenna and to process the data. An encrypted Sea WiFS data were decrypted by the decryption key assigned by the Goddard Space Flight Center (GSFC) of National Aero Space Agency (NASA). The level-1a data were generated on the R/V Mirai.

(4) Data

We received and processed the Sea WiFS data from Guam on June 7 through Brisbane on July 30, 2003. The chlorophyll-a distribution data will be applied for the time and depth resolved primary productivity model to determine a standing stock of phytoplankton a function of chlorophyll-a.

(5) Data archives

The raw data will be submitted to JAMSTEC Data Management Division, and will be under their control based on the agreement between NASA and JAMSTEC in 1993.

6.7.2 NOAA HRPT (Sea surface temperature and IR)

(1) Personnel

Ichio Asanuma	JAMSTEC	Principal investigator, not onboard
Wataru Tokunaga	GODI	leg.1
Katsuhisa Maeno	GODI	leg.1
Norio Nagahama	GODI	leg.1 and leg.2
Satoshi Okumura	GODI	leg.2
Ryo Kimura	GODI	leg.2

(2) Objective

It is our objectives to collect the data of sea surface temperature distribution in a high spatial resolution from Advance Very High Resolution Radiometer (AVHRR) on the NOAA polar orbit satellite and to build a time and depth resolved primary productivity model.

(3) Method

We receive the down link High Resolution Picture Transmission (HRPT) signal from NOAA satellite by receiving station on the R/V Mirai. We processed the HRPT signal with the inflight calibration and computed the sea surface temperature by the multi-channel sea surface temperature (MCSST) method. A daily composite map of MCSST data are processed for each day. A raw data on the pass disk for each pass are also processed into the local area coverage (LAC) formatted data.

(4) Data

We received and processed the NOAA data from Guam on June 7 through Brisbane on July 30, 2003. The sea surface temperature distribution data will be applied for the time and depth resolved primary productivity model to determine a temperature field for the model.

(5) Data archives

The raw data will be submitted to JAMSTEC Data Management Division, and will be under their control.

7 Special Observation

7.1 TRITON moorings

7.1.1 TRITON Mooring Operation

(1) Personnel

Hideaki Hase	(JAMSTEC): Principal Investigator (on board Leg1,2)
Koichi Takao	(MWJ): Technical staff (on board Leg1)
Masayuki Fujisaki	(MWJ): Operation leader (on board Leg1)
Masaki Taguchi	(MWJ): Technical staff (on board Leg2)
Takeo Matsumoto	(MWJ): Operation leader (on board Leg2)
Hiroshi Mastunaga	(MWJ): Technical staff (on board Leg1)
Kentaro Shiraishi	(MWJ): Technical staff (on board Leg1)
Kei Suminaga	(MWJ): Technical staff (on board Leg2)
Masaki Furuhata	(MWJ): Technical staff (on board Leg1)
Masato Muranaka	(MWJ): Technical staff (on board Leg1)
Mizue Hirano	(MWJ): Technical staff (on board Leg2)
Kenichi Katayama	(MWJ): Technical staff (on board Leg1)
Tomoyuki Takamori	(MWJ): Technical staff (on board Leg2)
Fuma Matsunaga	(MWJ): Technical staff (on board Leg1,2)
Keisuke Wataki	(MWJ): Technical staff (on board Leg1)
Masaki Moro	(MWJ): Technical staff (on board Leg2)
Yu Naito	(MWJ): Technical staff (on board Leg1,2)
Tomoyuki Marui	(MWJ): Technical staff (on board Leg1,2)
Toru Nishihashi	(MWJ): Technical staff (on board Leg1,2)
Mari Sakai	(MWJ): Technical staff (on board Leg1,2)
Tadashi Takiyama	(MWJ): Technical staff (on board Leg1,2)
Keisuke Matsumoto	(MWJ): Technical staff (on board Leg1,2)

(2) Objectives

The large-scale 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 of the warm pool and the air-sea interaction over the warm pool have not been well understood. Long term data sets of temperature, salinity, currents, so on have been required at fixed locations. In particular, the oceanic change due to the surface winds over the western tropical Pacific is important to study the relation with 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 buoy array is 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 eight TRITON buoys have been successfully recovered during this R/V Mirai cruise (MR03-K03-leg1,2), deployed seven TRITON buoys.

(3) Measured parameters

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

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

(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 Deployment

Nominal location	8N, 137E
ID number at JAMSTEC	10003
Number on surface float	T02
ARGOS PTT number	11824
ARGOS backup PTT number	11592
Deployed date	09 Jun. 2003
Exact location	07 - 52.14N, 136 - 29.44E
Depth	3350 m

Nominal location	5N, 137E
ID number at JAMSTEC	11003
Number on surface float	T03
ARGOS PTT number	11825
ARGOS backup PTT number	11593
Deployed date	11 Jun. 2003
Exact location	04 - 56.58N, 137 - 18.07E
Depth	4039 m

Option sensors	Precipitation sensor (capacitive type) at Tower
	CTD at 175 m : S/N 0493

Nominal location	2N, 138E
ID number at JAMSTEC	12005
Number on surface float	T14
ARGOS PTT number	07962
ARGOS backup PTT number	07860
Deployed date	13 Jun. 2003
Exact location	02 - 04.00N, 138 - 03.85E
Depth	4228 m
Option sensors	Precipitation sensor (capacitive type) at Tower
	CTD at 175 m : S/N 0500

Nominal location	EQ, 138E
ID number at JAMSTEC	13005
Number on surface float	T15
ARGOS PTT number	none
ARGOS backup PTT number	7861, 7864
Deployed date	16 Jun. 2003
Exact location	00 - 04.27N, 138 - 02.80E
Depth	4107 m
Option sensors	CTD at 175 m : S/N 0610

Nominal location	2N, 130E
ID number at JAMSTEC	16003
Number on surface float	T17
ARGOS PTT number	03595
ARGOS backup PTT number	07878
Deployed date	20 Jun. 2003
Exact location	01 - 56.48N, 129 - 55.85E
Depth	4319 m
Option sensors	CTD at 175 m : S/N 0615

Nominal location	8N, 130E
ID number at JAMSTEC	14002
Number on surface float	T16
ARGOS PTT number	09771
ARGOS backup PTT number	07871
Deployed date	24 Jun. 2003
Exact location	07 - 55.53N, 130 - 03.94E
Depth	5512 m

Nominal location	1.5S, 90E
ID number at JAMSTEC	18003
Number on surface float	T19
ARGOS PTT number	11827

ARGOS backup PTT number	24238
Deployed date	12 Jun. 2003
Exact location	S, 146 ‐ E
Depth	4694m

(2) TRITON recovered

Nominal location	8N, 137E
ID number at JAMSTEC	10002
Number on surface float	T13
ARGOS PTT number	20275
ARGOS backup PTT number	24229
Deployed date	01 Jul. 2002
Recovered date	09 Jun. 2003
Exact location	07 ‐ 39.23N, 136 ‐ 42.52E
Depth	3075 m

Nominal location	5N, 137E
ID number at JAMSTEC	11002
Number on surface float	T21
ARGOS PTT number	20417
ARGOS backup PTT number	24230
Deployed date	03 Jul. 2002
Recovered date	12 Jun 2003
Exact location	04 ‐ 53.26N, 137 ‐ 19.96E
Depth	3999 m
Option sensors	Precipitation sensor (capacitive type) at Tower : S/N01089 CT at 175 m : S/N 0512

Nominal location	2N, 138E
ID number at JAMSTEC	12004
Number on surface float	T22
ARGOS PTT number	20374
ARGOS backup PTT number	24231
Deployed date	05 Jul. 2002
Recovered date	14 Jun. 2003
Exact location	02 ‐ 01.09N, 138 ‐ 05.17E
Depth	4223 m
Option sensors	Precipitation sensor (capacitive type) at Tower : S/N01085 CT at 175 m : S/N 0523

Nominal location	EQ, 138E
ID number at JAMSTEC	13004
Number on surface float	T23
ARGOS PTT number	none
ARGOS backup PTT number	24232, 24233
Deployed date	07 Jul. 2002
Recovered date	17 Jun. 2003

Exact location	00 - 04.05N, 137 - 47.72 E
Depth	4271 m
Option sensors	CT at 175 m : S/N 0558

Nominal location	8N, 130E
ID number at JAMSTEC	14001
Number on surface float	T24
ARGOS PTT number	20384
ARGOS backup PTT number	24235
Deployed date	13 Aug. 2002
Recovered date	25 Jun. 2003
Exact location	08 - 02.85 N, 129 - 58.11 E
Depth	5685 m

Nominal location	5N, 130E
ID number at JAMSTEC	15001
Number on surface float	T25
ARGOS PTT number	20439
ARGOS backup PTT number	24236
Deployed date	13 Jul. 2002
Recovered date	22 Jun. 2003
Exact location	05 - 06.46N, 130 - 02.85 E
Depth	4992 m

Nominal location	2N, 130E
ID number at JAMSTEC	16002
Number on surface float	T26
ARGOS PTT number	20458
ARGOS backup PTT number	24237
Deployed date	11 Jul. 2002
Recovered date	21 Jun. 2003
Exact location	02 - 06.45N, 129 - 57.27 E
Depth	4229 m
Option sensors	CT at 175 m : S/N 0579

Nominal location	1.5S, 90E
ID number at JAMSTEC	18002
Number on surface float	T28
ARGOS PTT number	20380
ARGOS backup PTT number	24240
Deployed date	30 Jul 2002
Recovered date	13 Jul 2003
Exact location	01 - 39.01S, 090 - 06.97 E
Depth	4628m

*: Dates are UTC and represent anchor drop times for deployments and release time for recoveries, respectively.

(6) Details of deployed

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

Deployed and Repaired TRITON buoys

Observation No.	Location.	Details.
10003	8N 137E	Deploy with full spec.
11003	5N 137E	Deploy with full spec and one optional precipitation sensor and optional CTD sensor.
12005	2N 138E	Deploy with full spec with one optional CTD sensors.
13005	EQ 138E	Deploy with only underwater sensors and one optional CTD sensor. No data transmission system.
16003	2N 130E	Deploy with only under water sensors and one optional CTD sensor.
14002	8N 130E	Deploy with only underwater sensors.
18003	1.5S 90E	Deploy with full spec.

(7) Data archive

Hourly averaged data transmitted are 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 Institute.

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

7.1.2 Intercomparison between shipboard CTD and TRITON data

(1) Personnel

Hideaki Hase (JAMSTEC): Principal investigator (on board Leg1,2)
Takeo Matsumoto (MWJ): Operation leader (on board Leg 2)
Fuma Matsunaga (MWJ): Technical staff (on board Leg 1,2)

(2) Objectives

TRITON CTD data validation.

(3) Measured parameters

・Temperature
・Conductivity
・Pressure

(4) Methods

TRITON buoy underwater sensors are equipped along wire cable of buoy below sea surface. We used the same CTD (SBE 9/11Plus) system with general CTD observation (See section 6.2.1) on R/V MIRAI for this inter-comparison. We conducted CTD and XCTD cast (following below table.).

MR03-K03 Leg No.	Deployment site	Recovery site
Leg1	XCTD	CTD
Leg2	CTD	CTD

These CTD cast at the TRITON buoy deployment site was performed after the deployment. At the TRITON buoy recovery site, it was performed before the recovery cast. As for the XCTD cast, we conducted during the deployment. R/V MIRAI was kept the distance from the TRITON buoy within 1 nm.

TRITON buoy data was sampled every 1 hour except for transmission to the ship. We compared CTD observation by R/V MIRAI data with TRITON buoy data using the 1 hour averaged value.

As our temperature sensors are expected to be more stable than conductivity sensors, conductivity data and salinity data are selected at the same value of temperature data. Then, we calculated difference of salinity and conductivity between CTD casting and TRITON buoy for each deployment and recovery.

(5) Results

Most of temperature, conductivity and salinity data from TRITON buoy showed good agreement with CTD cast data (See the Figures 7.1.2-1(a), (b)), but is showed agreement or not with XCTD cast data (See the Figures 7.1.2-1(a)).
To evaluate the performance of the conductivity sensors on TRITON buoy, the data from deployed buoy and shipboard CTD and XCTD data at the same location were analyzed.

The estimation was calculated as deployed buoy data minus shipboard CTD data and XCTD data. The salinity differences are from –0.132 to 0.343 psu for all depths. Below 300 db, salinity differences are from –0.015 to 0.004 psu (from CTD data), −0.132 to 0.049 psu (from XCTD data) (See the Figures 7.1.2-2(a) and Table 7.1.2-1(a),(b)). The average of salinity differences was 0.022 psu with standard deviation of 0.058.

The estimation was calculated as recovered buoy data minus shipboard CTD (9Plus) data. The salinity differences are from –0.164 to 0.134 psu for all depths. Below 300 db, salinity differences are from –0.017 to 0.008 psu (See the Figures 7.1.2-2(b) and Table 7.1.2-1(b)). The average of salinity differences was –0.001 psu with standard deviation of 0.046 psu.

(6) Data archive

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

Table 7.1.2.-1(a) Data differences between TRITON buoys data and ship board CTD data after deployment

Observation No.	Pressure (db)	Temperature (degC)	Conductivety (S/m)	Salinity (psu)
01006	1.5	0.15	0.002	-0.087
01006	25.0	0.01	0.012	0.071
01006	50.0	0.00	-0.014	-0.100
01006	75.0	0.00	0.001	0.002
01006	100.0	0.01	0.001	-0.002
01006	125.0	0.02	0.011	0.068
01006	150.0	0.11	0.014	0.035
01006	200.0	0.02	0.003	0.007
01006	250.0	-0.01	-0.002	-0.015
01006	300.4	0.00	-0.001	-0.015
01006	500.0	-0.01	-0.003	-0.014
01006	747.5	0.01	0.000	-0.008
18003	1.5	0.00	-0.002	-0.012
18003	25.0	0.00	-0.006	-0.039
18003	50.0	-0.01	-0.010	-0.058
18003	75.0	-0.01	0.002	0.020
18003	100.0	-0.08	-0.008	0.004
18003	125.0	0.00	0.003	0.025
18003	150.0	0.00	-0.001	-0.007
18003	200.0	0.00	0.000	-0.005
18003	250.0	-0.01	-0.001	-0.001
18003	300.0	0.00	-0.001	-0.011
18003	500.0	0.00	0.000	-0.002
18003	745.7	0.00	0.000	0.004
10003	25.0	0.00	0.008	0.029
10003	50.0	0.00	0.006	0.017
10003	75.0	0.01	0.006	0.017
10003	100.0	0.02	0.015	0.072
10003	125.0	0.22	0.039	0.095
10003	150.0	0.00	0.007	0.041
10003	200.0	0.02	0.010	0.046
10003	250.0	0.00	0.005	0.034
10003	299.5	0.00	0.004	0.020
10003	500.0	0.05	0.010	0.031
10003	744.9	0.00	0.002	0.019
11003	25.0	0.00	0.010	0.037
11003	50.0	0.00	0.009	0.030
11003	75.0	-0.01	0.006	0.037
11003	100.0	-0.05	0.005	0.036
11003	125.0	0.00	0.004	0.013
11003	150.0	-0.01	0.006	0.034
11003	200.0	0.00	-0.098	-0.993
11003	250.0	0.00	0.003	0.001
11003	298.2	0.00	0.002	-0.001
11003	500.0	-0.01	0.001	0.006
11003	738.2	0.00	0.001	0.002

12005	25.0	0.00	0.006	0.022
12005	50.0	0.00	0.005	0.015
12005	75.0	0.00	0.006	0.022
12005	100.0	-0.04	0.009	0.074
12005	125.0	-0.01	0.007	0.032
12005	150.0	-0.01	0.006	0.029
12005	200.0	0.14	0.031	0.076
12005	250.0	0.00	0.006	0.050
12005	299.8	0.00	0.008	0.049
12005	500.0	-0.01	0.004	0.040
12005	744.0	0.01	0.006	0.040
14002	1.5	-0.01	0.012	0.343
14002	25.0	0.00	0.004	0.004
14002	50.0	0.19	0.056	0.122
14002	75.0	0.03	0.008	0.024
14002	100.0	-0.11	-0.002	0.045
14002	125.0	0.01	0.007	0.028
14002	150.0	-0.01	0.002	0.012
14002	200.0	0.00	0.002	-0.010
14002	250.0	0.01	0.002	0.006
14002	299.4	0.00	0.002	0.004
14002	500.0	0.00	0.001	-0.001
14002	743.8	0.00	0.001	-0.009
16003	25.0	0.00	0.008	0.033
16003	50.0	-0.01	0.009	0.046
16003	75.0	0.02	0.012	0.052
16003	100.0	-0.09	-0.001	0.046
16003	125.0	-0.02	0.030	0.215
16003	150.0	-0.13	-0.006	0.041
16003	200.0	0.00	-0.004	-0.053
16003	250.0	0.00	0.006	0.026
16003	296.7	0.00	-0.012	-0.132
16003	500.0	0.02	0.002	-0.014
16003	723.3	0.05	0.006	0.015

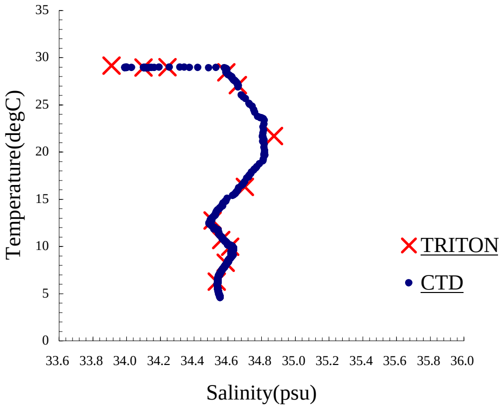
Bad data

Table 7.1.2.-1(b) Data differences between TRITON buoys data and ship board CTD data before recovery

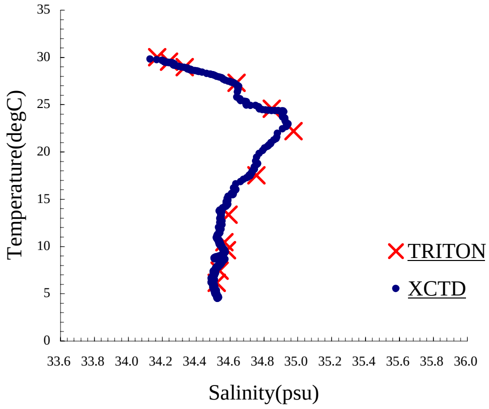
Observation No.	Pressure (db)	Temperature (degC)	Conductivety (S/m)	Salinity (psu)
01005	25.0	-0.02	0.005	0.050
01005	50.0	0.00	-0.003	-0.020
01005	75.0	-0.02	0.003	0.032
01005	100.0	0.01	0.003	0.017
01005	125.0	-0.11	-0.007	0.039
01005	150.0	0.06	0.012	0.054
01005	200.0	-0.02	0.000	0.018
01005	250.0	0.02	-0.001	-0.017
01005	300.3	-0.04	-0.006	-0.017
01005	500.0	0.00	0.000	0.002
01005	750.7	-0.05	-0.005	0.002
10002	1.5	0.07	0.005	-0.016
10002	25.0	0.00	0.004	0.026
10002	50.0	-0.02	-0.002	-0.006
10002	75.0	-0.01	0.004	0.034
10002	100.0	-0.01	0.002	0.021
10002	125.0	0.03	0.020	0.134
10002	150.0	-0.12	-0.006	0.048
10002	200.0	-0.05	-0.004	0.001
10002	250.0	0.01	0.003	0.017
10002	299.8	-0.02	-0.001	-0.001
10002	500.0	0.01	0.000	-0.007
10002	750.3	0.01	0.001	-0.004
11002	1.5	-0.01	-0.002	0.003
11002	25.0	-0.01	-0.015	-0.093
11002	50.0	-0.01	-0.017	-0.105
11002	75.0	-0.19	-0.022	-0.018
11002	100.0	-0.04	-0.006	-0.021
11002	125.0	-0.01	0.011	0.098
11002	150.0	0.00	0.001	0.011
11002	200.0	0.00	-0.001	-0.013
11002	250.0	-0.01	-0.001	0.003
11002	294.9	0.00	-0.001	-0.006
11002	500.0	0.14	0.013	-0.001
11002	725.9	0.19	0.015	-0.009
12004	1.5	0.13	0.008	-0.041
12004	25.0	0.00	-0.045	-0.302
12004	50.0	-0.01	-0.006	-0.033
12004	75.0	0.00	0.000	0.000
12004	100.0	-0.12	-0.004	0.059
12004	125.0	0.01	0.005	0.030
12004	150.0	0.00	-0.002	-0.012
12004	200.0	0.09	0.012	0.028
12004	250.0	0.11	0.012	0.011
12004	300.9	0.00	-0.001	-0.012
12004	500.0	0.00	0.001	0.008
12004	748.5	0.00	-0.001	-0.009

14001	1.5	0.19	-0.005	-0.164
14001	25.0	-0.01	-0.043	-0.290
14001	50.0	0.22	0.017	-0.037
14001	75.0	0.00	-0.006	-0.053
14001	100.0	0.28	0.028	-0.003
14001	125.0	0.19	0.019	0.002
14001	150.0	0.58	0.057	0.011
14001	200.0	0.00	-0.013	-0.124
14001	250.0	-0.01	0.000	0.012
14001	302.5	-0.01	0.001	0.006
14001	500.0	0.00	0.000	0.001
14001	745.3	0.00	0.000	0.001
18002	1.5	0.00	-0.003	-0.006
18002	25.0	0.00	-0.002	-0.004
18002	50.0	0.00	-0.027	-0.130
18002	75.0	-0.14	-0.005	0.073
18002	100.0	-0.10	-0.006	0.055
18002	125.0	0.01	-0.008	0.004
18002	150.0	0.00	-0.004	-0.004
18002	200.0	0.00	-0.009	-0.006
18002	250.0	-0.01	-0.002	-0.004
18002	310.2	0.00	-0.004	-0.004
18002	500.0	0.00	-0.001	-0.006
18002	754.3	0.00	-0.007	-0.001

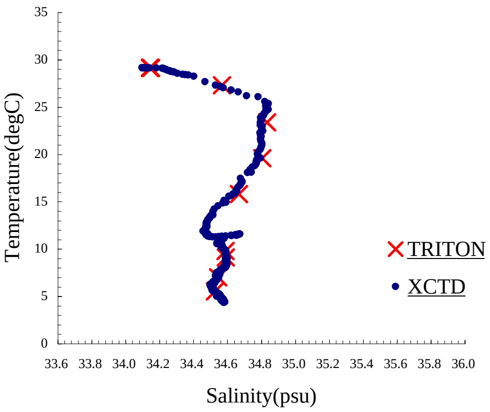
Bad data



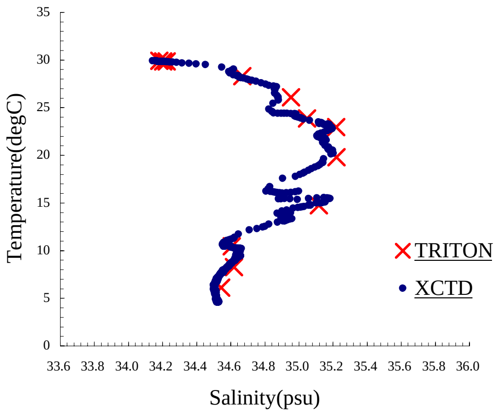
Observation No. 01006 after Deployment



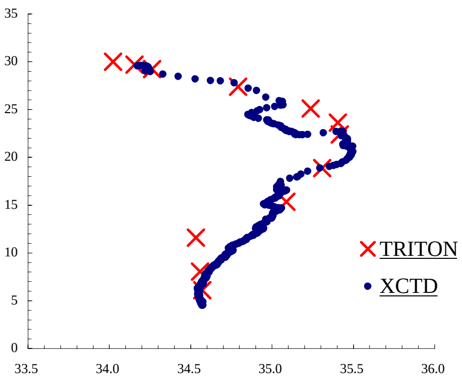
Observation No. 10003 after Deployment



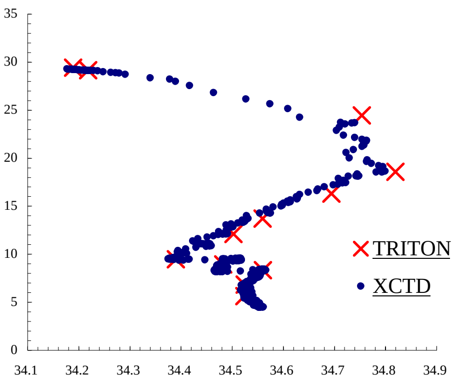
Observation No. 11003 after Deployment



Observation No. 12005 after Deployment

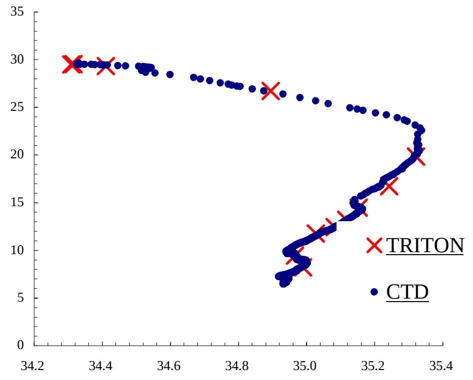


Observation No. 16003 after Deployment



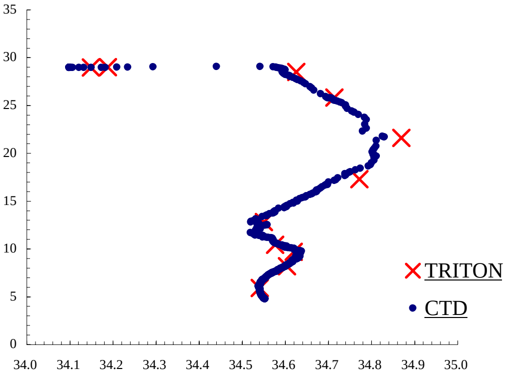
Observation No. 14002 after Deployment

Fig.7.1.2.-1(a) T-S diagram of TRITON buoys data and shipboard CTD data

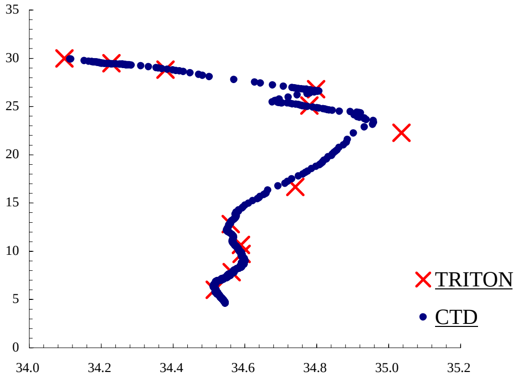


Observation No. 18003 after Deployment

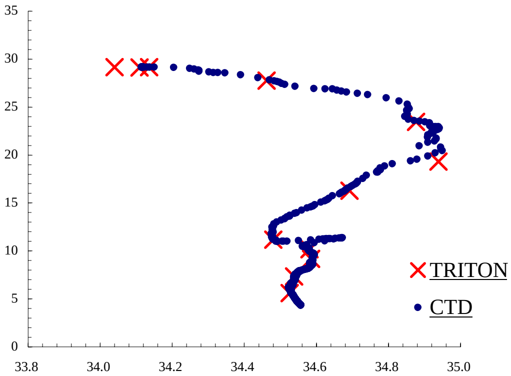
Fig.7.1.2.-1(b) T-S diagram of TRITON buoys data and shipboard CTD data



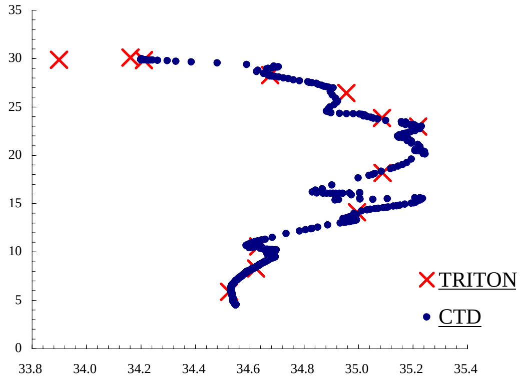
Observation No. 01005 before Recovery



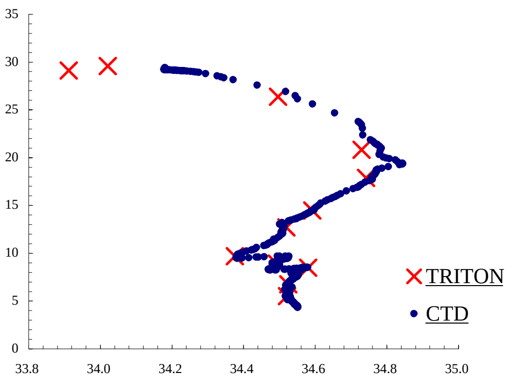
Observation No. 10002 before Recovery



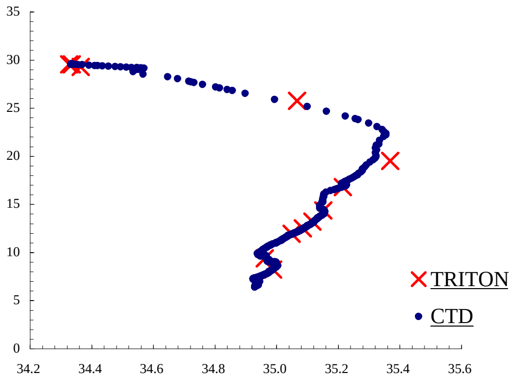
Observation No. 11002 before Recovery



Observation No. 12004 before Recovery



Observation No. 14001 before Recovery



Observation No. 18002 before Recovery

Fig.7.1.2.-1(c) T-S diagram of TRITON buoys data and shipboard CTD data

7.2 ADCP subsurface mooring

(1) Personnel

Hideaki Hase	(JAMSTEC): Principal Investigator (Leg.1)
Shinya Minato	(JAMSTEC): Investigator (Leg.2)
Yukio Masumoto	(FORSGC): Principal Investigator (Not on board)
Hiroshi Matsuura	(FORSGC): Investigator (Leg.2)
Hiroshi Matsunaga	(MWJ): Operation leader (Leg.1)
Masaki Taguchi	(MWJ): Operation leader (Leg.2)
Masayuki Fujisaki	(MWJ): Technical staff (Leg.1)
Kenichi Katayama	(MWJ): Technical staff (Leg.1)
Fuma Matsunaga	(MWJ): Technical staff (Leg.1-2)
Kentaro Shiraishi	(MWJ): Technical staff (Leg.1)
Masaki Furuhata	(MWJ): Technical staff (leg.1)
Masato Muranaka	(MWJ): Technical staff (Leg.1)
Kei Suminaga	(MWJ): Technical staff (Leg.2)
Mizue Hirano	(MWJ): Technical staff (Leg.2)

(2) Objectives

The purpose is to understand physical process in the western equatorial Pacific Ocean. We recovered two subsurface ADCP moorings at Eq-138E/6.8N-127E and deployed one ADCP mooring at 6.8N-127E during leg1. We recovered / deployed at Eq-90E during leg2.

(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 upper ocean layer currents from surface to 300m depths. The other is CTD to observe pressure, temperature and salinity for correction of sound speed and depth variability. And two current meters are equipped on the mooring at 6.8N-127E.

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 : 1222 (Mooring No.021025-00138E)
- Serial Number : 1678 (Mooring No.020714-7N127E)

Deployed ADCP

- Serial Number : 1150 (Mooring No.030618-00138E)

(b) Self-Contained Workhorse Long Ranger ADCP 75 kHz (RD Instruments)

Distance to first bin: 7.04 m
Pings per ensemble: 27

Time per ping: 6.66 seconds
Bin length: 8.00 m
Sampling Interval: 3600 seconds
Recovered ADCP
・Serial Number: 1248 (Mooring No.020729-EQ90E)
Deployed ADCP
・Serial Number: 1645 (Mooring No.030711-EQ90E)

2) CTD
(a)SBE-16 (Sea Bird Electronics Inc.)
Sampling Interval : 1800 seconds
Recovered CTD
・Serial Number : 1276 (Mooring No.021025-00138E)
・Serial Number : 1275 (Mooring No.020714-7N127E)
Deployed CTD
・Serial Number : 1278 (Mooring No.030618-00138E)
(b) SBE-37 (Sea Bird Electronics Inc.)
Sampling Interval: 1800 seconds
Recovered CTD
・Serial Number: 1388 (Mooring No.020729-EQ90E)
Deployed CTD
・Serial Number: 1775 (Mooring No.030711-EQ90E)

3) Other instrument
(a) Acoustic Releaser (BENTHOS,Inc.)
Recovered Acoustic Releaser
・Serial Number :916 (Mooring No.021025-00138E)
・Serial Number :692 (Mooring No.021025-00138E)
・Serial Number :716 (Mooring No.020714-7N127E)
・Serial Number :666 (Mooring No.020714-7N127E)
・Serial Number: 844 (Mooring No.020729-EQ90E)
・Serial Number: 937 (Mooring No.020729-EQ90E)
Deployed Acoustic Releaser
・Serial Number :691 (Mooring No.030618-00138E)
・Serial Number :599 (Mooring No.030618-00138E)
・Serial Number: 960 (Mooring No.030711-EQ90E)
・Serial Number: 961 (Mooring No.030711-EQ90E)

(b) RCM-9 (AANDERAA Instruments)
Temperature range : low
Recording : 60min
Conductivity range : 0-74 mS
Channel : 7ch
Recovered RCM9
・Serial Number :541 (Mooring No.020714-7N127E)
・Serial Number :542 (Mooring No.020714-7N127E)
(c) Transponder (BENTHOS,Inc.)
Recovered Transponder
・Serial Number : 67489 (Mooring No.021025-00138E)

・Serial Number : 57069 (Mooring No.020714-7N127E)

Deployed Transponder

・Serial Number : 57114 (Mooring No.030618-00138E)

(5) Deployment

The ADCP mooring deployed at Eq-138E was planned to play the ADCP at about 310m depth, and at Eq-90E was planned to play the ADCP at about 400m depth . After we dropped the anchor, we monitored the depth of the acoustic releaser (Fig.7-2-1-1, 7-2-1-2).

The position of the mooring No.030618-00138E

Date: 18 Jun. 2003 Lat: 00-00.68N Long: 138-01.75E Depth: 3942m

The position of the mooring No.030711-EQ90E

Date: 11 Jul. 2003 Lat: 00-00.3799N Long: 09-03.3532E Depth: 3532m

(6) Recovery

We recovered two ADCP moorings. One was deployed on 26 Oct.2002 (KY02-10) and the other was deployed on 14 Jul. 2002 (MR02-K04). After the recovery, we uploaded ADCP, RCM-9 and CTD data into a computer, then raw data were converted into ASCII code. But we could not obtain ADCP data at Eq-138E due to misconnect of battery. And we could not download ADCP data at Eq-90E due to un-connect to PC.

Results were shown in the figures in the following pages. Fig.7-2-2, Fig.7-2-3 and Fig.7-2-4 show CTD pressure, temperature and salinity data. Fig.7-2-5～Fig.7-2-7 show the ADCP velocity data (zonal and meridional component) at bin#19 (128m) , bin#12(184m) , bin#1(288m).Fig.7-2-8～Fig. 7-2-10 show pressure and velocity data of RCM-9.

(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 during Leg.1 .About leg.2 data will be archived by the member of RORSGC project at JAMSTEC.

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

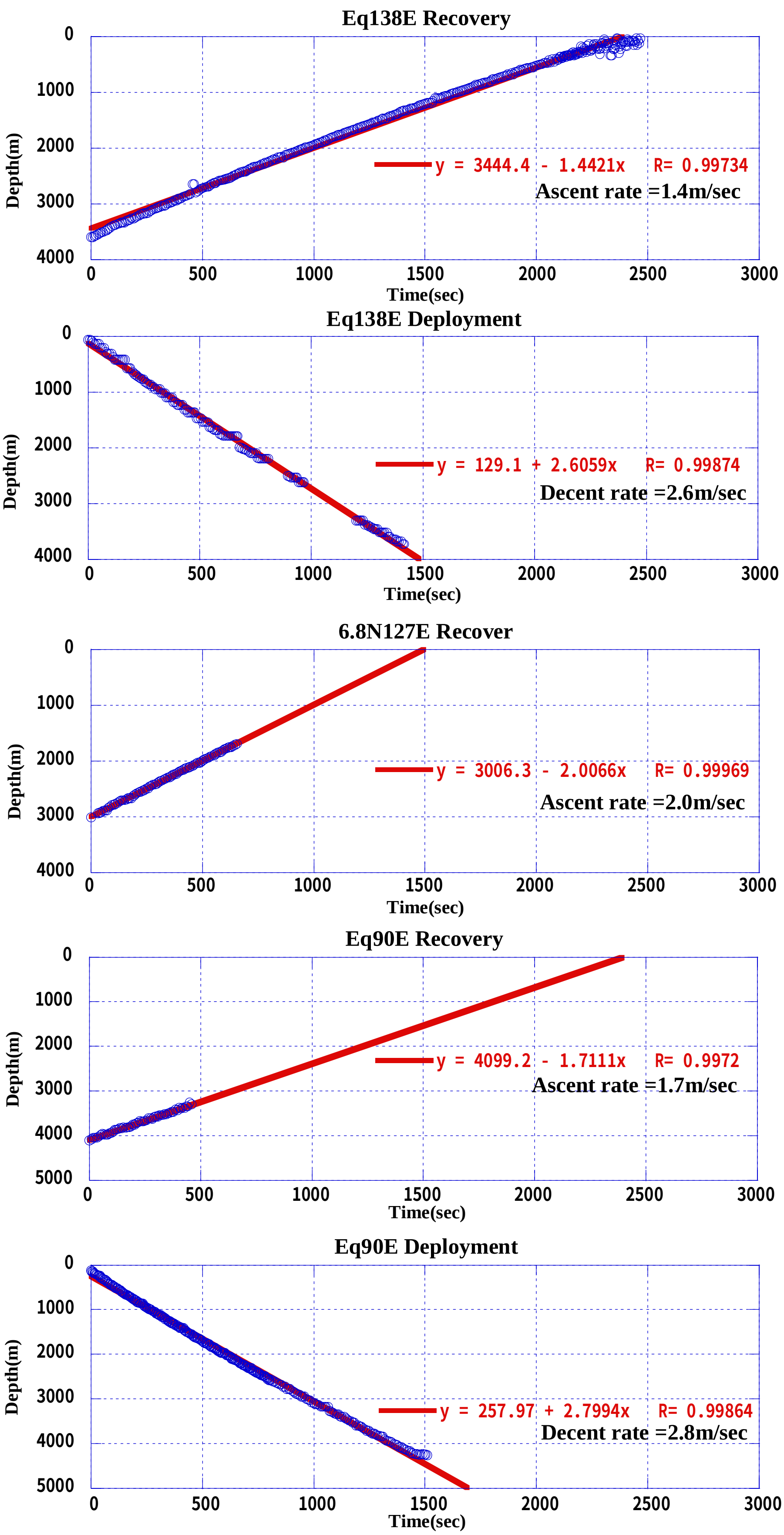
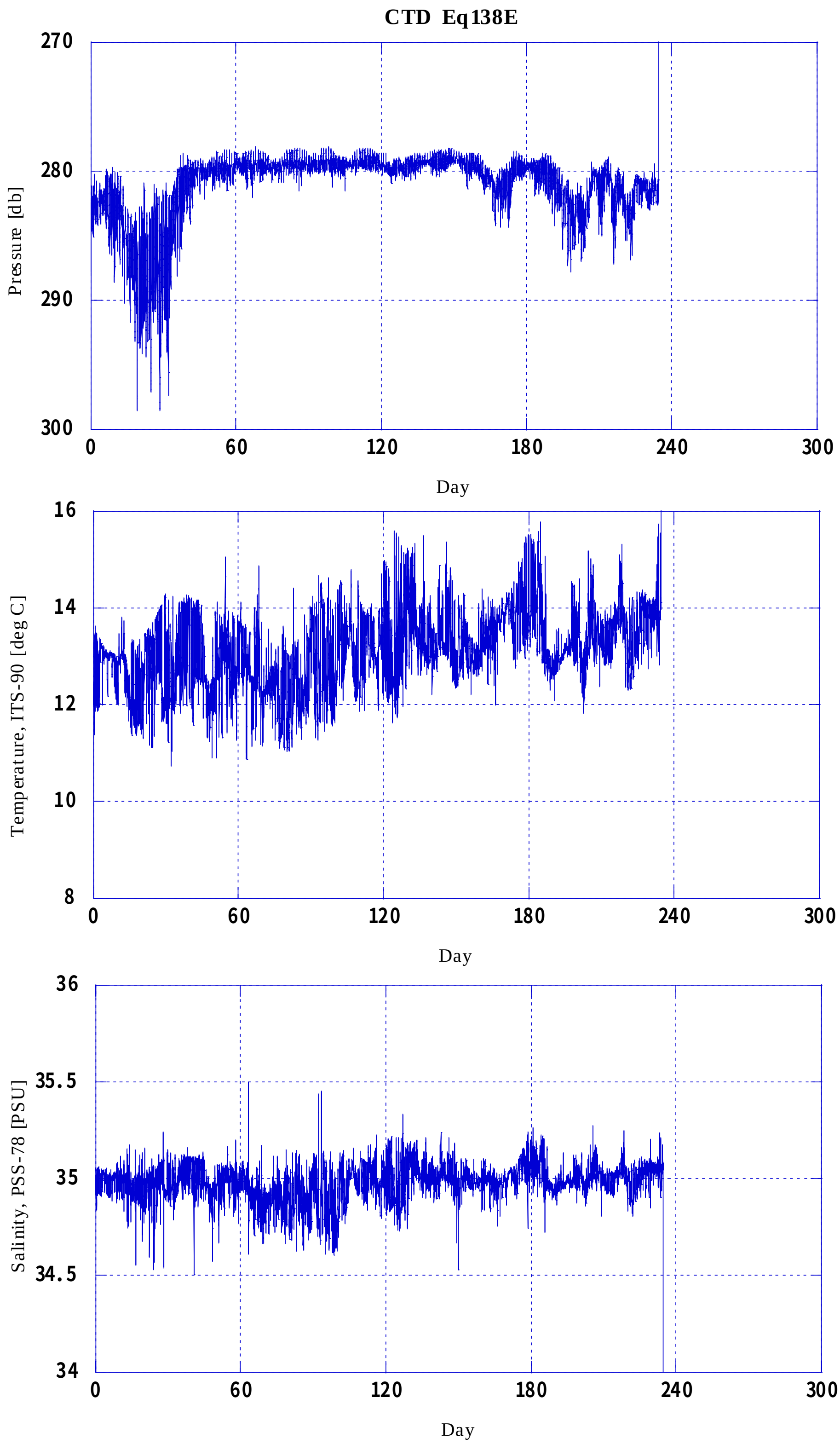


Fig.7-2-1 Depth monitoring of acoustic releaser



2002/10/27-2003/6/16

Fig.7-2-2 Time series of pressure, temperature and salinity obtained with CTD of Eq-138E mooring

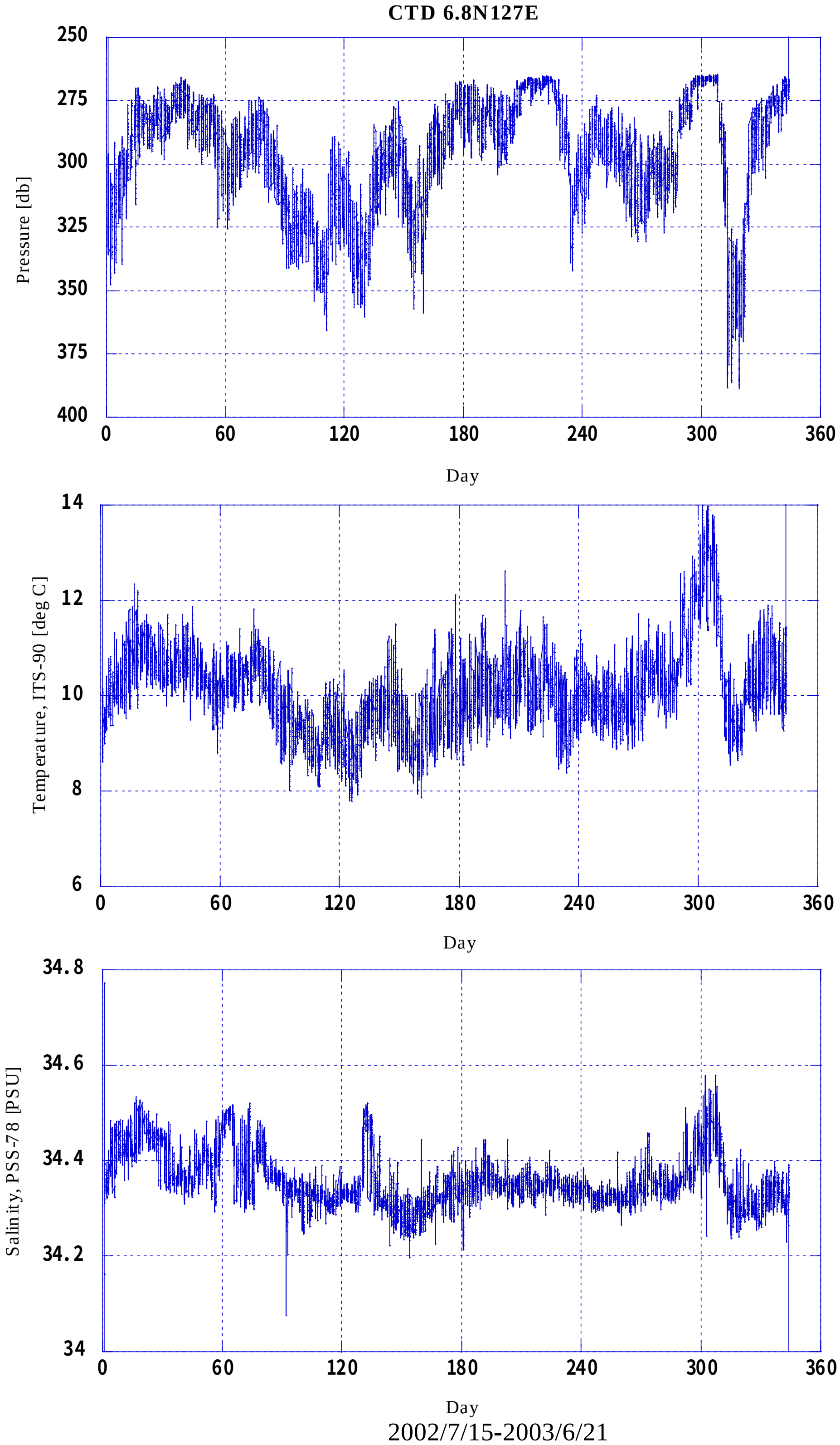
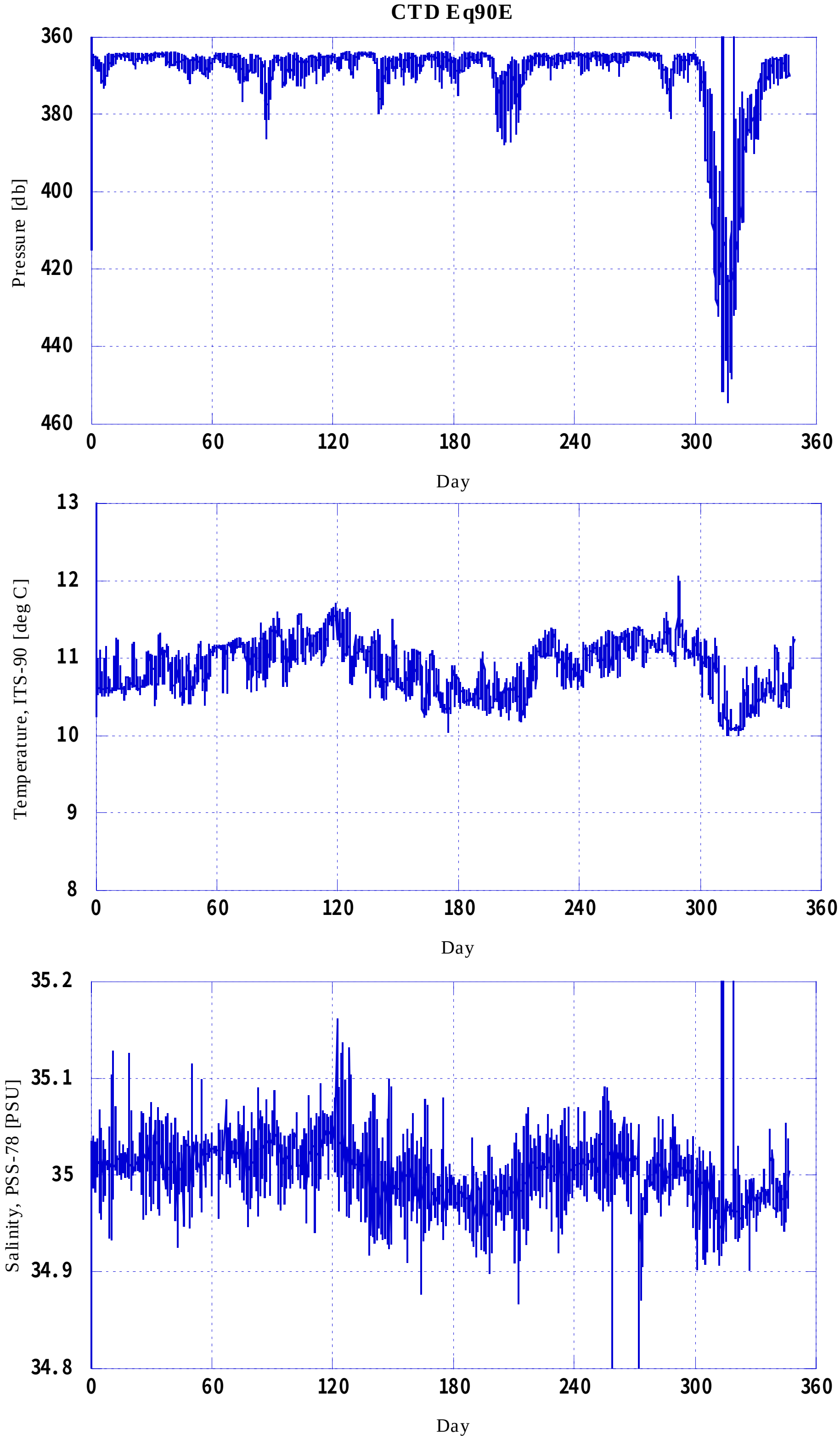


Fig.7-2-3 Time series of Time series of pressure, temperature and salinity obtained with CTD of 6.8N-127E mooring



2002/7/29-2003/7/11

Fig.7-2-4 Time series of Time series of pressure, temperature and salinity obtained with CTD of Eq-90E mooring

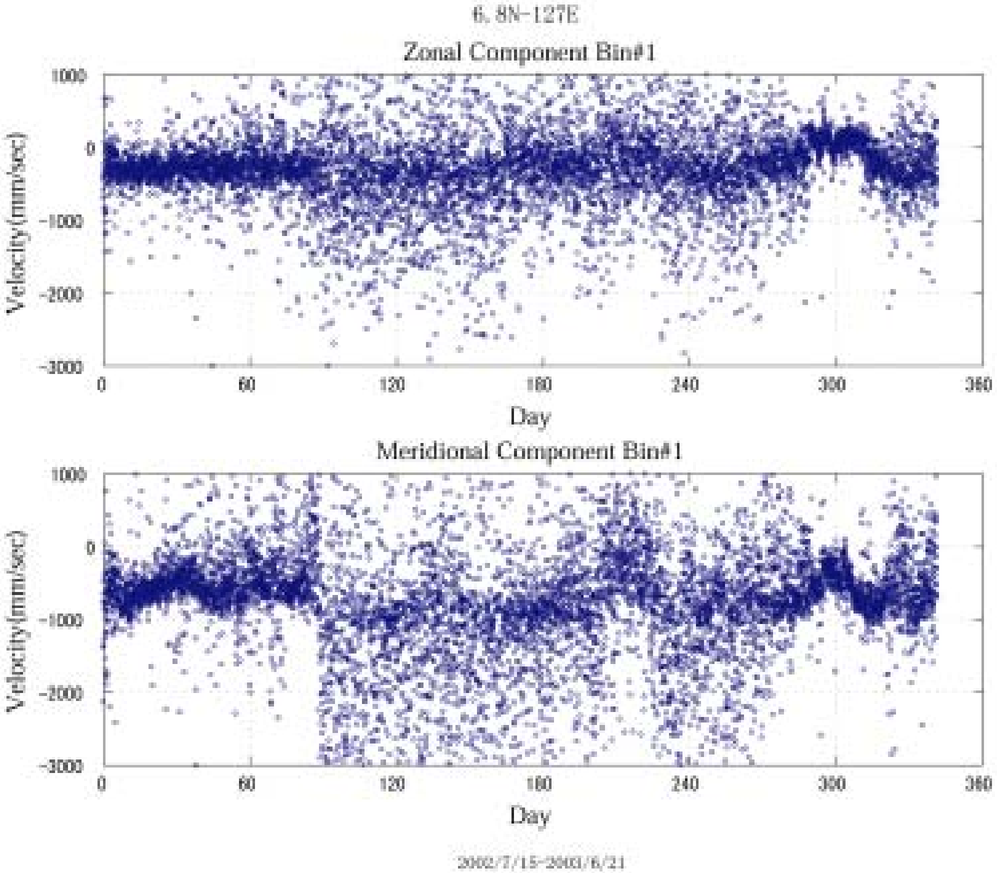


Fig.7-2-5 Time series of zonal and meridional velocities of 6.8N-127E mooring at bin#1

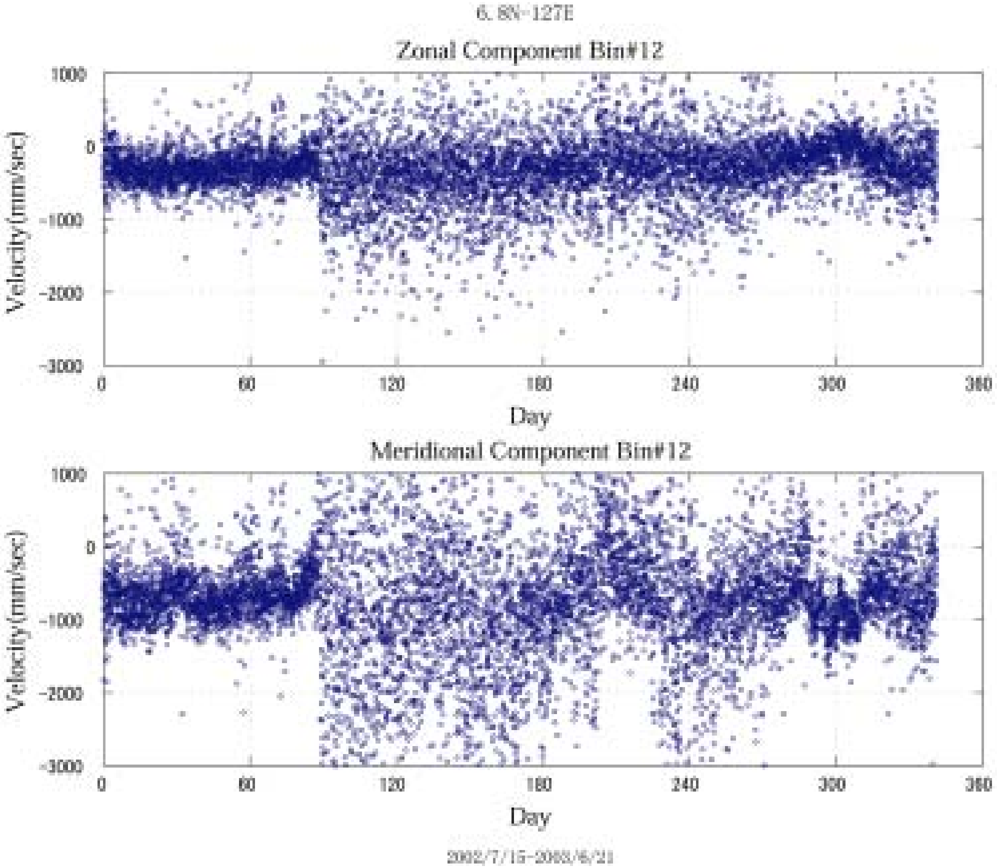


Fig.7-2-6 Time series of zonal and meridional velocities of 6.8N-127E mooring at bin#12

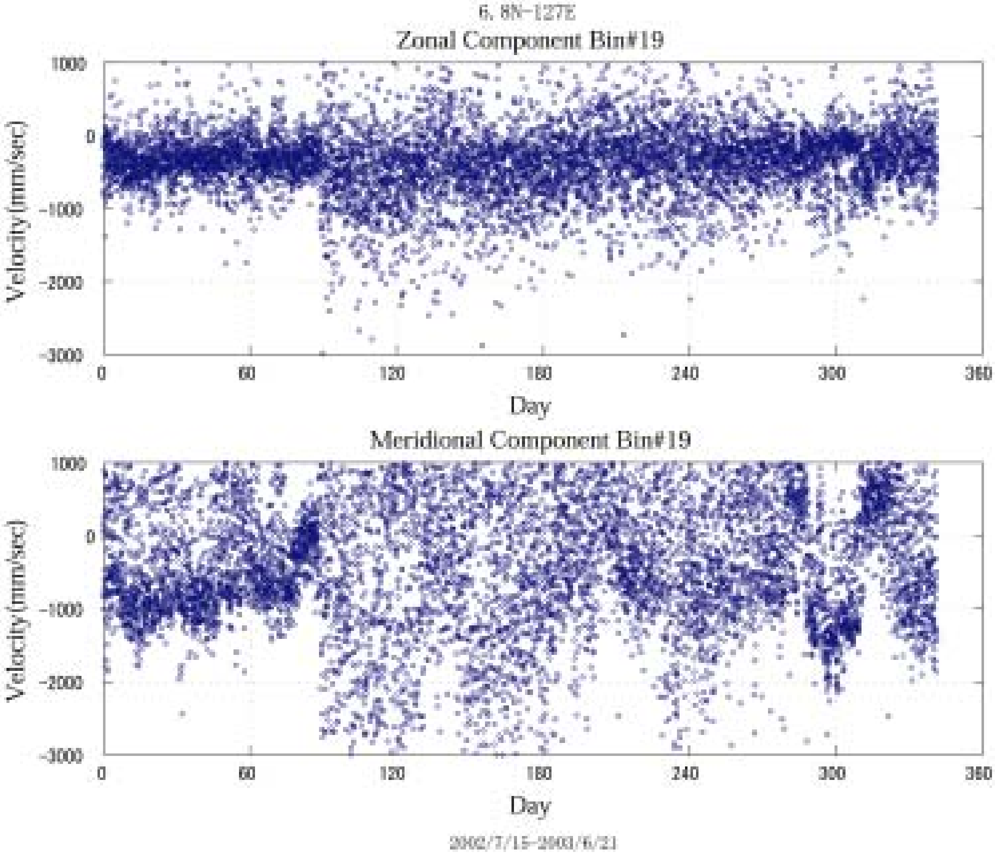
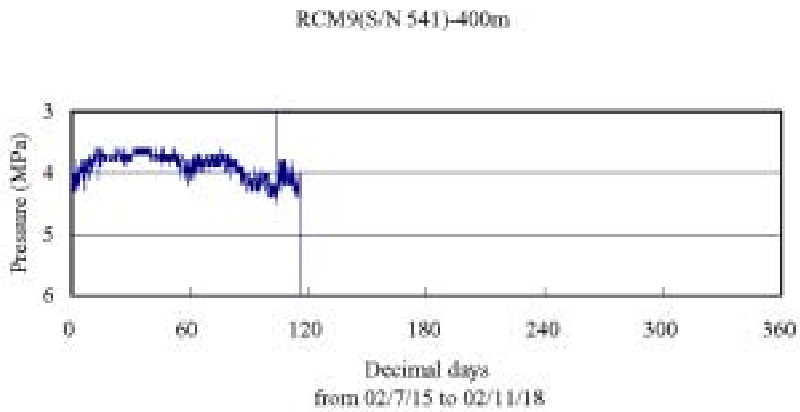


Fig.7-2-7 Time series of zonal and meridional velocities of 6.8N-127E mooring at bin#19



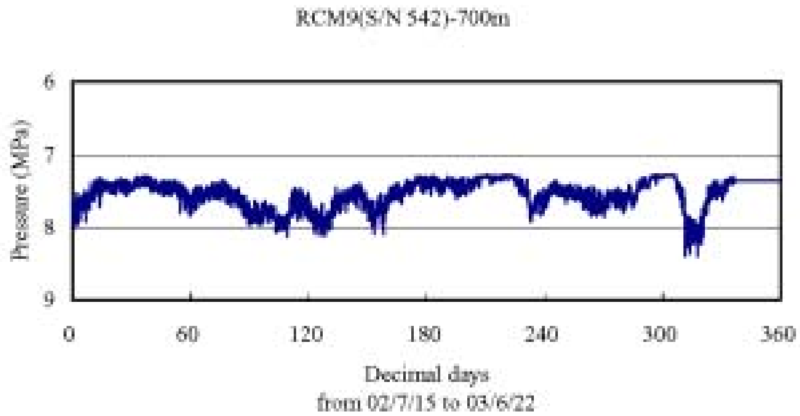
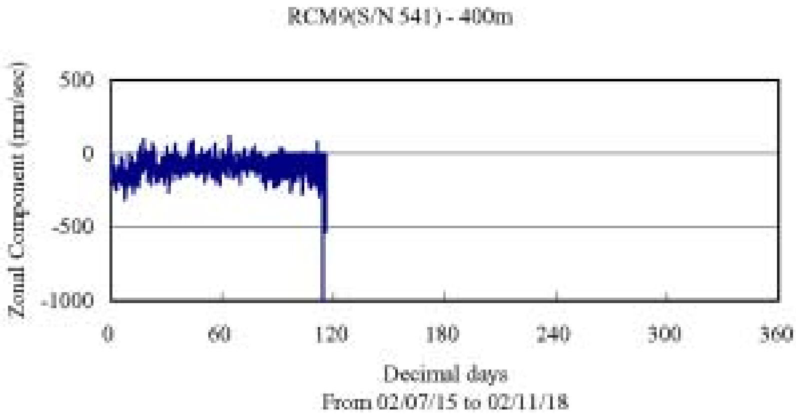


Fig.7-2-8 Time series of Pressure obtained with RCM9 of 6.8N-127E mooring



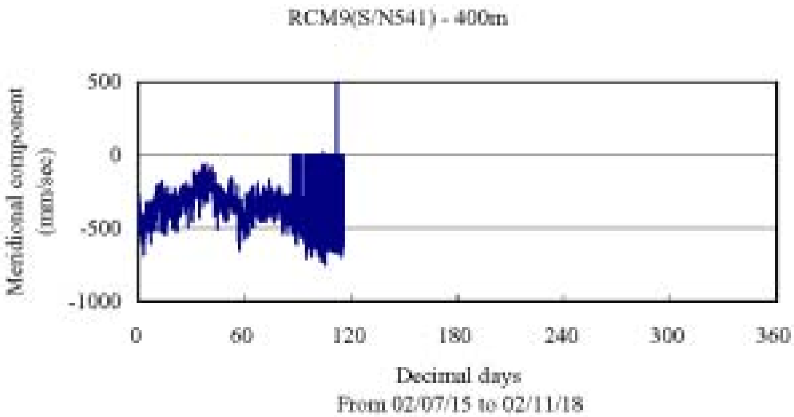
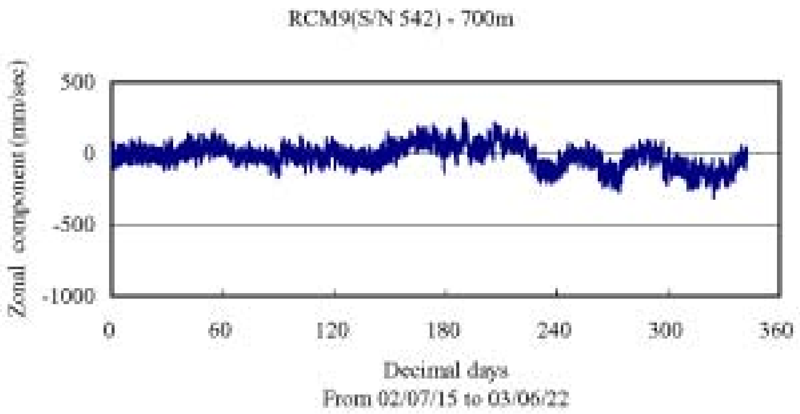


Fig.7-2-9 Time series of Pressure obtained with RCM9 of 6.8N-127E mooring



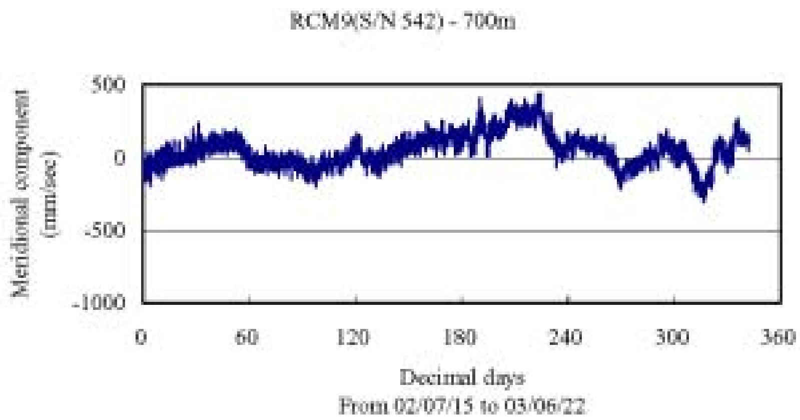


Fig.7-2-10 Time series of Pressure obtained with RCM9 of 6.8N-127E mooring

7.3 Particulate organic matter (POM) observation

Personnel

Michimasa Magi	(RITE)	leg.1
Saeko Mito	(RITE)	leg.1
Jun Kita	(RITE)	not onboard

RITE : Research Institute of Innovative Technology for the Earth

Objectives of POM sampling

In the view of the problem of the global warming, it is important to know the carbon cycles in ocean. Our purpose of this cruise is to collect basic information of the biological transport of organic material from surface waters into the deep sea using multiple stable isotopes.

Parameters

Oceanic parameters for vertical profile; Particulate organic matter (POM)

Description of Methods of POM

POM was obtained from discrete depths using a rosette sampler with an attached CTD meter to take water samples (see Table 7.3-1 and Fig.7.3-1 & 7.3-2). These were then filtered through a Whatman GF/F filters pretreated at 500°C for 5 hours (Fig.7.3-3). All samples will be thawed and rinsed quickly with distilled water. Organisms will be desiccated in a dry oven at 60°C until dry weight stabilized.

Stable isotope analysis

All samples are ground to a fine powder. To avoid variance in $\delta^{13}C$ due to lipid content levels the solvent-extractable lipid fraction will be removed from a subsample by regrinding with a mixture of chloroform:methanol (2:1), filtration onto a Whatman GF/C glass fiber filter, rinsing with the chloroform/methanol sokution several times and subsequent redrying at 60°C over night for$\delta^{13}C$ analysis. The carbon ($^{13}C/^{12}C$) and nitrogen ($^{15}N/^{14}N$) ratios will be analyzed by IsoPrime stable isotope mass spectrometer, after sample combustion in an on-line Elemental Analyzer (Euro EA3024).

Table 7.3-1 Lists of POM sampling position & layer

Stn.	Cast	Date & Time 1)	Position	Sampling Layer 2) (sampling volume)
1	1	2003/06/09 13:00	07°41'N 136°41'E	0m(40L), 500m(40L), 1000m(40L), 2000m(40L)
	2	2003/06/09 15:10	07°41'N 136°41'E	0m(40L), 500m(40L), 1000m(40L), 2000m(40L)
2	1	2003/06/11 13:00	04°52'N 137°17'E	0m(40L), 1000m(40L), 2000m(80L)
	2	2003/06/11 14:40	04°52'N 137°17'E	500m(80L), 1000m(40L)
3	1	2003/06/13 13:00	02°01'N 138°06'E	0m(40L), 1000m(40L), 2000m(80L)
	2	2003/06/13 14:45	02°01'N 138°06'E	500m(80L), 1000m(40L)
	3	2003/06/15 07:50	02°01'N 138°07'E	0m(40L), 50m(40L), 1500m(40L), 3000m(40L)
4	1	2003/06/16 13:00	00°03'N 137°54'E	0m(40L), 1000m(40L), 2000m(80L)
	2	2003/06/16 15:30	00°03'N 137°52'E	500m(80L), 1000m(40L)
5	1	2003/06/20 12:50	02°00'N 130°01'E	0m(40L), 1000m(40L), 2000m(80L)
	2	2003/06/20 14:30	02°01'N 130°00'E	500m(80L), 1000m(40L)
6	1	2003/06/22 10:30	05°07'N 130°03'E	0m(40L), 1000m(40L), 2000m(80L)
	2	2003/06/22 12:55	05°01'N 129°58'E	500m(80L), 1000m(40L)
7	1	2003/06/24 13:00	07°58'N 130°01'E	0m(40L), 2000m(80L), 3000m(40L)
	2	2003/06/24 15:30	07°58'N 130°01'E	1000m(80L), 1500m(40L)
	3	2003/06/25 12:40	08°00'N 130°01'E	0m(40L), 50m(40L), 500m(80L)

1): Japanese Standard Time , 2): Bucket (0m) & Niskin Bottle (other layers)

Fig.1 Sampling View of Surface water by Bucket

Fig.2 Sampling view of middle layer sea water by CTD-RMS

Fig.3 View of filtration of sampling water

7.4 Argo float (profiling float) deployment

(1) Personnel

Nobie Shikama	(FORSGC): Principal Investigator (not on board)	
Eitarou Oka	(FORSGC)	not on board
Kenichi Katayama	(MWJ)	
Fuma Matsunaga	(MWJ)	

(2) Objectives

The objective of deployment is to clarify variations of temperature and salinity in association with interannual variations such as ENSO events and intraseasonal variations.

The profiling float launched in this cruise measures vertical profiles of temperature and salinity automatically every ten days. The data from the float will enable us to understand the variations mentioned above with time scales much smaller than those in the previous studies.

(3) Parameters

・water temperature, salinity, and pressure

(4) Methods

1) Profiling float deployment

We launched 1 APEX float manufactured by Webb Research Ltd. It equips SBE41 CTD sensor manufactured by Sea-Bird Electronics Inc.

The float usually drifts at a depth of 1500 dbar (called the parking depth), rising up to the sea surface every ten days by increasing its volume and changing the buoyancy. During the ascent, it measures temperature, salinity, and pressure. It stays at the sea surface for approximately nine hours, transmitting its position and the CTD data to the land via the ARGOS system, and then returns to the parking depth by decreasing volume. The status of float and its launch are shown in Table 7.4-1.

(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.

Table 7.4-1 Status of floats and their launches

Float

Float Type	APEX floats manufactured by Webb Research Ltd.
CTD sensor	SBE41 manufactured by Sea-Bird Electronics Inc.
Cycle	10 days (approximately 9 hours at the sea surface)
ARGOS transmit interval	30 sec
Target Parking Pressure	1500 dbar
Sampling layers	66 (1500, 1400, 1300, 1250, 1200, 1150, 1100, 1050, 1000, 975, 950, 925, 900, 875, 850, 825, 800, 780, 760, 740, 720, 700, 680, 660, 640, 620, 600, 580, 560, 540, 520, 500, 480, 460, 440, 420, 400, 380, 360, 340, 320, 300, 280, 260, 240, 220, 200, 190, 180, 170, 160, 150, 140, 130, 120, 110, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10 [dbar])

Launches

Float S/N	ARGOS PTT ID	Date and Time of Reset (UTC)	Date and Time of Launch (UTC)	Location of Launch
926	25183	00:08, Jun. 15	01:12, Jun. 15	02-01.87 N, 138-08.02 E

7.5 Lidar observations of clouds and aerosols

(1) Personnel

Nobuo Sugimoto (NIES): Principal investigator, not onboard
Ichiro Matsui (NIES)
Atsushi Shimizu (NIES)
*Lidar system was operated and maintained by GODI technical staff.
*NIES; National Institute for Environmental Studies

(2) Objectives

Objectives of the observations in this cruise are

- to study distribution and optical characteristics of marine aerosols using a two-wavelength dual polarization lidar,
- to study distribution of water/ice clouds.

(3) Measured parameters

- Vertical profiles of backscattering coefficient at 532 nm and 1064 nm.
- Vertical profile of depolarization ratio at 532 nm.

(4) Method

Vertical profiles of aerosols and clouds were measured with a two-wavelength dual polarization lidar. The lidar employs a Nd:YAG laser as a light source which generates the fundamental output at 1064 nm and the second harmonic at 532 nm. Transmitted laser energy is typically 30 mJ per pulse at 1064 nm and 20 mJ per pulse at 532 nm. The pulse repetition rate is 10 Hz. The receiver telescope has a diameter of 20 cm. The receiver has three detection channels to receive the lidar signals at 1064 nm and the parallel and perpendicular polarization components at 532 nm. An analog-mode avalanche photo diode (APD) is used as a detector for 1064 nm, and photomultiplier tubes (PMTs) are used for 532 nm. The detected signals are recorded with a digital oscilloscope and stored on a hard disk with a computer. The lidar system was installed in the sonde container and operated continuously regardless of weather.

(5) Results

Throughout the cruise, small scale cumulus located just above the boundary layer were detected between 500 m – 900 m altitude. Clouds in middle troposphere were frequently appeared at the beginning of leg.1. Aerosols distributed mainly in the boundary layer, but during leg.2 there were several cases where aerosols penetrated above 2.5 km altitude. A large scale cirrus cloud system was confirmed during July 18-20 around 12 km. As seen in the bottom panel of Figure 1, the depth of boundary layer, or altitude of cumulus, showed clear daily variations at the end of leg.2.

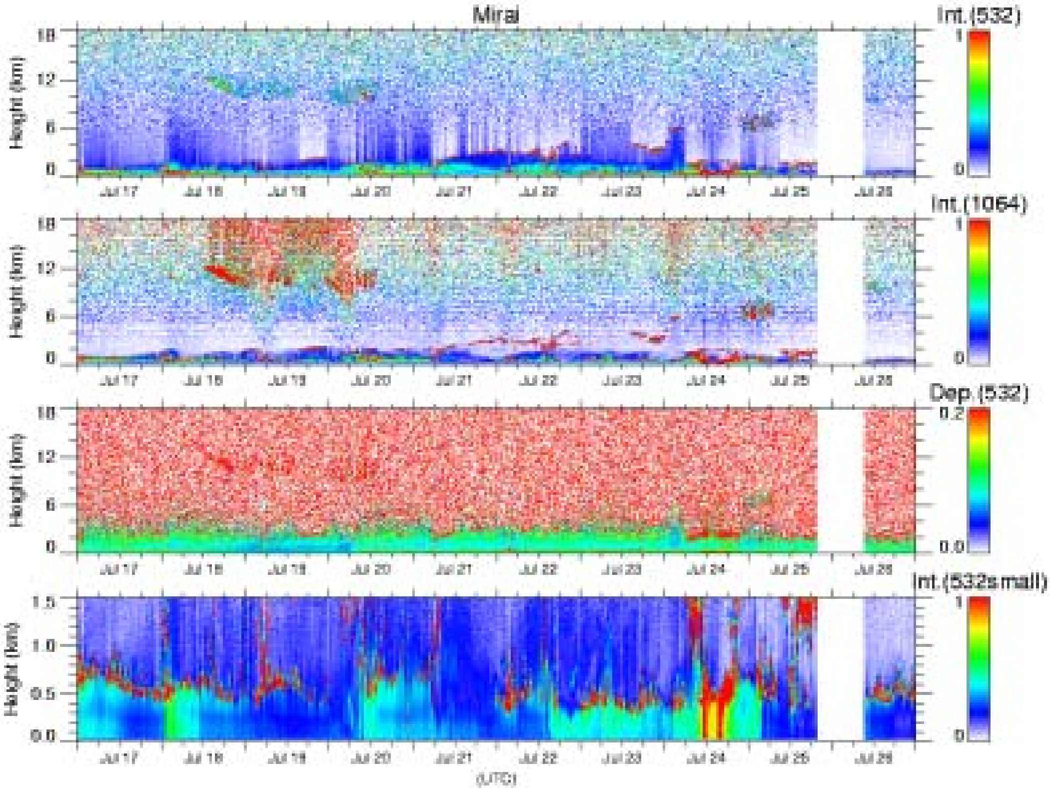


Figure 1: Time-height sections of backscattering intensities at 532nm and 1064nm, depolarization ratio at 532 nm, and backscattering intensity at 532 nm below 1.5 km during July 17 – July 26, 2003.

(6) Data archive

- raw data

lidar signal at 532 nm (parallel polarization)

lidar signal at 532 nm (perpendicular polarization)

lidar signal at 1064 nm

period 0306070000-0307290745 (UTC), except during 0306280615-0306300900, 0307251930-0307260915 and 0307021400-0307061830.

temporal resolution 15 min.

vertical resolution 6 m.

- processed data

cloud base height, apparent cloud top height, cloud phase

cloud fraction

boundary layer height (aerosol layer upper boundary height)

backscatter coefficient of aerosols

depolarization ratio

7.6 AMSR/AMSR-E validation observation

(1) Personnel

Masayuki Sasaki (JAXA/EORC*): Principle Investigator (not on board)
Yozo Takayama (JMA/MRI**)

(2) Objectives

The satellite-borne microwave radiometers are the powerful device to obtain the spatial and temporal variation of the water vapor, cloud liquid water, sea surface temperature, rain rate, etc, especially over the ocean where the ground-based observation is poor. To validate the products of AMSR (Advanced Mircowave Scanning Radiometer) / ADEOS-II and AMSR-E / EOS Aqua, brand-new satellite-borne microwave radiometer, the Mirai basic observation system installed on the vessel and continuous observation is carried out.

(3) Methods

The micro rain radar MRR-2 (METEK GmbH) and the microwave radiometer WVR-1100 (Radiometrics Co.) are used for this observation.

The radar is a compact 24 GHz FM-CW-radar for the measurement of profiles of drip size distribution and rain rates, liquid water content and characteristic falling velocity of the raindrops. The transmitter power is 50 mW. In this observation, the data is obtained every 60 seconds, at every 200-m range gate to 6000-m height.

The radiometer obtained brightness temperature data for the two frequency, 23GHz and 31GHz. The brightness temperature data is converted to the vertically integrated water vapor amount and cloud liquid water amount.

The observation is performed continuously from 7 June to, 30 July 2003.

Match-up data between AMSR/AMSR-E products and Mirai observation data will be created.

a) Water Vapor : AMSR/AMSR-E vs. Microwave Radiometer
b) Liquid Water : AMSR/AMSR-E vs. Microwave Radiometer
c) Rain rate : AMSR/AMSR-E vs. Micro Rain radar

(4) Preliminary Results

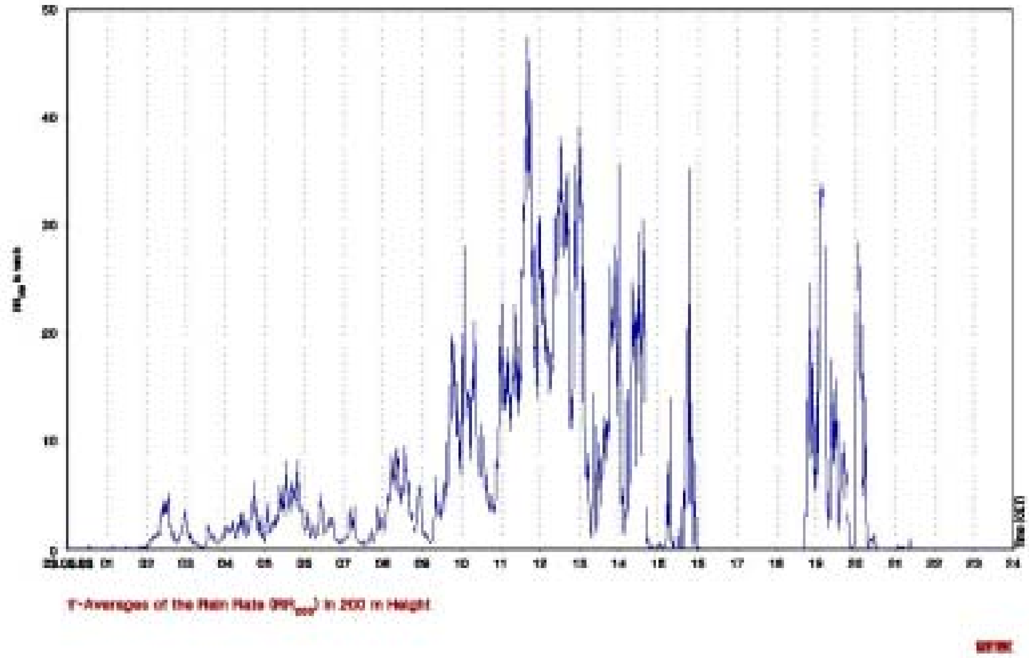
We are processing the Match-up data.

(5) Data Archive

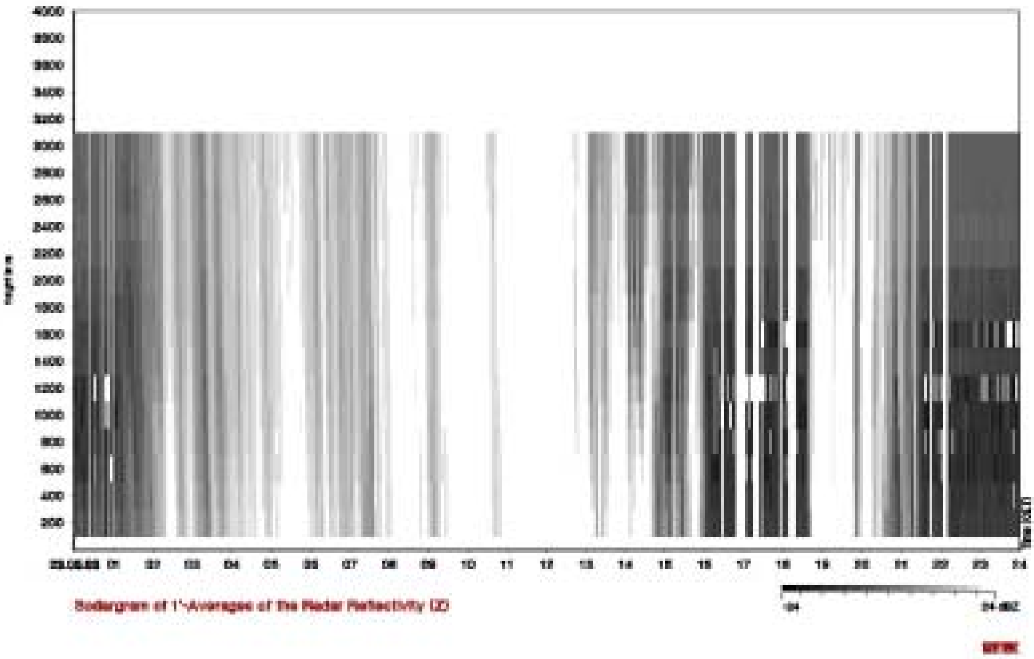
The original data will be archived at JAXA/EORC, and will be submitted to JAMSTEC.

*JAXA/EORC: Japan Aerospace Exploration Agency/ Earth Observation Research and application Center.
**JMA/MRI : Japan Meteorological Agency / Meteorological Research Institute

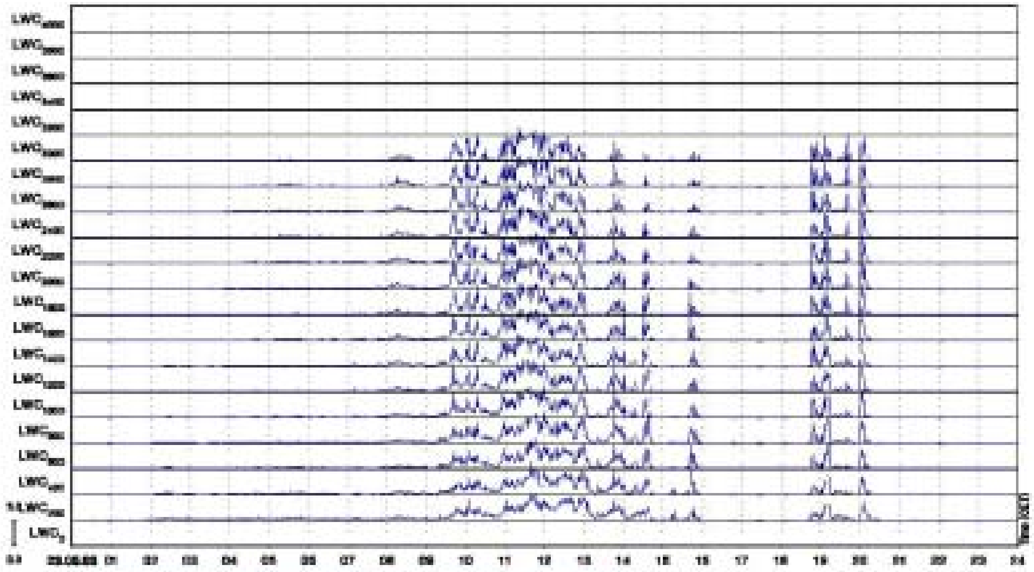
Sample data



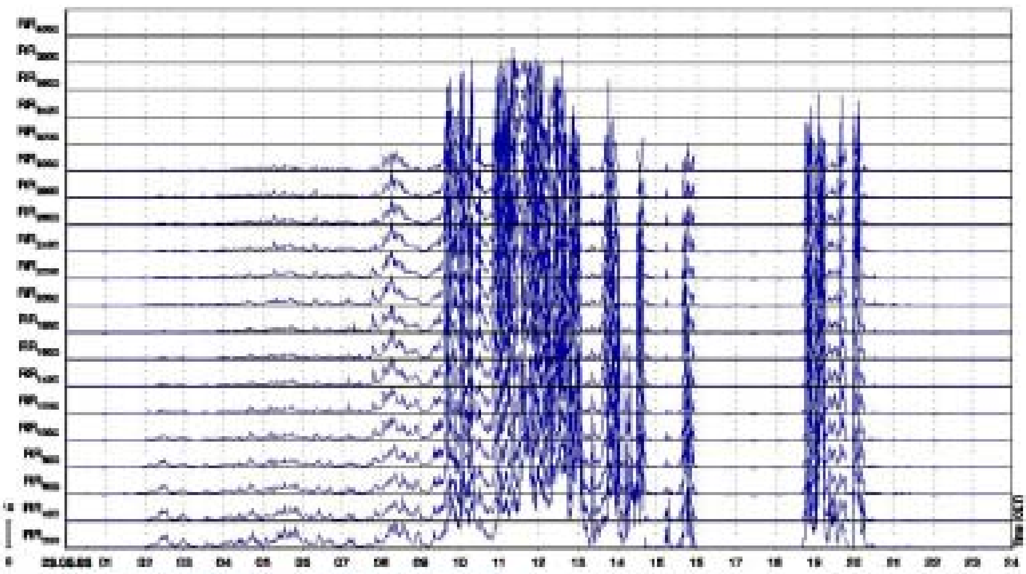
1'-Averages of the Rain Rate (RR_{200}) in 200 m Height



Sodargram of 1'-Averages of the Radar Reflectivity (Z)



1'-Averages of the Liquid Water Contents (LWC_x) in g/m3 for Selected Heights (x)



1'-Averages of the Rain Rate (RR_x) in mm/h for Selected Heights (x)

7.7 Doppler Radar Observation

(1) Personnel

Shuichi Mori (FORSGC): Principal Investigator
Hamada Jun-Ichi (FORSGC)
Satoshi Okumura (GODI)
Norio Nagahama (GODI)
Ryo Kimura (GODI)

(2) Objective

The objective of Doppler radar observation is to understand precipitating convective systems in the eastern Indian Ocean during the Indian monsoon season by obtain both spatial and temporal distribution of rainfall amount, and structures of the precipitating convective system.

(3) Method

The hardware specifications 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:	250kW (Peak Power)
Signal Processor:	RVP-7 (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, (4) transmitting pulse width and (5) receiver linearity at the beginning and the end of the observation period.

The observation is performed continuously from July 06 through 29, 2003 except for 01-04 UTC.on July 07. During the observation, the programmed “tasks” are repeated every 10 minutes. One cycle consists of one “volume scan” (consists of PPIs for 21 elevations) with Doppler-mode (160 km range for reflectivity and Doppler velocity), one-elevation “surveillance” PPI with Intensity-mode (300 km range for reflectivity). In the interval of the cycles, RHI (Range Height Indicator) scans were operated to obtain detailed vertical cross sections with Doppler-mode. The Doppler velocity is unfolded automatically by dual PRF unfolding algorithm. The parameters for the above three tasks are listed in Table 7.7-1.

Table 7.7-1

	Surveillance PPI	Volume Scan	RHI
Pulse Width	2 [microsec.]	0.5 [microsec.]	
Scan Speed	18 [deg./sec.]		Automatically determined
PRF	260 [Hz]	900/720 [Hz]	
Sweep Integration	32 samples		
Ray Spacing	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 65.0
Azimuths	Full Circle		Optional
Range	300 km	160 [km]	

(4) Preliminary results

Continuous observation of Doppler radar has been carried out successfully without any trouble during this period. Major disturbance events were observed on July 10 and 15 in the eastern Indian Ocean. Figures. 7.7-1 and 7.7-2 show CAPPI and RHI images of both radar reflectivity (left panels) and Doppler velocity (right panels) at 17:40 UTC, July 15 over the position of (4.9S, 94.8E). The Line shaped Mesoscale Convective System (MCS) approached R/V Mirai from northeastern-ward with, and caused heavy shower of 100 mm/hr or above followed by persistent stratiform rainfall. The RHI reflectivity image indicates an active convective cell on the head with over 40 dBZ, transition zone, and stratiform region with bright band at a height of 0°C level (approximately 5 km). An airflow toward the head below 3 km and an counter outflow aloft toward the trail are also sown in the Doppler velocity field. The detailed analyses for these observed events with 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 Data Management Office (DMO). The original data will be archived at and available from Frontier Observational Research System for Global Change (FORSGC).

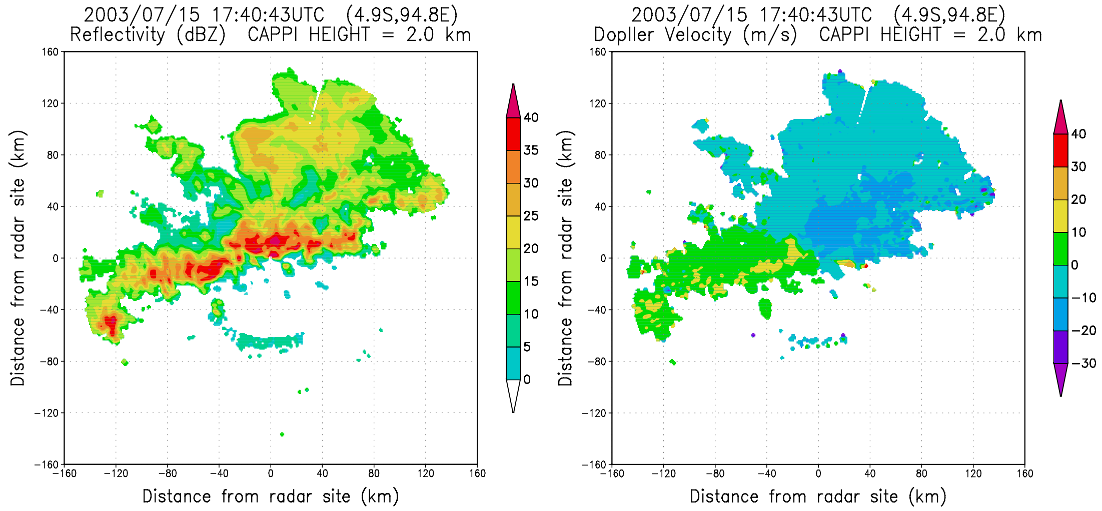


Fig. 7.7-1 Radar reflectivity (left panel) and Doppler wind (right panel) fields at 17:40 UTC on July 15, 2003. The line shaped Mesoscale Convective System is approaching R/V Mirai from northeastern side.

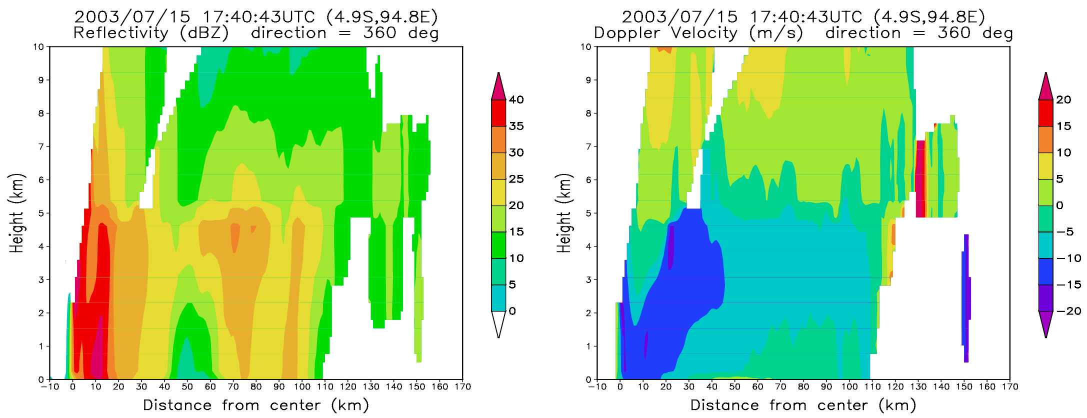


Fig. 7.7-2 RHI images of radar reflectivity (left panel) and Doppler wind (right panel) fields at 17:40 UTC on July 15, 2003. Azimuth direction from the radar is 360 degree and horizontal range is 160 km.

7.8 Rawinsonde Observation

(1) Personnel

Shuichi Mori (FORSGC): Principal Investigator
Hamada Jun-Ichi (FORSGC)
Satoshi Okumura (GODI)
Norio Nagahama (GODI)
Ryo Kimura (GODI)

(2) Objective

The objective of rawinsonde observation is to understand precipitating convective systems in the eastern Indian Ocean during the Indian monsoon season by obtain the atmospheric environmental profiles of pressure, temperature, relative humidity, wind direction, and wind speed.

(3) Method

Atmospheric sounding by rawinsonde was carried out every 6 or 3 hours during July 09 through 18, 2003 along the cruise track described in Fig. 7.8-1, and Table 7.8-1 shows the summary of 54 launches in total. The observation system consists of receiver/processor (Vaisala DigiCORA MW11), GPS antenna (GA20), UHF telemetry antenna (RB20), balloon launcher (ASAP), 200g balloon (Totex TA-200), and GPS rawinsonde transmitter (Vaisala RS80-15GH).

Transmitters using in RS-001 through 016 in Table 7.8-1 were calibrated before launch by using the digital barometer (Vaisala PTB220 Class A) and the humidity calibrator (General Eastern C-1 RH Generator) set at approximately 70 %. Other transmitters in the Table 7.8-1 were calibrated with the ground check kit (Vaisala GC23) which humidity was set at 0 % because of some malfunction with Vaporpak H-31 calibrator.

(4) Preliminary results

Time-height cross sections of temperature, zonal and meridional wind components, relative humidity, specific humidity, and equivalent potential temperature are shown in Fig. 7.8-2. Vertical profiles of temperature, dew-point temperature are plotted on the thermodynamic chart wind profiles in Fig7.8-3.

Southwesterly and northeasterly winds in the lower and upper troposphere, respectively, are observed along 90E line in the northern hemisphere (July 09-11) corresponding to Indian monsoon circulation. The wind field was replaced by easterly wind in the lower troposphere, corresponding to the winter circulation in the southern hemisphere (July 12-18) along 90E line and over southwestern side of Sumatra Island. Relative and specific humidity increase in the lower troposphere during July 10, 12, and 15 when the ship passed through a large precipitating cloud system. Especially, notable strong easterly wind are shown in the near surface layer on July 15 when the line shaped severe Mesoscale Convective System (MCS) passed over the ship with lightning and heavy rainfall of 100 mm/h or above (see 7.7 Doppler radar observation). A typical tropical atmospheric structure with convective unstable condition is indicated throughout the observation period, which has both much specific humidity of 15-20 g/kg in the near surface and rather dries air in the middle of troposphere.

(5) Data archive

All sounding data have been sent to the world meteorological community by Global Telecommunication System (GTS) through Japan Meteorological Agency (JMA) immediately after the each observation. Raw data are stored in digital ASCII format that are available through JAMSTEC Data Management Office (DMO).

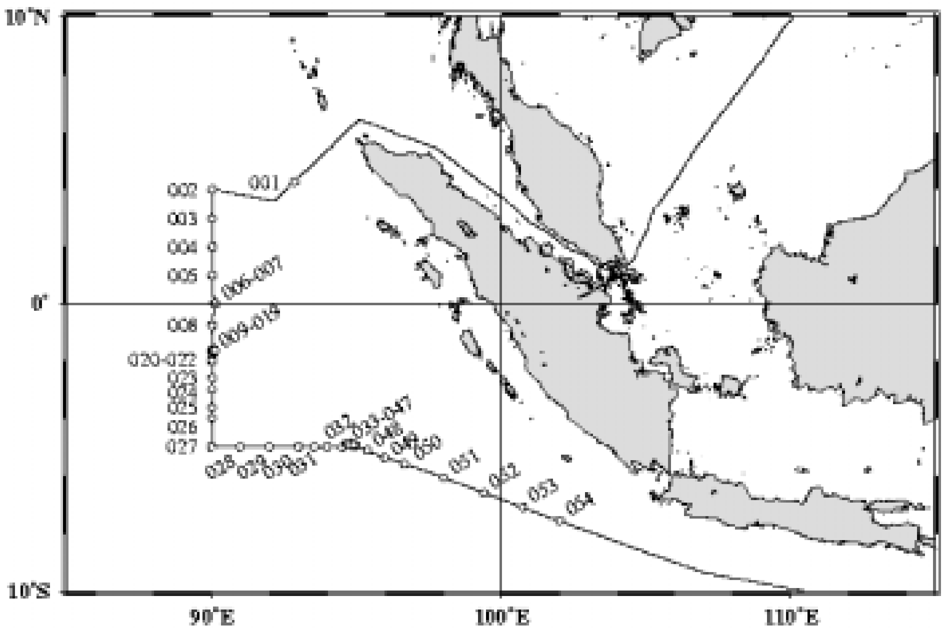


Fig. 7.8-1 Locations of rawinsonde launching along the cruise track of MR03-K03. Numbers indicated in the figure show the observation number listed in Table 7.8-1.

Table 7.7-1 Rawinsonde Observation Log

No.	Date & Time (UTC)				Position		Surface Data					Maximum Altitude		Cloud Amount & Type	
					Lon. E	Lat. N	P	T	RH	WD	WS				
	YY	MM	DD	HH	(deg.)	(deg.)	(hPa)	(deg. C)	(%)	(deg.)	(m/s)	(hPa)	(gpm)		
RS-001	03	07	09	06	92.85	4.26	1008.6	25.0	89	200	4.0	22.1	25797	10	Cu, St, Ac
RS-002	03	07	10	00	90.01	3.99	1007.2	26.9	83	215	7.0	30.3	23734	8	Cu, Cg, Ac, As
RS-003	03	07	10	06	90.00	2.98	1007.8	26.6	84	245	10.3	18.8	26869	8	Cu, Cb, Ns, Ac
RS-004	03	07	10	12	90.01	1.99	1006.8	27.7	80	256	9.0	34.2	22959	9	Cu, Ac, As
RS-005	03	07	10	18	90.01	0.99	1008.8	28.1	81	299	7.5	35.6	22783	10	Cu, St
RS-006	03	07	11	00	90.07	0.01	1007.2	28.1	70	219	0.3	26.6	24554	9	Ac, As
RS-007	03	07	11	06	90.11	0.00	1007.8	29.0	69	094	1.7	26.5	24593	9	Cu, Sc, Cs
RS-008	03	07	11	12	90.02	-0.76	1006.5	28.6	72	144	2.7	36.2	22599	7	Cu, Ac, As
RS-009	03	07	11	18	90.03	-1.67	1007.8	28.4	75	124	5.0	32.0	23429	7	Cu, Ac, As
RS-010	03	07	12	00	90.05	-1.75	1006.9	28.2	74	97	3.4	23.7	25273	7	Cu, Sc, Ac
RS-011	03	07	12	03	90.01	-1.69	1007.8	28.9	73	145	2.6	41.4	21844	7	Cu, Ac, As
RS-012	03	07	12	06	90.02	-1.67	1007.8	28.7	74	145	6.8	19.8	26447	8	Cu, Cg, Ac
RS-013	03	07	12	09	90.09	-1.58	1005.8	29.0	74	121	5.5	29.5	23900	6	Cu, Sc, Ns, Cs
RS-014	03	07	12	12	90.00	-1.64	1006.4	28.8	76	130	7.0	35.3	22767	6	Cu, Cg, Ns, Cs
RS-015	03	07	12	15	90.03	-1.60	1008.8	28.1	76	162	4.0	35.8	22711	9	Cu, Cb, Sc, Ac
RS-016	03	07	12	18	90.04	-1.59	1009.7	25.2	90	340	8.6	445.9	6760	--	Unknown
RS-017	03	07	12	21	90.07	-1.59	1007.8	25.7	84	306	0.7	--	--	--	Unknown
RS-018	03	07	13	00	90.09	-1.60	1008.1	25.7	81	155	3.5	117.7	15592	8	Cu, Ac, As
RS-019	03	07	13	03	90.10	-1.63	1009.9	26.9	77	170	4.1	23.6	25329	5	Sc, As, Cs
RS-020	03	07	13	06	90.02	-1.94	1008.6	27.5	79	135	4.5	27.6	24320	6	Cu, Sc, As, Cs
RS-021	03	07	13	09	89.99	-1.99	1008.9	28.5	74	135	4.3	48.7	20797	4	Cu, Ac, Cs
RS-022	03	07	13	12	90.01	-1.99	1005.9	28.6	75	126	8.0	37.0	22466	4	Cu, Cb, Ac, Ci
RS-023	03	07	13	15	90.01	-2.60	1006.8	28.6	77	114	10.1	--	--	--	Unknown
RS-024	03	07	13	18	90.00	-2.99	1007.8	28.4	76	120	8.6	29.4	23942	2	Cu, Cb, Ci
RS-025	03	07	13	21	90.00	-3.62	1007.0	28.3	75	135	5.7	28.6	24077	10	Cu, Ac
RS-026	03	07	14	00	90.00	-3.99	1006.9	28.1	76	125	6.5	59.1	19617	3	Cu, As
RS-027	03	07	14	06	89.99	-5.00	1008.3	28.7	75	109	7.5	28.7	24043	3	Cu
RS-028	03	07	14	12	90.99	-4.99	1006.3	28.6	77	114	8.5	37.7	22368	3	Cu, Ns, As
RS-029	03	07	14	18	91.99	-4.99	1008.4	28.2	80	108	9.3	32.4	23338	7	Cu, Ac
RS-030	03	07	15	00	92.99	-4.99	1006.7	28.2	76	096	10.3	27.6	24306	--	Unknown
RS-031	03	07	15	03	93.54	-4.99	1008.8	26.8	85	087	12.4	23.5	25389	--	Unknown
RS-032	03	07	15	06	93.98	-5.00	1008.3	27.0	83	111	10.3	37.0	22485	9	Cu, Ac
RS-033	03	07	15	09	94.49	-5.02	1006.4	28.0	80	121	11.4	46.8	21014	8	Cu, Cg
RS-034	03	07	15	12	94.97	-4.95	1007.0	28.3	79	124	11.2	31.4	23523	9	Cu, Sc, Ns, Ac
RS-035	03	07	15	15	94.93	-4.92	1009.5	27.5	82	120	9.7	37.0	22501	6	Cu, Ns, Ac, As
RS-036	03	07	15	18	94.84	-4.88	1010.4	27.8	80	126	12.7	559.3	4982	10	Cu, Cb
RS-037	03	07	15	21	94.87	-4.91	1010.3	25.5	82	46	8.7	492.2	5993	10	Cu, Cb
RS-038	03	07	16	00	94.88	-4.95	1009.0	27.8	73	117	9.3	29.1	24004	3	Cu, Cb, Ac, As
RS-039	03	07	16	03	94.88	-4.95	1010.8	28.5	71	109	11.1	26.6	24542	4	Cu, Ac
RS-040	03	07	16	06	94.89	-4.93	1010.5	28.4	69	109	10.3	28.5	24143	8	Cu, As
RS-041	03	07	16	09	94.86	-4.92	1009.2	28.5	68	109	9.2	30.5	23693	9	Cu, Sc, Ci
RS-042	03	07	16	12	94.76	-4.90	1009.6	28.3	72	92	10.8	32.2	23362	7	Cu, Sc, As, Cs
RS-043	03	07	16	15	94.65	-4.89	1011.1	28.2	73	103	9.8	351.2	8555	2	Cu, AS
RS-044	03	07	16	18	94.66	-4.89	1009.6	28.0	75	117	13.2	30.2	23778	3	Cu, As
RS-045	03	07	16	21	94.73	-4.93	1007.8	27.8	74	109	10.7	33.9	23035	4	Cu, Ac
RS-046	03	07	17	00	94.90	-4.93	1009.5	27.6	70	109	11.7	30.5	23674	4	Cu, Sc
RS-047	03	07	17	03	94.88	-4.93	1010.9	28.4	69	116	10.6	27.7	24316	3	Cu, As
RS-048	03	07	17	06	95.39	-5.13	1010.2	27.9	68	105	11.3	28.5	24136	3	Cu
RS-049	03	07	17	09	95.99	-5.38	1008.0	27.8	69	101	12.0	--	--	2	Cu
RS-050	03	07	17	12	96.65	-5.59	1008.6	27.6	70	92	10.0	30.6	23687	--	Unknown
RS-051	03	07	17	18	98.02	-6.08	1010.8	27.1	74	100	9.4	29.6	23895	--	Unknown
RS-052	03	07	18	00	99.40	-6.59	1010.2	27.0	78	115	8.3	29.7	23842	4	Cu, Sc
RS-053	03	07	18	06	100.74	-7.10	1010.1	27.0	71	111	9.3	27.9	24249	2	Cu, Ci
RS-054	03	07	18	12	102.01	-7.57	1009.1	26.4	68	110	8.2	29.9	23841	2	Cu

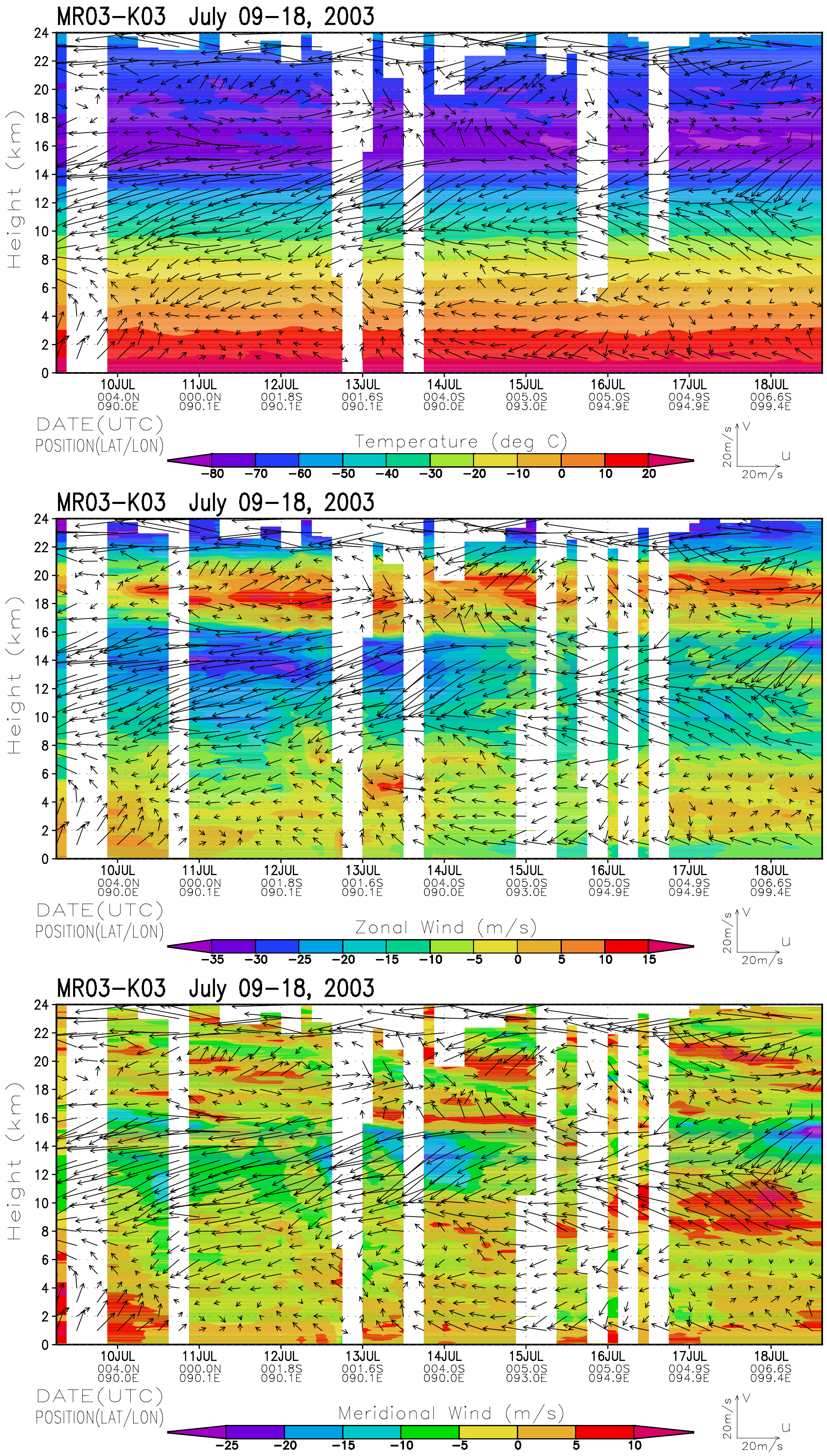


Fig. 7.8-2 Time-height cross sections of temperature (upper panel), zonal wind component (middle panel), and meridional wind component (lower panel), respectively.

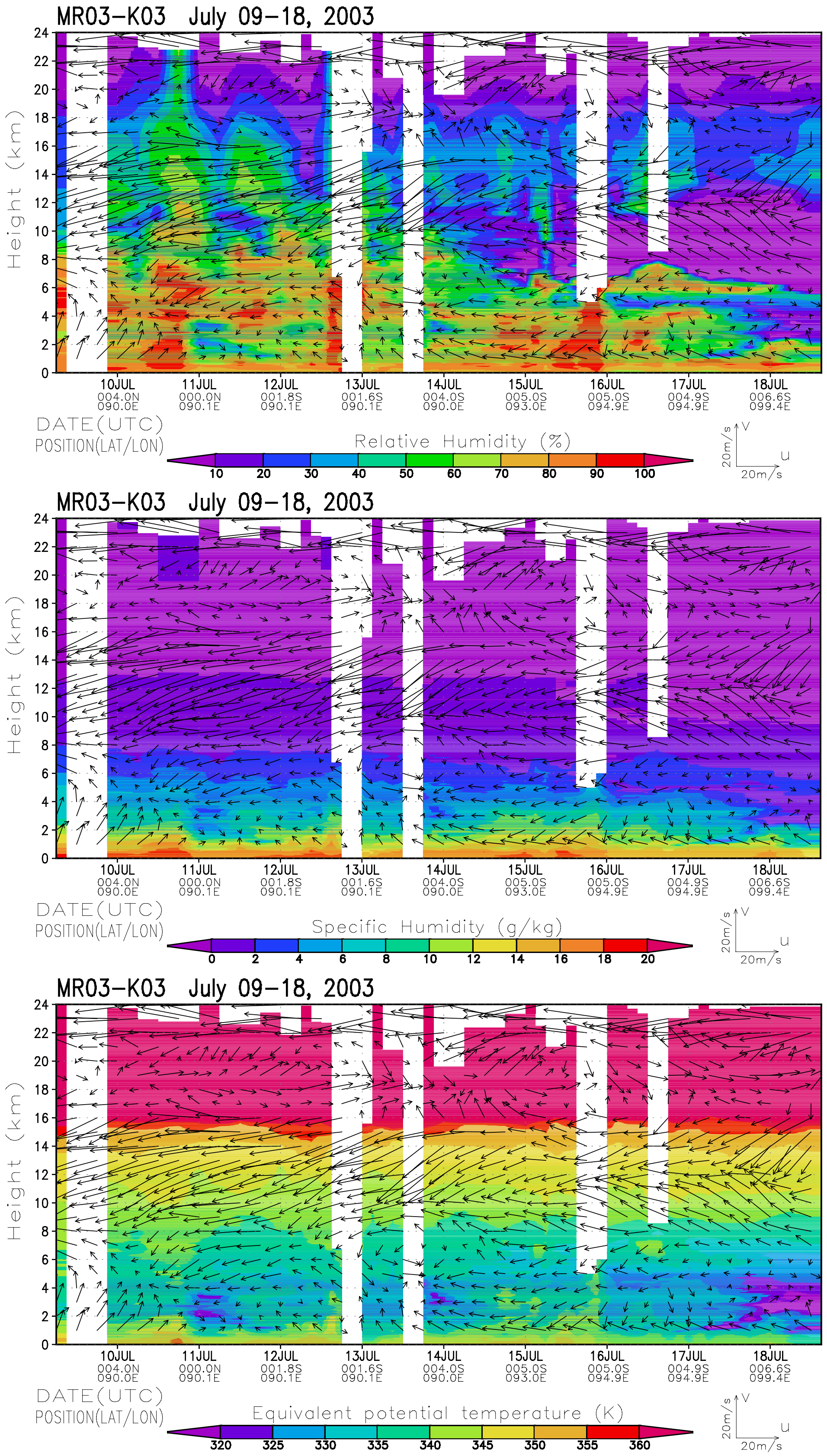


Fig. 7.8-2 (continued) Time-height cross sections of relative humidity (upper panel), specific humidity (middle panel), and equivalent potential temperature (lower panel), respectively.

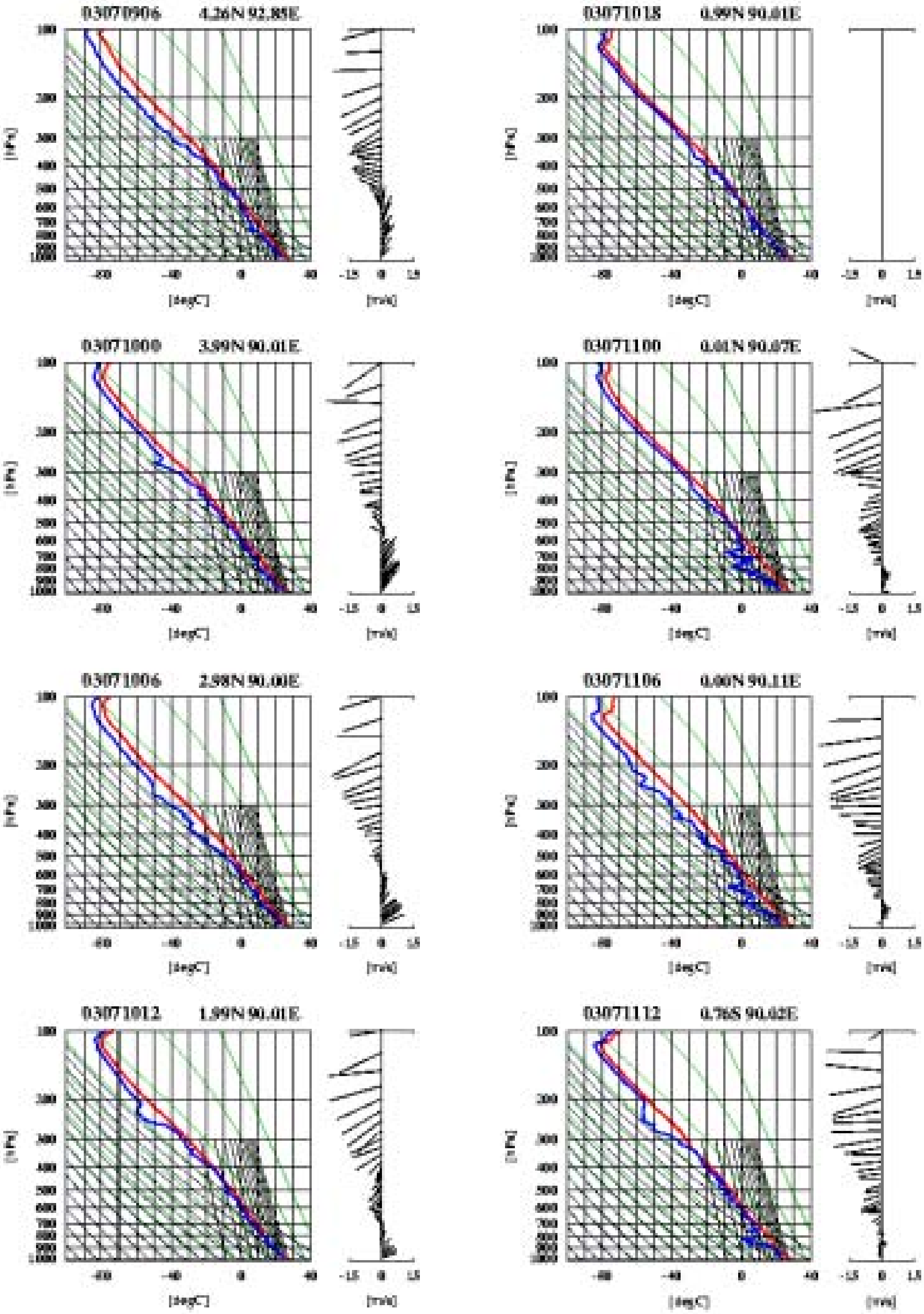


Fig. 7.8-3 Vertical profiles of temperature (red line) and dew-point temparature (blue line) described on the emagram. Wind direction and speed are indicated by vector on the right hand of each panel.

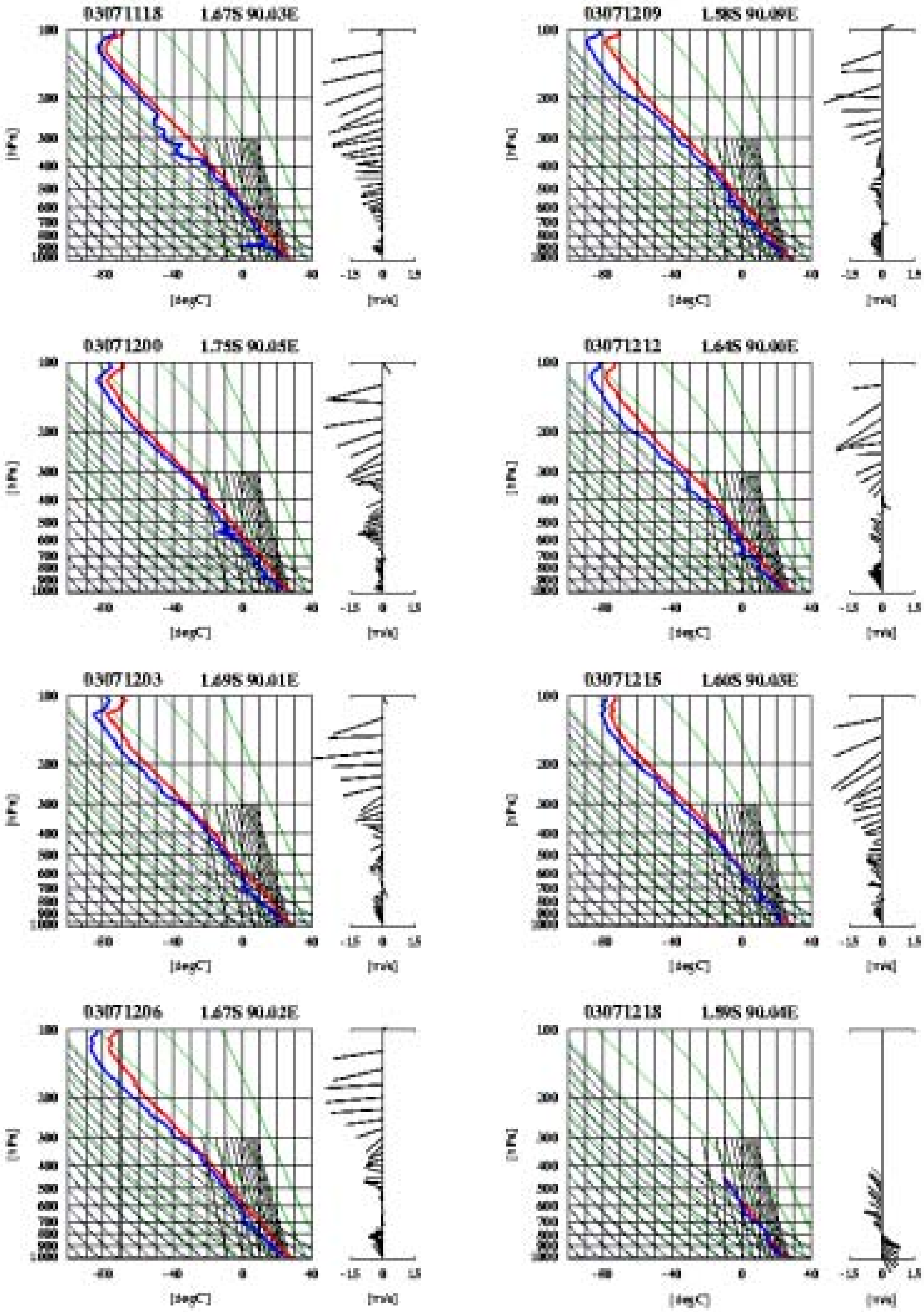


Fig. 7.8-3 (continued)

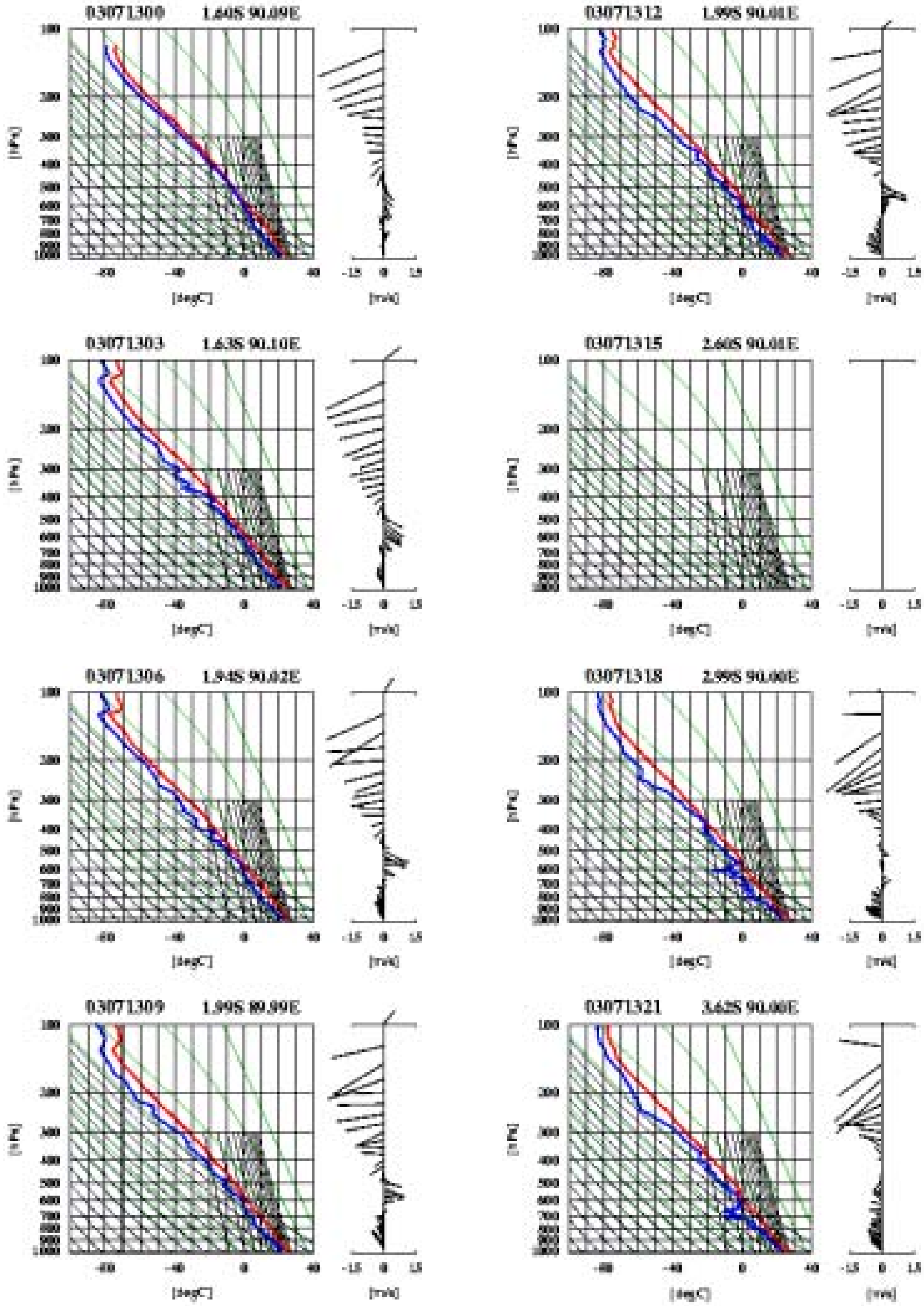


Fig. 7.8-3 (continued)

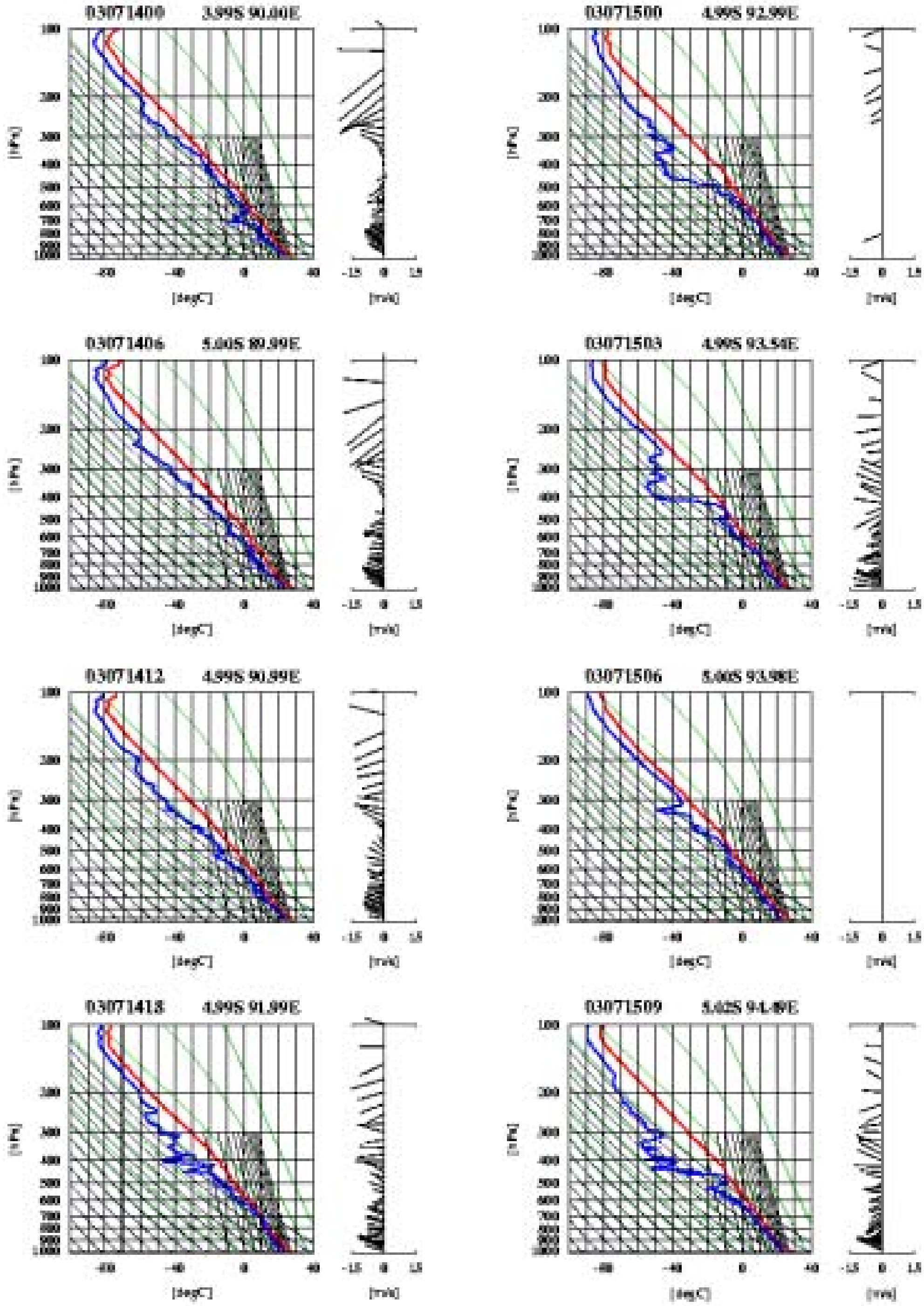


Fig. 7.8-3 (continued)

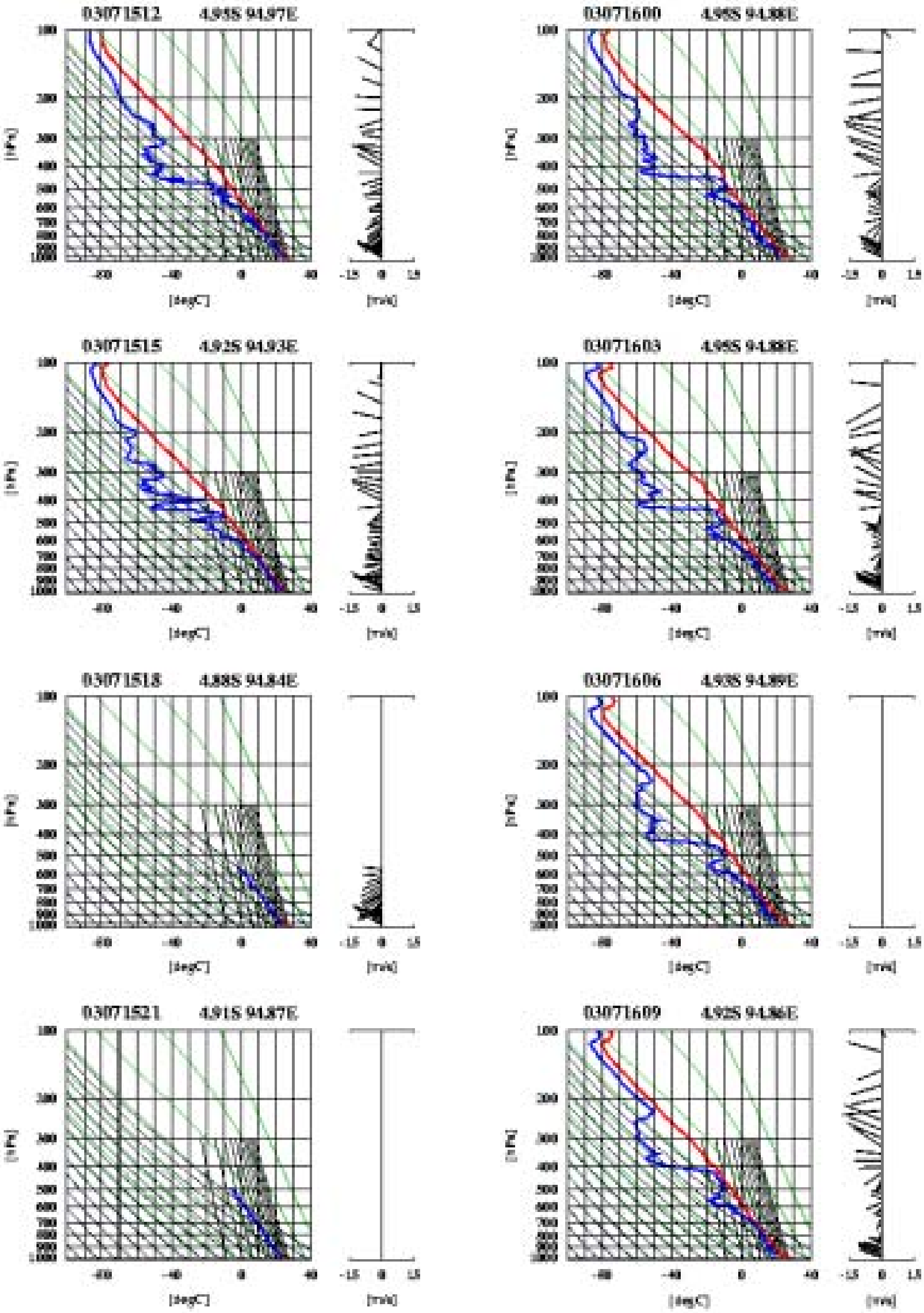


Fig. 7.8-3 (continued)

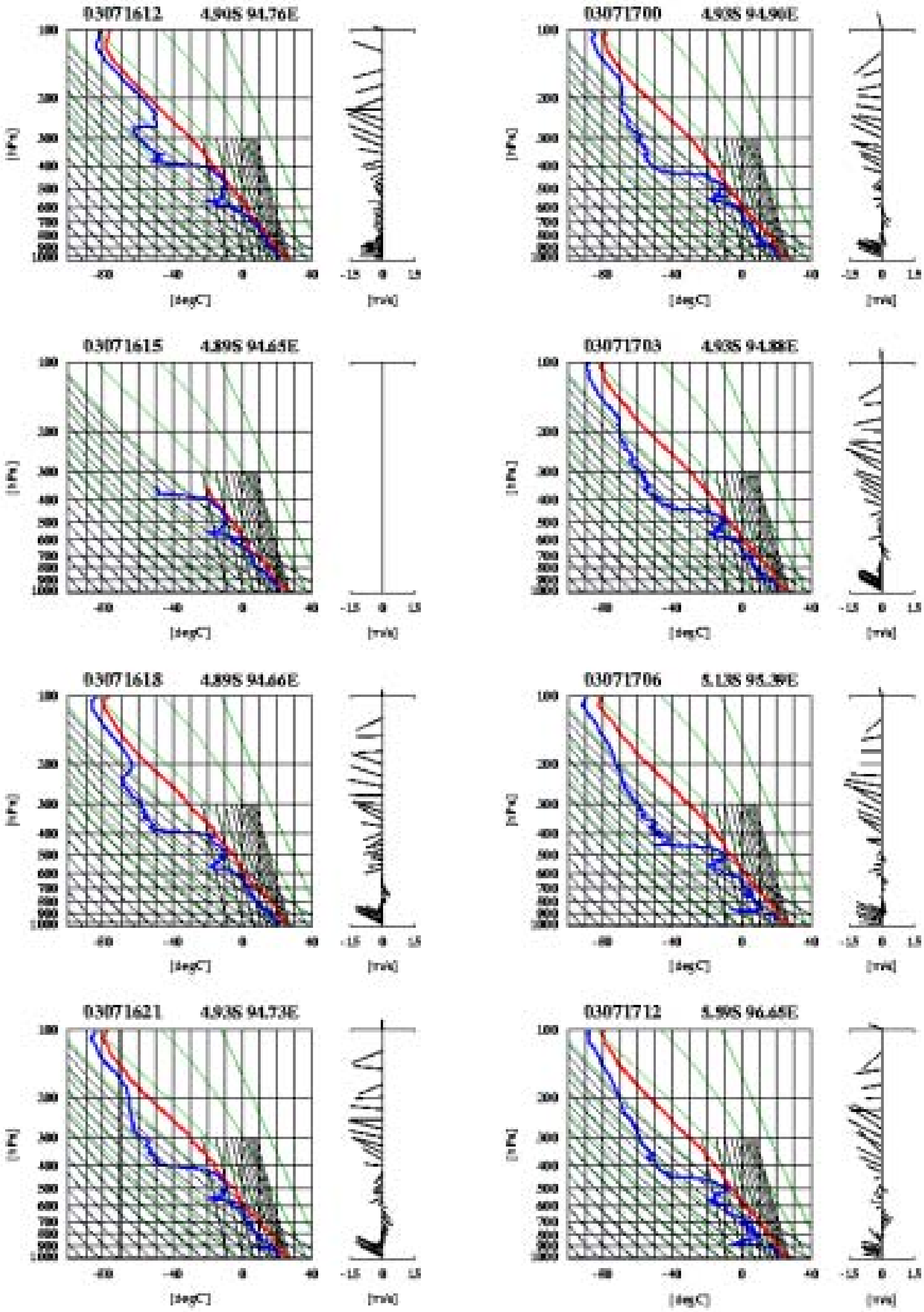


Fig. 7.8-3 (continued)

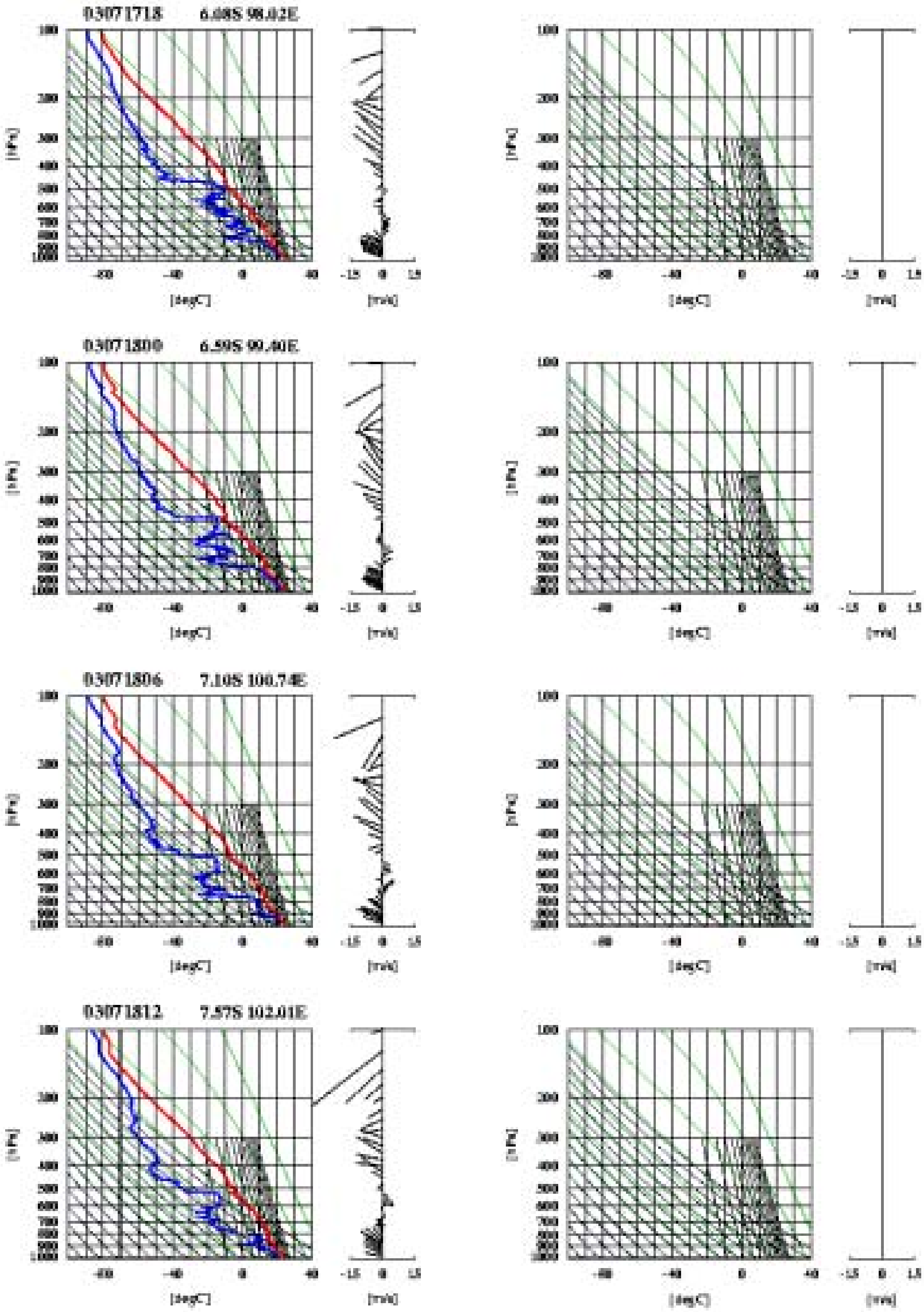


Fig. 7.8-3 (continued)

7.9 Observation of Rainfall Drop Size Distribution

(1) Personnel

Shuichi Mori (FORSGC): Principal Investigator
Hamada Jun-Ichi (FORSGC)
Satoshi Okumura (GODI)
Norio Nagahama (GODI)
Ryo Kimura (GODI)

(2) Objective

Rainfall Drop Size Distribution (DSD) data is obtained to study rainfall characteristics, that vary with its originated precipitating cloud system, i.e., clouds type (convective and stratiform) and development stage of precipitating clouds system (developing, mature, and dissipating). Both temporal and spatial variations of DSD characteristics are also interested over the Indian Ocean during the Indian monsoon season.

(3) Method

An optical type disdrometer (Parsivel M300) was installed over the anti-rolling system on the navigation deck of the vessel as shown in Fig. 7.9-1. The range of drop diameters that can be measured spans from 0.1 mm to 20 mm. DSD data are collected then recorded every one minute with 32 drop size classes.

(4) Preliminary results

Continuous observation of DSD has been carried out except over the Chinese EEZ. The detailed analyses with other obtained datasets are in future work after the quality check.

(5) Data archive

Original samples will be preserved at Frontier Observational Research System for Global Change (FORSGC). Both inventory information and analyzed dataset will be submitted to JAMSTEC Data Management Office (DMO).

Fig. 7.9-1 Look of the Persivel M300 sensor installed over the anti-rolling system on the navigation deck.

7.10 Particulate carbonaceous substances and ozone in the remote marine atmosphere

(1) Personnel

Mitsuo Uematsu (Ocean Research Institute, The University of Tokyo): Principal Investigator

Kiyoshi Matsumoto (Ocean Research Institute, The University of Tokyo / Japan Science and Technology Corporation)

(2) Objectives

The potential influence of increasing tropospheric aerosols on negative radiative forcing in the atmosphere has attracted considerable attention, since these aerosols may have a cooling effect through direct and indirect radiative processes, thus mitigating the global warming. In order to understand the effects of carbonaceous aerosols on climate, it is necessary to determine their geographical distributions and seasonal changes, especially over the remote ocean. In this cruise, continuous measurements of particulate carbonaceous substances were conducted over the western North Pacific Ocean. Ozone concentrations were also measured during this cruise, since ozone is a good indicator of air mass histories and photochemical activities.

(3) Methods

The concentrations of carbonaceous substances, organic carbon (OC) and elemental carbon (EC) in aerosols were measured for every 4 hours by using an Ambient Carbon Particulate Monitor (Rupprechet & Patashnick Co. Inc., Model 5400). This instrument can automatically measure the concentrations of OC and EC in aerosols by a thermal analysis. Only ambient aerosols with diameter < 2.5μm were introduced into the instrument using a PM2.5 cyclone (with a 50% effective cut-off diameter of 2.5μm) to eliminate coarse aerosols such as sea-salt particles. The inlet tube was heated at 50°C to avoid dewfall. Aerosols were collected with an impactor (with a 50% effective cut-off diameter of 0.14μm) at a flow rate of 16.7L min^{-1}. The collection plate of the impactor was heated at 50°C in order to minimize the adsorption of gaseous organic matter during sampling; therefore, large fraction of the particulate carbonaceous matters evolved below 50°C may have been lost from our measurements. The collected samples of carbonaceous matters were volatilized by heating the collection plate and then transformed to CO_2 by combustion at 750°C with an afterburner. The concentration of CO_2 was then measured by a NDIR CO_2 sensor. The heating temperatures of the collection plate were set at four stages, 200°C, 250°C, 340°C and 750°C. In this study, OC and total carbon (TC) were defined as the carbonaceous matters evolved below 340°C and below 750°C, respectively. And then, the difference between the amounts of TC and OC yielded the amount of EC.

Our preliminary experiments found that the monitor overestimates particulate OC concentration, probably due to the adsorption of organic vapors on the collection plate that is called “positive artifact”. In order to avoid the positive artifact, a parallel plate organic denuder, which is produced by Sunset Laboratory Inc., was installed at the inlet of the monitor.

The concentration of ozone was measured at 12-second intervals by using an ozone monitor (Dylec, Model 1150). The inlets of air were located on the compass deck (about 17m above the sea surface).

(4) Future Plane and Data Archives

The data of the concentrations of carbonaceous aerosols and ozone obtained in this cruise will be analyzed to determine the concentration levels of these species over each oceanic region and discuss their geographical distribution, seasonal and diurnal variations. They will be archived at Ocean Research Institute (ORI), the University of Tokyo.

7.11 Horizontal distribution and optical properties of aerosols

(1) Personnel

Principal Investigator (not on board)

Tatsuo Endoh (Tottori University of Environmental Studies)

Co-workers (not on board)

Tamio Takamura (Center of environmental remote sensing science, Chiba University)

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(2) Objectives

To clear and solve the problems of horizontal distribution and optical properties of aerosols, some observations were carried out the central region of the Northern Pacific Ocean. Furthermore, collections of the data for calibration and validation to the remote sensing data were performed simultaneously.

(3) Introduction

One of the most important objects is to collect the 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 profiles of aerosol concentration are obtained by means of extrapolation up to the scale height. It is desired to compare the integrated value of these profiles of aerosol concentration with optical thickness observed by the optical and radiative measurements (Hayasaka et al. 1998, Takamura et al.1994). Facing this object, the optical and radiative observations were carried out by mean of the Sky Radiometer providing more precise radiation data as the radiative forcing for global warming.

(4) Measuring parameters

Atmospheric optical thickness, Ångström coefficient of wavelength efficiencies, Direct irradiating intensity of solar, and forward up to back scattering intensity with scattering angles of 2-140degree and seven different wavelengths. GPS provides the position, 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.

(5) Methods

The instruments used in this work are shown as following in Table 7.11-1.

Sky Radiometer measures irradiating intensities of solar radiation through seven different filters with the scanning angle of 2-140 degree. These data will provide finally optical thickness, Ångström exponent, single scattering albado and size distribution of atmospheric aerosols with a kind of retrieval method.

Optical Particle Counter measures the size of large aerosol particle and counts the number concentration with laser light scattering method and provides the size distribution in 0.3,0.5,1.0,2.0 and 5.0 micron of diameter with real time series display graphically.

(6) Results

Information of data and sample obtained are summarized in Table 7.11-2. The sky radiometer has

been going well owing to calm and silent condition and less shivering circumstances 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 with 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 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 the time series data are displayed in real time with 5stages of size range of 0.3, 0.5, 1.0, 2.0, and 5.0 micron in diameter.

(7) Data archive
This aerosol data by the Particle Counter are able to be archived soon. However, the data of other kind of aerosol measurements are not able to be archived so soon. Data processing method will be developed and the data will be examined, arranged and finally provided as available data after certain duration. All data will be 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.

Data inventory

Table 7.11-1. Information of obtained data inventory (method)

Item, No. data	Name	Instrument	Site position
Optical thickness Ångström exponent.	Endoh	Sky Radiometer (Prede, POM-01MK2)	roof of stabilizer
Aerosol Size distribution	Endoh	Particle Counter (Rion, KC-01C)	compass deck (inlet) & environmental research laboratory

Table 7.11-2. Data and sample inventory

Data/Sample	rate	site	object	name	state	remarks
Sun & Sky Light	1/5min (fine& daytime)	roof of stabilizer	optical thickness Ångström expt.	Endoh	land analysis	06/07-07/30