Preliminary Report
of
The Hakuho Maru Cruise KH-96-5
(Piscis Austrinus Expedition)

December 19, 1996 - February 18, 1997

Studies on Ocean Flux in the Eastern Indian Ocean and its Adjacent Seas

Ocean Research Institute
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By
The Scientific Members of the Expedition

Edited by
Toshitaka GAMO

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1. Introduction

The *Hakuho Maru* KH-96-5 cruise, which is nicknamed "Piscis Austrinus Expedition", was successfully conducted by the Ocean Research Institute, University of Tokyo, from 19 December 1996 to 18 February 1997 (62 days) in the eastern Indian Ocean and its adjacent areas (Sulu Sea, Andaman Sea, and South China Sea).

The cruise consists of the following three legs:

Leg-1: Tokyo (19 Dec. 1996) to Fremantle (5 Jan. 1997)
Leg-2: Fremantle (11 Jan. 1997) to Penang (3 Feb. 1997)
Leg-3: Penang (7 Feb. 1997) to Tokyo (18 Feb. 1997)

The main purposes of the cruise are: (1) investigation of geochemical processes affecting ocean fluxes through atmosphere, ocean and bottom sediment in relation to international project JGOFS, (2) paleoceanographic studies using deep sea sedimentary records, and (3) comparison of geochemical cycles among the three marginal seas. Seawater samples as well as suspended particulate matters from surface to bottom, sedimentary core samples, and atmospheric samples (air, rain water, aerosol) were taken for analyzing various chemical components, such as dissolved gases, trace elements, stable and radioactive isotopes, etc. on board the ship and in shorebased laboratories.

The initial plan of this cruise was made in detail by Professor Yoshiyuki NOZAKI (Ocean Research Institute, University of Tokyo), who regrettably had to give up his participation in the cruise because of incomplete recovery from his illness. We are much grateful for his supervision and useful suggestion.

Besides fourty-one shipboard scientists (including graduate students) from various universities and institutes in Japan and Philippines, two officers, one from Philippines (Mr. Ildefonso S. Pascual, Jr.) and the other from India (Lieutenant Indu Prakash), took part in the cruise for inspection, because the station in the Sulu Sea (PA-1) and that in the Andaman Sea (PA-10) are included in the exclusive economic zones of Philippines and India, respectively. The Governments of Philippines and India kindly gave us permissions to carry out the oceanographic works in these stations. We sincerely acknowledge Monbusho (the Ministry of Education, Science, Sports and Culture) and the Ministry of Foreign Affairs for their many official efforts to get the permissions in time.

It is our great pleasure to thank Captain Yoichi JINNO, the officers and crew of R.V. *Hakuho Maru* for their invaluable collaboration in the successful conduct of all shipboard works. Thanks are also due to Ms. Mie Kaneko for her help in editorial works to publish this cruise report.

Toshitaka GAMO (Chief Scientist)
and the Shipboard Scientific Party

2. Caution about the data included herein

Data in this preliminary report should be treated as carefully as possible, in order to protect the priority of the cruise participants.

Confidential and publication policies are as follows:

(1) No one other than the cruise participants can submit papers or give oral (or poster) presentations using any data in this report within 24 months after the completion of the cruise (18 Feb. 1997).

(2) Although all data included in this report is common to the cruise participants, primary investigators of each study item have higher priority to use their data.

(3) Any questions or problems on the publication policy should be forwarded to the chief scientist.

There may be some misprints or mistakes to be corrected later in this report. If any misprint or mistake is found, kindly inform the chief scientist, who is responsible for distributing the cruise report to all the cruise participants.

3. List of the cruise participants

3-1. List of scientists

(Family name)	(First name)	(Affiliation)	Leg-1	Leg-2	Leg-3
ALIBO	Dia Sotto	University of Tokyo	○	○	○
AMAKAWA	Hiroshi	University of Tokyo	○	○	○
AONO	Tatsuo	National Institute of Radiological Sciences	○	○	
GAMO*	Toshitaka	University of Tokyo	○	○	○
HAQUE	Mohammad Azizul	Kanazawa University	○	○	○
HASUMOTO	Hiroshi	University of Tokyo	○	○	○
HATTORI	Hiroshi	Kinki University	○	○	○
HAYASHI	Kazuhiro	Hokkaido University		○	○
ICHIKAWA	Masaaki	Science University of Tokyo	○		
IKEHARA	Yosuke	Keio University	○		
ISSHIKI	Kenji	Kochi Women's University	○		
JORDAN	Richard W.	Yamagata University	○	○	
KAKIUCHI	Hideki	Kyushu University	○	○	○
KATO	Yoshihisa	Tokai University	○	○	
KIMOTO	Katsunori	University of Tokyo		○	○
KIMURA	Munehito	Kinki University	○	○	○
KOBAYASHI	Takayuki	Nihon University	○	○	
KOJIMA	Hiroshi	Science University of Tokyo			○
KURAMOTO	Toshikatsu	Hokkaido University	○		
LI	Hong-Jun	University of Tokyo	○		
MANAKA	Toshiki	University of Tokyo	○		
MARUO	Masahiro	University of Shiga Prefecture	○		
MINAMI	Hideki	Hokkaido Tokai University		○	○
MIURA	Kazuhiko	Science University of Tokyo		○	
MORI	Koji	Kyoto University	○	○	○
MURAYAMA	Masafumi	Hokkaido University		○	○
NAGATO	Toru	Muroran Institute of Technology	○	○	○
NAKAGUCHI	Yuzuru	Kinki University	○		
NAKANISHI	Takasi	Kanazawa University	○	○	
NAKAYAMA	Eiichiro	University of Shiga Prefecture		○	
NARITA	Hisashi	Hokkaido University	○	○	
NARITA	Yasushi	Keio University		○	
OBATA	Hajime	Kyoto University	○	○	
OKUNO(EGUCHI)	Nobuhisa	University of Tokyo	○		
PASCUAL	Ildefonso S., Jr.	National Mapping & Resource Information Authority	○		
PRAKASH	Indu	Navy Office, Port Blair, India		○**	
SISTER	Maria Chona	University of San Carlos	○		
SOHRIN	Yoshiki	Kanazawa University		○	
TADAI	Osamu	University of Tokyo		○	○
TAKEDA	Kazuhiko	Hiroshima University			○
TSUNOGAI	Urumu	University of Tokyo		○	
YAMADA	Masatoshi	National Institute of Radiological Sciences	○	○	○
YAMAMOTO	Yoshiyuki	University of Tokyo	○	○	○
ZHANG	Jing	National Institute of Radiological Sciences	○	○	○

(*Chief Scientist) (** 30 January - 1 February, 1997)

3-2. List of crew

EBIHARA	Kaoru	Junior 2-nd Engineer
FUJITA	Ushio	3-rd Officer
HASEGAWA	Shigeyuki	Quarter Master
HATAKEYAMA	Noboru	2-nd Boatswain
HIRATSUKA	Yoshiharu	Steward
INABA	Fujio	2-nd Officer
JINNO*	Yoichi	Master
KANBE	Takanori	No. 1 Oiler
KANEKO	Yasuo	Purser
KAWAMATA	Wataru	1-st Engineer
KAWANA	Yukio	Sailor
KONNO	Hiraku	No. 3 Oiler
MUNEMURA	Takamitsu	2-nd Radio Officer
NAKAJIRI	Kenji	No. 6 Oiler
NAKAYAMA	Tomeo	No. 2 Oiler
NANBA	Kiyoshi	1-st Officer
NISHIDATE	Shintaro	Quarter Master
NISHIURA	Rikio	Associate Boatswain
NOZAWA	Takayuki	Steward
OGITA	Mitsuhiko	Ship's Doctor (2-nd leg only)
OKAMOTO	Yasuyuki	No. 5 Oiler
OKAZAKI	Hiroyuki	No. 4 Oiler
OKUBO	Suguru	Junior 3-rd Officer
SAKUMA	Seizo	Steward
SAKUMA	Yasuhiro	3-rd Engineer
SANADA	Kazumi	Steward
SASAI	Yuji	Junior 1-st Engineer
SAWAGUCHI	Minoru	Boatswain
SUGAWARA	Shin-ichi	Quarter Master
SUZUKI	Akira	Associate Boatswain
SUZUKI	Shoichi	Junior 2-nd Officer
TAKAHASHI	Yoshimitsu	2-nd Engineer
TANAKA	Yutaka	Chief Officer
UCHISHIRO	Takaaki	Sailor
YAMADA	Yasutaka	Steward
YAMAGUCHI	Yoshihiko	No. 7 Oiler
YAMANAKA	Takahiro	Machine Man
YONEDA	Hisashi	Chief Radio Officer
YOSHIDA	Sakae	Machine Man
YOSHIMURA	Takashi	Chief Engineer

(*Ship's Master)

4. Stations and track chars of the cruise

4-1. List of major stations: locations, dates, depths, and observations performed.
(For detailed information, chapter 5 should be referred to.)

Station No.	Date (yy.mm.dd - yy.mm.dd)	Latitude	Longitude	Depth* (m)	CTD-Hydrocast	Large Volume Water Sampling	In situ Filtration	Multiple Core	Piston Core
(Leg-1)									
PA-1	96.12.24 - 96.12.26	8° 50'N	121° 48'E	4,860	○	○		○	○
PA-2	96.12.31 - 97.01.01	12° 50'S	117° 00'E	5,600	○		○		
(Leg-2)									
PA-3	97.01.13	42° 19'S	112° 09'E	4,410					○
PA-4	97.01.14 - 97.01.16	40° 00'S	110° 00'E	4,610	○	○	○	○	○
PA-5	97.01.17 - 97.01.19	30° 00'S	110° 00'E	5,460	○	○	○	○	○
PA-6	97.01.20	23° 59'S	108° 22'E	2,470					○
PA-7	97.01.22 - 97.01.24	10° 00'S	102° 00'E	5,690	○	○	○	○	○
PA-8-1	97.01.27	3° 32'N	90° 17'E	2,010				○	○
PA-8-2	97.01.27	3° 40'N	90° 17'E	1,930					○
PA-9	97.01.28 - 97.01.29	8° 00'N	89° 00'E	3,600	○	○		○	○
PA-10	97.01.30 - 97.02.01	9° 52'N	94° 03'E	3,780	○	○	○	○	○
(Leg-3)									
PA-11	97.02.11 - 97.02.12	15° 22'N	115° 17'E	4,240	○	○		○	○

*These depth values are approximate ones. Correct values should be reffered to the CTD or core darta.

4-2. Track and drift charts

4-2-1. Track chart of Leg-1: Tokyo (19 Dec. 1996) to Fremantle (5 Jan. 1997)

4-2-2. Drift chart of Leg-1

4-2-3. Track chart of Leg-2: Fremantle (11 Jan. 1997) to Penang (3 Feb. 1997)

4-2-4. Drift chart of Leg-2

4-2-5. Track chart of Leg-3: Penang (7 Feb. 1997) to Tokyo (18 Feb. 1997)

4-2-6. Drift chart of Leg.3

5. Working log

```
      ----- 19 DEC.96 (GMT) -----
S-1   23:58 31°35.180N 138°04.200E 3900m  SURFACE SAMPLING START
      ----- 20 DEC.96 (GMT) -----
S-1   00:04 31°33.780N 138°03.240E 3920m  SURFACE SAMPLING FINISH
S-2   23:49 25°50.510N 134°38.660E 3849m  SURFACE SAMPLING START
S-2   23:55 25°48.980N 134°37.740E 4419m  SURFACE SAMPLING FINISH
      ----- 21 DEC.96 (GMT) -----
S-3   23:49 20°13.840N 131°23.870E 5874m  SURFACE SAMPLING START
S-3   23:53 20°12.960N 131°23.390E 5821m  SURFACE SAMPLING FINISH
      ----- 22 DEC.96 (GMT) -----
S-4   23:50 14°33.400N 128°14.010E 9754m  SURFACE SAMPLING START
S-4   23:54 14°32.460N 128°13.490E 9788m  SURFACE SAMPLING FINISH
      ----- 24 DEC.96 (GMT) -----
S-5   00:48 09°24.010N 124°33.100E 1776m  SURFACE SAMPLING START
S-5   00:52 09°23.460N 124°32.000E 1821m  SURFACE SAMPLING FINISH
PA-1  12:17 08°50.070N 121°48.600E 4857m  LV SAMPLING START
PA-1  12:39 08°50.190N 121°48.620E 4863m  CLOSED NO.1 LV
PA-1  12:49 08°50.290N 121°48.570E 4858m  CLOSED NO.2 LV
PA-1  12:56 08°50.350N 121°48.560E 4858m  CLOSED NO.3 LV
PA-1  13:02 08°50.430N 121°48.570E 4865m  CLOSED NO.4 LV
PA-1  13:06 08°50.480N 121°48.550E 4857m  LV SAMPLING FINISH
PA-1  13:39 08°49.980N 121°48.470E 4858m  LV SAMPLING START 2 ND CAST
PA-1  14:09 08°50.060N 121°48.610E 4856m  CLOSED NO.1 LV WIRE OUT 1500M
PA-1  14:16 08°50.050N 121°48.640E 4857m   LV SAMPLING NO.2 (WIRE OUT 1250 M)
PA-1  14:22 08°50.060N 121°48.640E 4859m  LV SAMPLING NO.3 (WIRE OUT 1000 M)
PA-1  14:29 08°50.060N 121°48.640E 4853m  LV SAMPLING NO.4 (WIRE OUT 750M)
PA-1  14:43 08°50.050N 121°48.670E 4859m  LV SAMPLING FINISH (2 ND CAST)
PA-1  15:19 08°49.950N 121°48.290E 4858m  LV SAMPLING START (3 RD CAST)
PA-1  16:40 08°50.390N 121°48.440E 4856m  LV SAMPLING  ( NO 1 )
PA-1  16:41 08°50.390N 121°48.440E 4859m  LV SAMPLING  ( NO 2 )
PA-1  16:46 08°50.400N 121°48.450E 4856m  LV SAMPLING  ( NO 3 )
PA-1  16:56 08°50.380N 121°48.510E 4866m  IN SITU PUMP START
PA-1  16:56 08°50.380N 121°48.520E 4870m  LV SAMPLING ( NO 4 )
PA-1  17:17 08°50.400N 121°48.600E 4858m  SURFACE SAMPLING START ( L V )
PA-1  17:43 08°50.340N 121°48.800E 4866m  SURFACE SAMPLING FINISH ( L V )
PA-1  17:57 08°50.300N 121°48.810E 4856m  LV SAMPLING FINISH
PA-1  18:04 08°50.250N 121°48.830E 4859m  IN SITU PUMP FINISH
PA-1  18:31 08°50.170N 121°48.390E 4860m  LV SAMPLING START  ( 4 TH CAST )
PA-1  18:40 08°50.260N 121°48.380E 4860m  LV SAMPLING (NO 1)
PA-1  18:44 08°50.260N 121°48.390E 4851m  LV SAMPLING ( NO 2 )
PA-1  18:46 08°50.280N 121°48.400E 4853m  LV SAMPLING (NO 3)
PA-1  18:49 08°50.300N 121°48.390E 4862m  LV SAMPLING ( NO 4 )
PA-1  18:55 08°50.340N 121°48.420E 4862m  LV SAMPLING FINISH ( 4TH  CAST)
PA-1  19:40 08°50.030N 121°48.320E 4855m  MULTI STARTED
PA-1  21:09 08°50.210N 121°48.970E 4855m  MULTI HIT BOTTOM
PA-1  22:06 08°50.380N 121°49.380E 4860m  SUNRISE & PUT OFF REGULAION LIGHTS
PA-1  22:33 08°50.450N 121°49.670E 4858m  MULTI ON DECK
PA-1  23:03 08°50.120N 121°48.470E 4850m  CTD-CAROUSEL START
      ----- 25 DEC.96 (GMT) -----
PA-1  00:54 08°50.620N 121°48.370E 4857m  CTD-CAROUSEL DEEPEST
PA-1  02:57 08°50.460N 121°48.230E 4857m  CTD-RMS FINISH
PA-1  03:14 08°49.910N 121°48.480E 4861m  PISTON CORING STARTED
PA-1  04:59 08°50.190N 121°48.160E 4856m  PISTON CORER LANDED
PA-1  05:26 08°50.340N 121°48.220E 4859m  COM`CED VIS
PA-1  05:34 08°50.410N 121°48.160E 4862m  F/W DEGREE OF CLEARNCE
PA-1  05:36 08°50.420N 121°48.150E 4853m  NORPAC NET START
PA-1  05:46 08°50.520N 121°48.100E 4857m  NORPAC NET FINISH (1)
PA-1  06:00 08°50.600N 121°47.980E 4857m  NORPAC NET START ( N56)
PA-1  06:04 08°50.640N 121°47.920E 4852m  PISTON CORING ENDED
PA-1  06:15 08°50.740N 121°47.810E 4856m  NORPAC NET START ( N56 )
PA-1  06:27 08°50.840N 121°47.710E 4864m  NORPAC NET FINISH ( N56 )
PA-1  06:52 08°49.980N 121°48.420E 4853m  CTD START + CAROUCEL
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PA-1 07:03 08°50.080N 121°48.330E 4859m COM`CED N56 NET
PA-1 07:19 08°50.240N 121°48.220E 4857m F/W N56 NET
PA-1 07:26 08°50.290N 121°48.180E 4858m COM`CED N56 NET
PA-1 07:40 08°50.420N 121°48.070E 4857m F/W IT
PA-1 07:58 08°50.590N 121°47.940E 4860m CTD FINISH +CAROUSEL
PA-1 08:11 08°50.740N 121°47.820E 4853m TESTING NO
PA-1 08:47 08°51.080N 121°47.550E 4852m FINISHEDE IT
PA-1 09:11 08°50.030N 121°48.560E 4861m NISKIN SAMPLING START
PA-1 09:42 08°50.360N 121°48.500E 4853m NISKIN SAMPLING SEND MESS
PA-1 09:42 08°50.370N 121°48.500E 4851m SUNSET & PUT ON REGULATION LIGHTS
PA-1 09:49 08°50.420N 121°48.480E 4857m NISKIN SAMPLING ARR MESS
PA-1 10:10 08°50.640N 121°48.380E 4860m NISKIN SAMPLING FINISH
PA-1 10:49 08°50.220N 121°48.440E 4861m LV SAMPLING START
PA-1 11:07 08°50.360N 121°48.430E 4863m NORPAC NET START (N-56)
PA-1 11:32 08°50.630N 121°48.440E 4858m NORPAC NET START (N-56 2ND)
PA-1 11:46 08°50.780N 121°48.370E 4860m NORPAC NET FINISH
PA-1 11:51 08°50.820N 121°48.340E 4854m CLOSED NO.1
PA-1 11:55 08°50.840N 121°48.310E 4862m NORPAC NET START (N-56
PA-1 12:07 08°50.910N 121°48.220E 4858m LV SAMPLING NO.2 (WIRE OUT 300 M)
PA-1 12:07 08°50.910N 121°48.210E 4859m NORPAC NET FINISH (3 RD TIMES)
PA-1 12:18 08°50.940N 121°48.150E 4857m LV SAMPLING NO.3 (WIRE OUT 2500 M)
PA-1 12:28 08°50.950N 121°48.150E 4853m LV SAMPLING NO.4 (WIRE OUT 2000 M)
PA-1 12:57 08°51.110N 121°48.020E 4861m LV SAMPLING FINISH
PA-1 13:33 08°49.790N 121°48.450E 4860m LV SAMPLING START (6 TH CAST)
PA-1 13:40 08°49.800N 121°48.350E 4856m LV SAMPLING NO.1 (WIRE OUT 60 M)
PA-1 13:43 08°49.800N 121°48.340E 4859m LV SAMPLING NO.2 (WTRE OUT 40 M)
PA-1 13:46 08°49.810N 121°48.310E 4868m LV SAMPLING NO.3 (WIRE OUT 20 M)
PA-1 13:49 08°49.810N 121°48.290E 4852m LV SAMPLING NO.4 (WIRE OUT 10 M)
PA-1 13:52 08°49.810N 121°48.260E 4861m LV SAMPLING FINISH
PA-1 14:25 08°50.090N 121°48.750E 4862m LV SAMPLING START (7 TH CAST)
PA-1 14:39 08°50.050N 121°48.750E 4859m LV SAMPLING NO.1 (WIRE OUT 500 M)
PA-1 14:44 08°50.070N 121°48.760E 4857m LV SAMPLING NO.2 (WIRE OUT 300 M)
PA-1 14:48 08°50.040N 121°48.740E 4858m LV SAMPLING NO.3 (WIRE OUT 200 M)
PA-1 14:52 08°50.050N 121°48.770E 4861m LV SAMPLING NO.4 (WIRE OUT 100 M)
PA-1 14:57 08°50.010N 121°48.750E 4860m LV SAMPLING FINISH
PA-1 15:27 08°49.940N 121°48.680E 4858m LV SAMPLING START (8 TH TIME CAST)
PA-1 16:25 08°50.010N 121°48.560E 4858m LV SAMPLING NO.1 (WIRE OUT 4000 M)
PA-1 16:51 08°50.020N 121°48.570E 4855m LV SAMPLING (NO 2) WIRE OUT 2000M
PA-1 17:05 08°50.040N 121°48.540E 4855m LV SAMPLING (NO 3) WIRE OUT 1000M
PA-1 17:07 08°50.040N 121°48.540E 4857m LV SAMPLING (NO 4) WIRE OUT 1000M
PA-1 17:23 08°50.020N 121°48.530E 4862m LV SAMPLING FINISH
PA-1 17:57 08°49.990N 121°48.460E 4860m LV SAMPLING START (9 CAST)
PA-1 18:23 08°50.040N 121°48.470E 4861m LV SAMPLING (NO 1 WIRE OUT 1500M
PA-1 18:30 08°50.030N 121°48.470E 4862m LV SAMPLING (NO 2) WIRE OUT 1200M
PA-1 18:35 08°50.060N 121°48.480E 4856m LV SAMPLING (NO 3) WIRE OUT 1000M
PA-1 18:40 08°50.060N 121°48.500E 4857m LV SAMPLING (NO 4) WIRE OUT 800M
PA-1 18:52 08°50.090N 121°48.550E 4857m LV SAMPLING FINISH (9TH)
----- 26 DEC.96 (GMT) -----
S-7 00:50 07°42.010N 120°52.670E 4170m SURFACE SAMPLING START
S-7 00:52 07°41.520N 120°52.260E 4170m SURFACE SAMPLING FINISH
----- 28 DEC.96 (GMT) -----
S-9 00:53 04°14.020S 117°53.430E 1995m SURFACE SAMPLING START
S-9 00:55 04°14.430S 117°53.200E 2001m SURFACE SAMPLING FINISH
----- 31 DEC.96 (GMT) -----
PA-2 05:58 12°41.800S 117°30.560E 5604m LV SAMPLING START
PA-2 06:41 12°42.020S 117°30.200E 5611m F/W REPAIR OF NO1 WINCH
PA-2 08:36 12°42.360S 117°29.280E 5606m LV SAMPLING NO 1 (W.O 3000M)
PA-2 09:18 12°42.220S 117°28.990E 5610m LV SAMPLING (NO
PA-2 09:41 12°42.190S 117°28.760E 5603m LV SAMPLING (NO
PA-2 09:55 12°42.150S 117°28.610E 5605m LV SAMPLING (NO
PA-2 10:40 12°42.050S 117°28.350E 5605m SUNSET & PUT ON REGULATION LIGHTS
PA-2 10:56 12°42.000S 117°28.240E 5604m LV SAMPLING FINISH

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    ----- 01 JAN.97 (GMT) -----
PA-2  06:45 12°50.110S 116°59.980E 5600m  CTD-RMS START (SHALLOW)
PA-2  07:11 12°50.270S 116°59.840E 5566m  CTD-RMS DEEPEST
PA-2  07:50 12°50.540S 116°59.680E 5544m  CTD-RMS FINISH ( SHALLOW)
    ----- 02 JAN.97 (GMT) -----
S-    00:55 16°43.730S 115°12.900E 2079m  SURFACE SAMPLING START
S-11  00:59 16°44.830S 115°12.410E 2002m  SURFACE SAMPLING FINISH
    ----- 03 JAN.97 (GMT) -----
S-12  01:03 22°51.670S 112°30.020E 1624m  SURFACE SAMPLING START
S-12  01:06 22°52.520S 112°30.010E 1572m  SURFACE SAMPLING FINISH
    ----- 12 JAN.97 (GMT) -----
S-14  00:49 36°07.230S 113°55.850E 5448m  SURFACE SAMPLING START
S-14  00:53 36°08.370S 113°55.570E 5468m  SURFACE SAMPLING FINISH
    ----- 13 JAN.97 (GMT) -----
S-15  00:55 42°05.460S 112°12.820E 4346m  SURFACE SAMPLING FINISH
S-15  01:57 42°21.030S 112°07.940E 4290m  FULL AHEAD ENG
PA-3  02:22 42°18.470S 112°08.600E 4419m  CHANGED PROPULSION TO ELECTRIC MOTO
PA-3  02:36 42°18.530S 112°08.790E 4407m  PISTON CORING STARTED
PA-3  03:03 42°18.600S 112°08.780E 4397m  NORPAC NET START
PA-3  03:06 42°18.630S 112°08.740E 5102m  HOVE UP PISTON CORER FOR CHECK THE
PA-3  03:20 42°18.660S 112°08.660E 4409m  NORPAC NET FINISH
PA-3  03:20 42°18.660S 112°08.660E 4406m  NORPAC NET START
PA-3  03:42 42°18.770S 112°08.540E 4485m  NORPAC NET FINISH
PA-3  03:48 42°18.770S 112°08.550E 4432m  N-56 NET STARTED
PA-3  04:03 42°18.780S 112°08.540E 4473m  N-56 NET FINISHED
PA-3  04:42 42°19.010S 112°08.430E 4398m  PISTON CORER LANDED
PA-3  05:54 42°18.870S 112°08.470E 4405m  PISTON CORING ENDED
    ----- 14 JAN.97 (GMT) -----
S-16  00:57 41°52.610S 110°39.980E 4434m  SURFACE SAMPLING START
S-16  01:02 41°51.370S 110°39.520E 4279m  SURFACE SAMPLING FINISH
PA-4  08:22 39°59.940S 110°00.040E 4627m  CTD-CAR START (DEEP)
PA-4  09:51 40°00.390S 110°00.180E    3m  CTD+CAROUSEL DEEPEST
PA-4  10:21 40°00.530S 110°00.280E 7204m  NORPAC NET START
PA-4  10:35 40°00.640S 110°00.380E 7305m  NORPAC NET FINISH
PA-4  10:39 40°00.670S 110°00.400E 7371m  DEGREE OF CLEARNCE
PA-4  10:46 40°00.690S 110°00.470E 7556m  NORPAC NET START (N-56)
PA-4  10:56 40°00.740S 110°00.570E    3m  NORPAC NET FINISH
PA-4  11:01 40°00.780S 110°00.600E 7252m  NORPAC NET START (N-56)
PA-4  11:12 40°00.820S 110°00.700E 6641m  NORPAC NET FINISH
PA-4  11:22 40°00.860S 110°00.720E    3m  CTD+CAROUSEL FINISH
PA-4  11:58 40°00.180S 109°59.820E 4611m  LV SAMPLING START
PA-4  12:07 40°00.290S 109°59.750E 4806m  LV SAMPLING NO.1
PA-4  12:09 40°00.310S 109°59.720E 4615m  LV SAMPLING NO.2
PA-4  12:11 40°00.310S 109°59.710E 4611m  LV SAMPLING NO.3
PA-4  12:15 40°00.360S 109°59.710E 4620m  LV SAMPLING NO.4 (50 M)
PA-4  12:19 40°00.390S 109°59.690E 4619m  LV SAMPLING FINISH
PA-4  12:51 40°00.100S 110°00.220E 4617m  LV SAMPLING START (1000 M
PA-4  13:25 40°00.360S 110°00.040E 4610m  LV SAMPLING NO.1 (1500 M)
PA-4  13:27 40°00.360S 110°00.050E 4611m   LV SAMPLING NO.2 (1500 M)
PA-4  13:47 40°00.400S 110°00.010E 4620m  LV SAMPLING NO.3 (200 M)
PA-4  13:49 40°00.420S 110°00.010E 4619m  LV SAMPLING NO.4 LV (200 M)
PA-4  13:57 40°00.470S 109°59.970E 4611m  LV SAMPLING FINISH 2 ND TIMES
PA-4  14:27 40°00.170S 110°00.260E 4620m  LV SAMPLING START (1250.1000.750.15
PA-4  14:45 40°00.180S 110°00.070E 4611m  IN SITU PUMP START
PA-4  14:55 40°00.230S 110°00.000E 4608m  LV SAMPLING NO.1 (1250 M)
PA-4  15:01 40°00.250S 109°59.980E 4607m  LV SAMPLING NO.2 (1000 M)
PA-4  15:07 40°00.260S 110°00.010E 4606m  LV SAMPLING NO.3 (750 M)
PA-4  15:17 40°00.300S 109°59.970E 4602m  LV SAMPLING NO.4 (150 M)
PA-4  15:21 40°00.340S 109°59.920E 4611m  LV SAMPLING FINISH
PA-4  15:49 40°00.150S 110°00.120E 4618m  LV SAMPLING START (BOTTOM
PA-4  16:43 40°00.370S 109°59.880E 4612m  IN SITU PUMP FINISH
PA-4  17:38 40°00.680S 109°59.550E 4619m  LV SAMPLING ( NO1 )
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PA-4	17:40	40°00.700S	109°59.570E	4620m	LV SAMPLING (NO 2)
PA-4	17:47	40°00.740S	109°59.510E	4612m	LV SAMPLING (NO 3)
PA-4	18:47	40°01.130S	109°59.310E	4212m	LV SAMPLING (NO 4)
PA-4	19:05	40°01.310S	109°59.260E	4557m	LV SAMPLING FINISH
PA-4	19:39	39°59.900S	110°00.050E	4631m	LV SAMPLING START (5 TH)
PA-4	19:47	39°59.910S	109°59.910E	4624m	LV SAMPLING (NO 1)
PA-4	19:50	39°59.950S	109°59.930E	4626m	LV SAMPLING (NO 2)
PA-4	19:53	40°00.020S	109°59.900E	4626m	LV SAMPLING (NO 3)
PA-4	19:55	40°00.040S	109°59.850E	4622m	LV SAMPLING (NO 4)
PA-4	19:57	40°00.070S	109°59.830E	4618m	LV SAMPLING FINISH
PA-4	20:10	40°00.190S	109°59.760E	4609m	CTD+CAROUSEL STRAT (SHALLOW)
PA-4	20:31	40°00.360S	109°59.760E	4610m	CTD+CAROUSEL DEEPEST
PA-4	21:10	40°00.640S	109°59.950E	4627m	CTD+CAROUSEL FINISH
PA-4	21:19	40°00.750S	109°59.950E	4622m	NISKIN SAMPLING(MIDDLE) START
PA-4	21:28	40°00.850S	109°59.900E	4625m	SUNRISE & PUT OFF REGULATION LIGHTS
PA-4	22:04	40°01.080S	109°59.940E	4602m	NISKIN SAMPLING(MIDDLE) SEND MESS
PA-4	22:14	40°01.190S	109°59.920E	4599m	NISKIN SAMPLING(MIDDLE) ARR MESS
PA-4	22:41	40°01.430S	109°59.890E	4572m	NISKIN SAMPLING(MIDDLE) FINISH
PA-4	22:42	40°01.440S	109°59.900E	4571m	NISKIN SAMPLING(SHALLOW) START
PA-4	22:48	40°01.490S	109°59.910E	4565m	NISKIN SAMPLING(SHALLOW) SEND MESS
PA-4	22:49	40°01.490S	109°59.930E	4576m	NISKIN SAMPLING(SHALLOW) ARR MESS
PA-4	22:54	40°01.570S	109°59.930E	4567m	NISKIN SAMPLING(SHALLOW) FINISH
PA-4	23:21	40°00.020S	110°00.030E	4627m	MULTI STARTED
----- 15 JAN.97 (GMT) -----					
PA-4	00:52	40°01.060S	109°59.960E	5005m	MULTI HIT BOTTOM
PA-4	02:02	40°01.860S	110°00.050E	4616m	MULTI ON DECK
PA-4	02:42	39°59.960S	109°59.520E	4623m	PISTON CORING STARTED
PA-4	03:32	40°00.750S	109°59.510E	4619m	N-56 NET STARTED
PA-4	03:47	40°00.950S	109°59.510E	5493m	N-56 NET FINISHED
PA-4	04:54	40°01.700S	109°59.220E	4823m	PISTON CORING ENDED FOR TROUBLE
PA-4	05:44	39°59.860S	109°59.720E	4626m	PISTON CORING STARTED
PA-4	07:12	40°00.310S	109°59.340E	4623m	PISTON CORER LANDED
PA-4	08:27	40°00.580S	109°58.680E	4591m	PISTON CORING ENDED
PA-4	08:48	39°59.900S	110°00.060E	4632m	IN SITU PUMP START
PA-4	12:35	40°00.780S	109°57.290E	4874m	STARTED HEAVING UP IN-SITE
PA-4	12:49	40°00.900S	109°57.160E	7077m	NORPAC NET START
PA-4	13:08	40°01.100S	109°57.070E	5065m	NORPAC NET FINISH
PA-4	13:11	40°01.120S	109°57.050E	4718m	N-56 NET STARTED
PA-4	13:24	40°01.220S	109°56.960E	5339m	FINISHED N-56 NET
PA-4	13:29	40°01.290S	109°56.900E	5057m	STARTED N-56 NET 2 ND TIMES
PA-4	13:40	40°01.420S	109°56.850E	4767m	FINISHED N-56 NET
PA-4	13:42	40°01.440S	109°56.800E	4692m	IN SITU PUMP FINISH
PA-4	14:12	39°59.970S	110°00.110E	4688m	LV SAMPLING START (1000
PA-4	14:45	40°00.330S	109°59.780E	4613m	LV SAMPLING NO.1 (1000 M)
PA-4	14:47	40°00.350S	109°59.770E	4613m	LV SAMPLING NO.2 (1000 M)
PA-4	14:49	40°00.370S	109°59.780E	4615m	LV SAMPLING NO.3 (1000 M)
PA-4	15:04	40°00.570S	109°59.590E	4616m	LV SAMPLING NO.4 (80 M)
PA-4	15:09	40°00.600S	109°59.530E	4619m	LV SAMPLING FINISH
PA-4	15:38	39°59.980S	110°00.030E	4625m	LV SAMPLING START (4000
PA-4	17:17	40°00.680S	109°59.040E	4603m	LV SAMPLING NO.1 (4000 M)
PA-4	17:19	40°00.680S	109°59.040E	4600m	LV SAMPLING NO 2 (4000M)
PA-4	17:36	40°00.810S	109°58.940E	4593m	LV SAMPLING NO 3 (3000 M)
PA-4	17:38	40°00.800S	109°58.940E	4598m	LV SAMPLING NO 4 (3000M)
PA-4	18:40	40°01.250S	109°58.570E	4579m	LV SAMPLING FINISH
PA-4	19:13	40°00.030S	110°00.010E	4622m	LV SAMPLING START (2000M 300M)
PA-4	20:05	40°00.450S	109°59.610E	4619m	LV SAMPLING NO 1 (2000 M)
PA-4	20:07	40°00.440S	109°59.590E	4619m	LV SAMPLING (NO
PA-4	20:09	40°00.450S	109°59.570E	4615m	LV SAMPLING (NO
PA-4	20:34	40°00.440S	109°59.330E	4616m	LV SAMPLING (NO
PA-4	20:47	40°00.460S	109°59.200E	4606m	LV SAMPLING FINISH
PA-4	21:17	40°00.000S	110°00.100E	4625m	LV SAMPLING START
PA-4	21:41	40°00.010S	109°59.900E	4628m	LV SAMPLING (NO

PA-4	21:48	40°00.000S	109°59.790E	4617m	LV SAMPLING (NO
PA-4	21:53	40°00.010S	109°59.730E	4614m	LV SAMPLING (NO
PA-4	21:57	40°00.020S	109°59.670E	4621m	LV SAMPLING (NO
PA-4	22:10	40°00.050S	109°59.520E	4606m	LV SAMPLING FINISH
----- 16 JAN.97 (GMT) -----					
S-17	00:50	39°24.480S	109°59.970E	4464m	
S-17	00:50	39°24.430S	109°59.970E	4463m	SURFACE SAMPLING START
S-17	00:58	39°22.530S	109°59.970E	4492m	SURFACE SAMPLING FINISH
----- 17 JAN.97 (GMT) -----					
S-18	00:51	32°59.860S	109°59.940E	3008m	SURFACE SAMPLING START
S-18	00:56	32°58.410S	109°59.940E	3103m	SURFACE SAMPLING FINISH
PA-5	12:04	29°59.540S	109°59.910E	5461m	LV SAMPLING START
PA-5	12:59	29°59.200S	110°00.150E	5466m	LV SAMPLING NO.1 (1500 M)
PA-5	13:00	29°59.160S	110°00.120E	5873m	LV SAMPLING NO.2 (1500 M)
PA-5	13:06	29°59.100S	110°00.080E	5877m	LV SAMPLING NO.3 (1250 M)
PA-5	13:11	29°59.090S	110°00.030E	6925m	LV SAMPLING NO.4 (1200 M)
PA-5	13:30	29°59.000S	109°59.860E	5841m	LV SAMPLING FINISH
PA-5	14:00	30°00.290S	109°00.110E	7311m	LV SAMPLING START (2 ND CAST)
PA-5	14:29	30°00.140S	109°59.820E	6225m	LV SAMPLING NO.1 (1000 M)
PA-5	14:31	30°00.120S	109°59.790E	6959m	LV SAMPLING NO.2 (1000 M)
PA-5	14:36	30°00.120S	109°59.750E	5909m	LV SAMPLING NO.3 (800 M)
PA-5	14:39	30°00.110S	109°59.710E	8109m	LV SAMPLING NO.4 (750 M)
PA-5	14:52	30°00.030S	109°59.620E	8713m	LV SAMPLING FINISH (2 ND CAST)
PA-5	15:19	30°00.480S	110°00.280E	5692m	LV SAMPLING START (3 RD CAST)
PA-5	16:59	30°00.300S	110°00.200E	6846m	LV SAMPLING NO 1 (5500M)
PA-5	17:07	30°00.330S	110°00.250E	6137m	LV SAMPLING NO 2 (5400)
PA-5	17:16	30°00.350S	110°00.300E	6796m	LV SAMPLING NO 3 (5000M)
PA-5	17:47	30°00.450S	110°00.490E	7175m	LV SAMPLING NO 4 (3000M)
PA-5	18:45	30°00.320S	110°00.470E	5641m	LV SAMPLING FINISH
PA-5	19:14	29°59.840S	110°00.040E	6280m	LV SAMPLING START (4 TH CAST)
PA-5	19:20	29°59.780S	110°00.030E	6700m	LV SAMPLING NO 1 (60 M)
PA-5	19:23	29°59.770S	110°00.030E	7462m	LV SAMPLING NO 2 (40 M)
PA-5	19:26	29°59.720S	110°00.020E	7861m	LV SAMPLING NO 3 (20M)
PA-5	19:28	29°59.700S	110°00.010E	6692m	LV SAMPLING NO 4 (10M)
PA-5	19:31	29°59.680S	109°59.980E	5768m	LV SAMPLING FINISH
PA-5	19:50	29°59.900S	110°00.120E	5457m	CTD+CAROUSEL STRAT
PA-5	21:34	29°58.900S	110°00.030E	5463m	CTD+CAROUSEL DEEPEST
PA-5	21:46	29°58.830S	110°00.010E	5462m	SUNRISE & PUT OFF REGULATION LIGHTS
PA-5	21:56	29°58.780S	109°59.990E	5462m	SUNRISE & PUT OFF REGULATION LIGHTS
PA-5	23:23	29°58.180S	109°59.970E	5462m	CTD+CAROUSEL FINISH
----- 18 JAN.97 (GMT) -----					
PA-5	00:01	30°00.090S	110°00.000E	5460m	PISTON CORING STARTED
PA-5	02:07	29°59.920S	109°59.470E	6899m	PISTON CORER LANDED
PA-5	03:31	30°00.050S	109°58.910E	5527m	PISTON CORING ENDED
PA-5	04:36	30°00.550S	110°00.350E	5457m	PISTON CORING STARTED (2 ND)
PA-5	06:14	30°00.370S	110°00.500E	5460m	HOVE UP PISTON CORER FOR MISS ACTIO
PA-5	07:21	30°00.100S	110°00.540E	5458m	PISTON CORING ENDED
PA-5	07:39	30°00.090S	109°59.920E	5459m	CTD+CAROUSEL STRAT
PA-5	08:10	29°59.800S	110°00.030E	5460m	CTD+CAROUSEL DEEPEST
PA-5	08:53	29°59.310S	110°00.230E	5470m	CTD+CAROUSEL FINISH
PA-5	09:12	30°00.130S	110°00.020E	5461m	MULTI STARTED
PA-5	10:52	30°00.200S	110°00.500E	5960m	MULTI HIT BOTTOM
PA-5	11:11	30°00.140S	110°00.580E	5490m	COM'CED DEGREE OF CLEARNCE
PA-5	11:19	30°00.120S	110°00.690E	5458m	FINISH IT
PA-5	11:25	30°00.120S	110°00.770E	5458m	NORPAC NET START
PA-5	11:45	29°59.980S	110°01.030E	5465m	SUNSET & PUT ON REGULATION LIGHTS
PA-5	11:46	29°59.980S	110°01.030E	5465m	NORPAC NET FINISH
PA-5	12:10	29°59.960S	110°01.170E	5467m	MULTI ON DECK
PA-5	12:45	30°00.020S	109°59.850E	5463m	IN SITU PUMP START
PA-5	14:23	29°59.710S	110°00.250E	5458m	N-56 NET STARTED
PA-5	14:41	29°59.630S	110°00.400E	5458m	N-56 NET FINISHED
PA-5	17:05	30°00.060S	110°00.770E	5459m	COM CED HEAVING UP IN SITU

PA-5	18:21	30°00.150S	110°00.970E	5459m	IN SITU PUMP FINISH
PA-5	18:51	29°59.890S	110°00.120E	5455m	LV SAMPLING START
PA-5	19:51	29°59.940S	110°00.440E	5458m	LV SAMPLING NO 1 (2500 M)
PA-5	20:19	30°00.050S	110°00.370E	5467m	LV SAMPLING
PA-5	20:24	30°00.070S	110°00.340E	5459m	LV SAMPLING (NO
PA-5	20:29	30°00.090S	110°00.340E	5465m	LV SAMPLING (NO
PA-5	20:36	30°00.140S	110°00.320E	5457m	LV SAMPLING FINISH
PA-5	21:03	29°59.670S	109°59.900E	5457m	LV SAMPLING START (6TH)
PA-5	21:12	29°59.770S	109°59.980E	5467m	LV SAMPLING (NO
PA-5	21:15	29°59.810S	110°00.020E	5459m	LV SAMPLING (NO
PA-5	21:17	29°59.820S	110°00.030E	5460m	LV SAMPLING (NO
PA-5	21:19	29°59.840S	110°00.060E	5463m	LV SAMPLING (NO
PA-5	21:24	29°59.900S	110°00.120E	5456m	LV SAMPLING FINISH
PA-5	21:47	30°00.020S	109°59.990E	5462m	SUNRISE & PUT OFF REGULATION LIGHTS
PA-5	21:51	30°00.050S	109°59.960E	5459m	LV SAMPLING START (7TH)
PA-5	21:57	30°00.135S	109°59.941E	5458m	SUNRISE & PUT OFF REGULATION LIGHTS
PA-5	22:55	30°00.350S	110°00.240E	5460m	LV SAMPLING (NO
PA-5	22:57	30°00.370S	110°00.230E	5459m	LV SAMPLING (NO
PA-5	23:25	30°00.460S	110°00.430E	5458m	LV SAMPLING (NO
PA-5	23:27	30°00.470S	110°00.440E	5462m	LV SAMPLING (NO
PA-5	23:53	30°00.730S	110°00.640E	5458m	
----- 19 JAN.97 (GMT) -----					
PA-5	00:19	29°59.880S	109°59.830E	5471m	LV SAMPLING START (8 CAST)
PA-5	00:41	29°59.860S	110°00.000E	5450m	LV SAMPLING NO.1(600 M)
PA-5	00:46	29°59.860S	110°00.020E	5462m	LV SAMPLING NO.2 (400 M)
PA-5	00:51	29°59.910S	110°00.080E	5459m	LV SAMPLING NO.3(200 M)
PA-5	00:54	29°59.900S	110°00.100E	5457m	LV SAMPLING NO.4 (50 M)
PA-5	00:58	29°59.950S	110°00.140E	5462m	LV SAMPLING FINISH
----- 20 JAN.97 (GMT) -----					
PA-6	01:00	23°58.510S	108°22.310E	2476m	PISTON CORING STARTED
PA-6	02:53	23°59.620S	108°23.130E	4747m	PISTON CORER LANDED
PA-6	03:43	23°59.830S	108°23.140E	2615m	PISTON CORING ENDED
----- 21 JAN.97 (GMT) -----					
S-19	00:53	19°17.810S	105°29.590E	5571m	SURFACE SAMPLING START
S-19	00:56	19°17.070S	105°29.120E	5606m	SURFACE SAMPLING FINISH
----- 22 JAN.97 (GMT) -----					
S-20	00:56	13°12.360S	103°08.860E	4277m	SURFACE SAMPLING START
S-20	01:00	13°11.190S	103°08.400E	4220m	SURFACE SAMPLING FINISH
PA-7	14:04	10°00.060S	102°00.070E	5587m	CHANGED PROPULSION TO ELECTRIC MOTO
PA-7	14:08	10°00.030S	102°00.050E	5548m	LV SAMPLING START 1 ST CAST
PA-7	14:59	09°59.870S	101°59.580E	5336m	LV SAMPLING NO.1 (1200 M)
PA-7	15:05	09°59.830S	101°59.480E	5316m	LV SAMPLING NO.2 (1000 M)
PA-7	15:07	09°59.820S	101°59.460E	5298m	LV SAMPLING NO.3 (1000 M)
PA-7	15:12	09°59.780S	101°59.390E	5288m	LV SAMPLING NO.4 (800 M)
PA-7	15:25	09°59.740S	101°59.200E	5157m	LV SAMPLING FINISH 1 ST CAST
PA-7	15:52	10°00.050S	101°59.910E	5449m	LV SAMPLING START 2 ND CAST
PA-7	16:23	09°59.970S	101°59.710E	5370m	LV SAMPLING NO.1 (600 M)
PA-7	16:28	09°59.970S	101°59.660E	5357m	LV SAMPLING NO 2 (500 M)
PA-7	16:37	09°59.940S	101°59.570E	5337m	LV SAMPLING NO 3 (300M)
PA-7	16:42	09°59.920S	101°59.510E	5342m	LV SAMPLING NO 4(200M)
PA-7	16:51	09°59.880S	101°59.440E	5313m	LV SAMPLING FINISH
PA-7	17:19	10°00.080S	102°00.060E	5552m	LV SAMPLING START (3 RD CAST)
PA-7	17:58	10°00.080S	101°59.710E	5383m	IN SITU PUMP START
PA-7	19:18	09°59.740S	101°59.380E	5294m	LV SAMPLING NO 1 (5331 M)
PA-7	19:25	09°59.710S	101°59.370E	5251m	LV SAMPLING NO 2 (5231 M)
PA-7	19:32	09°59.690S	101°59.360E	5201m	LV SAMPLING NO 3 (5000 M)
PA-7	20:01	09°59.630S	101°59.320E	5169m	LV SAMPLING NO 4 (4000 M)
PA-7	20:17	09°59.550S	101°59.280E	5130m	IN SITU PUMP FINISH
PA-7	20:45	09°59.530S	101°59.100E	5005m	LV SAMPLING FINISH
PA-7	21:17	09°59.840S	102°00.100E	5607m	LV SAMPLING START (4TH)
PA-7	21:25	09°59.810S	102°00.090E	5604m	LV SAMPLING (NO
PA-7	21:28	09°59.820S	102°00.060E	5559m	LV SAMPLING (NO

PA-7 21:30 09°59.820S 102°00.020E 5452m LV SAMPLING (NO
PA-7 21:33 09°59.820S 102°00.000E 5485m LV SAMPLING (NO
PA-7 21:37 09°59.810S 101°59.970E 5448m LV SAMPLING FINISH
PA-7 21:48 09°59.900S 101°59.920E 5479m CTD+CAROUSEL STRAT
PA-7 23:06 09°59.750S 101°59.960E 5478m SUNRISE & PUT OFF REGULATION LIGHTS
PA-7 23:36 09°59.610S 102°00.040E 5570m CTD+CAROUSEL DEEPEST
----- 23 JAN.97 (GMT) -----
PA-7 01:22 09°59.460S 102°00.350E 5622m CTD+CAROUSEL FINISH
PA-7 01:35 09°59.460S 102°00.340E 5611m PISTON CORING STARTED
PA-7 03:31 09°59.590S 102°00.460E 5610m PISTON CORER LANDED
PA-7 05:01 09°59.360S 101°59.960E 5318m PISTON CORING ENDED
PA-7 05:23 10°00.030S 101°59.970E 5474m CTD+CAROUSEL STRAT
PA-7 05:52 10°00.110S 101°59.880E 5431m CTD+CAROUSEL DEEPEST
PA-7 06:29 10°00.130S 102°00.010E 5519m CTD+CAROUSEL FINISH
PA-7 06:54 09°59.580S 102°01.000E 5604m MULTI STARTED
PA-7 08:36 09°59.410S 102°00.420E 5609m MULTI HIT BOTTOM
PA-7 08:53 09°59.340S 102°00.340E 5610m START THE DEGREE OF CLEARNCE
PA-7 09:03 09°59.340S 102°00.260E 5615m FINISH IT
PA-7 09:08 09°59.340S 102°00.240E 5583m NORPAC NET START
PA-7 09:26 09°59.340S 102°00.140E 5515m NORPAC NET FINISH
PA-7 09:27 09°59.340S 102°00.130E 5409m N56 NET START
PA-7 09:42 09°59.270S 102°00.090E 4757m N56 NET FINISHED
PA-7 09:56 09°59.180S 102°00.040E 5500m MULTI ON DECK
PA-7 10:14 10°00.070S 102°00.080E 5557m IN SITU PUMP START
PA-7 11:40 09°59.570S 101°59.730E 5308m SUNSET & PUT ON REGULATION LIGHTS
PA-7 11:42 09°59.560S 101°59.710E 5311m SUNSET & PUT ON REGULATION LIGHTS
PA-7 16:36 09°59.530S 101°58.490E 5029m IN SITU PUMP FINISH
PA-7 17:11 10°00.260S 102°00.100E 5550m LV SAMPLING START (5TH CAST)
PA-7 18:14 10°00.230S 101°59.740E 5406m LV SAMPLING NO 1 (2500M)
PA-7 18:31 10°00.150S 101°59.550E 5375m LV SAMPLING NO 2 (1500M)
PA-7 18:40 10°00.140S 101°59.510E 5376m LV SAMPLING NO 3 (1250M)
PA-7 18:51 10°00.050S 101°59.420E 5324m LV SAMPLING NO 4 (750M)
PA-7 19:08 09°59.980S 101°59.300E 5275m LV SAMPLING FINISH
PA-7 19:40 10°00.090S 102°00.000E 5502m LV SAMPLING START (6TH CAST)
PA-7 19:52 10°00.160S 101°59.860E 5418m LV SAMPLING NO 1 (150M)
PA-7 19:58 10°00.200S 101°59.820E 8806m LV SAMPLING NO 2 (100M)
PA-7 20:00 10°00.220S 101°59.810E 6079m LV SAMPLING NO 4 (80 M)
PA-7 20:07 10°00.270S 101°59.730E 6185m LV SAMPLING FINISH
PA-7 20:36 10°00.120S 102°00.290E 5853m LV SAMPLING START (7TH)
PA-7 21:41 10°00.020S 102°00.090E 5895m LV SAMPLING (NO
PA-7 22:11 09°59.970S 102°00.040E 7880m LV SAMPLING (NO
PA-7 22:40 09°59.960S 101°59.970E 6032m LV SAMPLING FINISH
PA-7 23:06 10°00.160S 102°00.180E 7669m SUNRISE & PUT OFF REGULATION LIGHTS
PA-7 23:08 10°00.170S 102°00.140E 5645m LV SAMPLING START (8TH)
PA-7 23:22 10°00.270S 102°00.120E 5442m LV SAMPLING (NO
PA-7 23:29 10°00.310S 102°00.080E 5748m LV SAMPLING (NO
PA-7 23:30 10°00.320S 102°00.060E 8043m LV SAMPLING (NO
PA-7 23:33 10°00.340S 102°00.040E 8895m LV SAMPLING (NO
PA-7 23:39 10°00.400S 102°00.020E 9231m LV SAMPLING FINISH
----- 24 JAN.97 (GMT) -----
S-21 00:53 09°50.520S 101°51.440E 5607m SURFACE SAMPLING START
----- 25 JAN.97 (GMT) -----
S-22 00:52 05°21.980S 097°48.080E 5201m SURFACE SAMPLING START
S-22 00:57 05°21.050S 097°47.220E 5233m SURFACE SAMPLING FINISH
----- 26 JAN.97 (GMT) -----
S-23 00:54 00°40.600S 093°35.060E 4574m SURFACE SAMPLING START
S-23 01:01 00°39.360S 093°33.900E 4576m SURFACE SAMPLING FINISH
PA-8 22:57 03°31.730N 090°16.870E 2012m MULTI STARTED
PA-8 23:42 03°31.870N 090°16.780E 2009m MULTI HIT BOTTOM
----- 27 JAN.97 (GMT) -----
PA-8 00:13 03°32.020N 090°16.850E 2009m MULTI ON DECK
PA-8 00:14 03°32.020N 090°16.840E 2009m SUNRISE & PUT OFF REGULATION LIGHTS

PA-8	00:38	03°31.940N	090°17.050E	2027m	PISTON CORING STARTED
PA-8	01:13	03°32.020N	090°17.030E	2029m	NORPAC NET START AT 0838
PA-8	01:18	03°32.020N	090°17.010E	2029m	NORPAC NET FINISH & STARTED N-56 NE
PA-8	01:31	03°32.090N	090°16.980E	2029m	PISTON CORER LANDED
PA-8	01:32	03°32.090N	090°17.000E	2029m	N-56 NET FINISHED
PA-8	01:34	03°32.080N	090°17.020E	2029m	MESURED SEA WATER CLEARACE
PA-8	02:14	03°32.150N	090°17.090E	2029m	PISTON CORING ENDED
PA-8	04:04	03°40.110N	090°17.010E	1929m	PISTON CORING STARTED
PA-8	04:56	03°40.210N	090°17.020E	1930m	PISTON CORER LANDED
PA-8	05:35	03°40.320N	090°16.980E	1928m	PISTON CORING ENDED
PA-9	23:07	07°59.910N	088°59.870E	3606m	CTD+CAROUSEL STRAT
----- 28 JAN.97 (GMT) -----					
PA-9	00:20	08°00.060N	088°59.480E	3604m	CTD-RMS DEEPEST
PA-9	01:42	08°00.560N	088°59.060E	3603m	CTD+CAROUSEL FINISH
PA-9	02:28	07°56.610N	089°01.530E	3605m	PISTON CORING STARTED
PA-9	02:55	07°56.740N	089°01.310E	3597m	NORPAC NET START
PA-9	03:07	07°56.830N	089°01.210E	3608m	NORPAC NET FINISH
PA-9	03:07	07°56.840N	089°01.210E	3603m	N-56 NET STARTED
PA-9	03:16	07°56.900N	089°01.090E	3608m	N-56 NET FINISHED
PA-9	03:28	07°56.970N	089°01.010E	3633m	N-56 NET STARTED
PA-9	03:38	07°57.040N	089°01.010E	3608m	N-56 NET FINISHED
PA-9	03:46	07°57.060N	089°01.000E	3607m	N-56 NET STARTED
PA-9	03:55	07°57.100N	089°00.910E	3610m	N-56 NET FINISHED
PA-9	04:14	07°57.210N	089°00.730E	3603m	N56 NET FINISHED
PA-9	06:48	07°58.660N	089°00.960E	3583m	FINISHED REPAIR OF NO 1 WINCH
PA-9	07:22	07°58.950N	089°01.070E	3600m	PISTON CORING ENDED
PA-9	08:14	07°59.900N	088°59.990E	3605m	LV SAMPLING START
PA-9	08:40	07°59.810N	088°59.940E	3600m	LV SAMPLING (NO
PA-9	08:46	07°59.800N	088°59.930E	3603m	LV SAMPLING (NO
PA-9	08:52	07°59.800N	088°59.930E	3601m	LV SAMPLING (NO
PA-9	08:57	07°59.780N	088°59.940E	3604m	LV SAMPLING (NO
PA-9	09:07	07°59.770N	088°59.940E	3602m	LV SAMPLING FINISH
PA-9	09:35	08°00.000N	088°59.980E	3604m	LV SAMPLING START (SECOND)
PA-9	10:21	08°00.180N	088°59.950E	3602m	LV SAMPLING (NO
PA-9	10:31	08°00.230N	088°59.960E	3603m	LV SAMPLING (NO
PA-9	10:47	08°00.280N	088°59.960E	3602m	LV SAMPLING (NO
PA-9	10:53	08°00.280N	088°59.930E	3599m	LV SAMPLING (NO
PA-9	11:16	08°00.390N	088°59.910E	3598m	LV SAMPLING FINISH
PA-9	11:50	07°59.990N	088°59.960E	3601m	LV SAMPLING START (THIRD CAST)
PA-9	12:10	08°00.080N	088°59.940E	3605m	SUNSET & PUT ON REGULATION LIGHTS
PA-9	13:05	08°00.440N	088°59.660E	3603m	LV SAMPLING NO.1 (W.O. 3618 M)
PA-9	13:13	08°00.540N	088°59.650E	3603m	LV SAMPLING NO.2 (W.O. 3499 M)
PA-9	13:23	08°00.620N	088°59.660E	3606m	LV SAMPLING NO.3 (W.O.3200 M)
PA-9	13:29	08°00.680N	088°59.670E	3599m	LV SAMPLING NO.4 (W.O. 3000 M)
PA-9	14:19	08°01.030N	088°59.710E	3590m	LV SAMPLING FINISH
PA-9	14:40	07°59.940N	088°59.970E	3602m	CTD+CAROUSEL STRAT
PA-9	14:59	08°00.000N	088°59.730E	3605m	CTD+CAROUSEL DEEPEST
PA-9	15:35	08°00.170N	088°59.500E	3606m	CTD+CAROUSEL FINISH
PA-9	16:13	07°56.730N	089°01.550E	3608m	MULTI STARTED
PA-9	17:27	07°57.070N	089°01.400E	3600m	MULTI HIT BOTTOM
PA-9	18:30	07°57.340N	089°01.230E	3608m	MULTI ON DECK
PA-9	19:06	08°00.080N	088°59.900E	3603m	LV SAMPLING START (4 TH CAST)
PA-9	19:32	08°00.240N	088°59.880E	3601m	LV SAMPLING NO 1 (1000 M)
PA-9	19:38	08°00.300N	088°59.890E	3601m	LV SAMPLING NO 2 (800 M)
PA-9	19:44	08°00.300N	088°59.910E	3603m	LV SAMPLING NO 3 (600M)
PA-9	19:48	08°00.330N	088°59.930E	3602m	LV SAMPLING NO 4 (500 M)
PA-9	19:59	08°00.360N	088°59.930E	3599m	LV SAMPLING FINISH (4 TH CAST)
PA-9	20:27	07°59.910N	088°59.880E	3601m	LV SAMPLING START
PA-9	20:40	08°00.020N	088°59.850E	3606m	LV SAMPLING (NO
PA-9	20:43	08°00.070N	088°59.840E	3604m	LV SAMPLING (NO
PA-9	20:47	08°00.090N	088°59.840E	3605m	LV SAMPLING (NO
PA-9	20:51	08°00.130N	088°59.820E	3612m	LV SAMPLING (NO

PA-9 20:55 08°00.180N 088°59.790E 3603m LV SAMPLING FINISH
PA-9 21:24 07°59.920N 088°59.950E 3603m LV SAMPLING START (6TH)
PA-9 21:30 07°59.940N 088°59.970E 3600m LV SAMPLING (1TH)
PA-9 21:34 07°59.950N 089°00.000E 3602m LV SAMPLING (NO
PA-9 21:36 07°59.940N 088°59.990E 3601m LV SAMPLING (NO
PA-9 21:38 07°59.930N 089°00.010E 3599m LV SAMPLING (NO
PA-9 21:43 07°59.960N 089°00.010E 3604m LV SAMPLING FINISH
PA-9 22:09 07°59.920N 089°00.040E 3601m LV SAMPLING START (7TH CAST)
PA-9 22:22 07°59.910N 089°00.110E 3600m LV SAMPLING (NO
PA-9 22:28 07°59.920N 089°00.140E 3602m LV SAMPLING (NO
PA-9 22:31 07°59.930N 089°00.170E 3600m
PA-9 22:32 07°59.930N 089°00.170E 3602m LV SAMPLING (NO
PA-9 22:35 07°59.930N 089°00.190E 3601m LV SAMPLING (NO
PA-9 22:39 07°59.940N 089°00.210E 3599m LV SAMPLING FINISH
----- 29 JAN.97 (GMT) -----
PA-9 00:24 07°56.740N 089°00.960E 3606m SUNRISE & PUT OFF REGULATION LIGHTS
PA-9 00:24 07°56.740N 089°00.960E 3606m PISTON CORING STARTED
PA-9 01:40 07°56.870N 089°00.940E 3609m PISTON CORER LANDED
PA-9 02:44 07°56.930N 089°01.020E 3605m PISTON CORING ENDED
----- 30 JAN.97 (GMT) -----
S-24 00:55 11°35.430N 092°51.600E 1384m SURFACE SAMPLING START
S-24 01:09 11°39.320N 092°51.350E 1384m SURFACE SAMPLING FINISH
STP 13:51 09°51.760N 094°03.460E 3775m
PA-10 14:06 09°51.590N 094°03.330E 3773m LV SAMPLING START 1 ST CAST
PA-10 14:32 09°51.690N 094°03.340E 3776m LV SAMPLING NO.1 (122 M)
PA-10 14:37 09°51.700N 094°03.310E 3775m LV SAMPLING NO.2 (1000 M)
PA-10 14:43 09°51.710N 094°03.290E 3783m LV SAMPLING NO.3 (800 M)
PA-10 14:48 09°51.750N 094°03.300E 3783m LV SAMPLING NO.4 (600 M)
PA-10 15:25 09°51.640N 094°03.310E 3775m LV SAMPLING START 2 ND CAST
PA-10 16:03 09°51.470N 094°03.460E 3778m LV SAMPLING NO.1 (2000 M)
PA-10 16:13 09°51.450N 094°03.510E 3776m LV SAMPLING NO 2 (1500 M)
PA-10 16:20 09°51.430N 094°03.520E 3779m LV SAMPLING NO 3 (1250M)
PA-10 16:28 09°51.420N 094°03.520E 3779m LV SAMPLING NO 4(1000M)
PA-10 16:45 09°51.410N 094°03.580E 3777m LV SAMPLING FINISH
PA-10 17:12 09°51.540N 094°03.360E 3774m LV SAMPLING START (3RD CAST)
PA-10 17:36 09°51.400N 094°03.400E 3780m LV SAMPLING NO 1 (1000 M)
PA-10 17:42 09°51.390N 094°03.400E 3777m LV SAMPLING NO2 (800M)
PA-10 17:48 09°51.380N 094°03.450E 3775m LV SAMPLING NO3 (600M)
PA-10 17:51 09°51.400N 094°03.450E 3776m LV SAMPLING NO4 (500M)
PA-10 18:02 09°51.400N 094°03.440E 3780m LV SAMPLING FINISH
PA-10 18:27 09°51.530N 094°03.320E 3780m LV SAMPLING START (4TH CAST)
PA-10 18:35 09°51.500N 094°03.280E 3778m LV SAMPLING NO 1 (100 M)
PA-10 18:38 09°51.500N 094°03.240E 3783m LV SAMPLING NO 2 (75 M)
PA-10 18:41 09°51.490N 094°03.220E 3778m LV SAMPLING NO3 (50 M)
PA-10 18:43 09°51.480N 094°03.190E 3775m LV SAMPLING NO4 (25 M)
PA-10 18:47 09°51.470N 094°03.150E 3786m LV SAMPLING FINISH
PA-10 19:11 09°51.540N 094°03.330E 3784m LV SAMPLING START (5TH CAST)
PA-10 19:23 09°51.510N 094°03.290E 3780m LV SAMPLING NO 1 (300 M)
PA-10 19:27 09°51.490N 094°03.290E 3777m LV SAMPLING NO 2 (200 M)
PA-10 19:31 09°51.480N 094°03.280E 3775m LV SAMPLING NO 3 (100 M)
PA-10 19:32 09°51.490N 094°03.270E 3780m LV SAMPLING NO 4 (100 M)
PA-10 19:39 09°51.470N 094°03.230E 3784m LV SAMPLING FINISH
PA-10 19:55 09°51.380N 094°03.080E 3781m CTD+CAROUSEL STRAT
PA-10 20:15 09°51.290N 094°02.960E 3781m CTD+CAROUSEL DEEPEST
PA-10 20:56 09°51.160N 094°02.630E 3783m CTD+CAROUSEL FINISH
PA-10 21:17 09°51.760N 094°03.670E 3774m MULTI STARTED
PA-10 22:30 09°51.620N 094°03.440E 3774m MULTI HIT BOTTOM
PA-10 23:25 09°51.700N 094°03.250E 3783m MULTI ON DECK
----- 31 JAN.97 (GMT) -----
PA-10 00:06 09°51.650N 094°03.360E 3775m SUNRISE & PUT OFF REGULATION LIGHTS
PA-10 00:24 09°51.660N 094°03.420E 3778m PISTON CORING STARTED
PA-10 01:46 09°51.580N 094°03.370E 3775m PISTON CORER LANDED

PA-10 02:53 09°51.620N 094°03.350E 3777m PISTON CORING ENDED
PA-10 03:02 09°51.620N 094°03.320E 3774m CTD+CAROUSEL STRAT
PA-10 04:17 09°51.400N 094°03.250E 3775m CTD+CAROUSEL DEEPEST
PA-10 04:24 09°51.400N 094°03.170E 3775m NORPAC NET START
PA-10 04:41 09°51.450N 094°03.000E 3780m NORPAC NET FINISH (1ST)
PA-10 04:47 09°51.430N 094°02.950E 3784m N56 NET START
PA-10 05:07 09°51.500N 094°02.770E 3780m N56 NET FINISHED (1ST)
PA-10 05:08 09°51.500N 094°02.760E 3779m N56 NET START (2ND)
PA-10 05:22 09°51.490N 094°02.660E 3779m N56 NET FINISHED (2ND)
PA-10 05:24 09°51.480N 094°02.660E 3781m N56 NET START (3RD)
PA-10 05:35 09°51.490N 094°02.650E 3777m N56 NET FINISHED (3RD)
PA-10 05:49 09°51.450N 094°02.570E 3780m CTD+CAROUSEL FINISH
PA-10 05:52 09°51.440N 094°02.530E 3777m THE DEGREE OF CLEARVCE START
PA-10 05:55 09°51.420N 094°02.510E 3785m F/W IT
PA-10 06:00 09°51.400N 094°02.500E 3776m COM`CED FLOWMWTER CALIBRATION
PA-10 06:07 09°51.410N 094°02.460E 3777m IN SITU PUMP START
PA-10 06:37 09°51.470N 094°02.390E 3779m F/W FLOWMETER CALIBRATION
PA-10 06:46 09°51.440N 094°02.350E 3785m N56 NET START FOR INDIAN INSPECTOR
PA-10 07:00 09°51.450N 094°02.310E 3786m N56 NET FINISHED FOR INDIAN INSPEC
PA-10 07:36 09°51.440N 094°02.500E 3785m PUMP ATARTED
PA-10 11:05 09°50.610N 094°02.590E 3781m IN SITU PUMP FINISH
PA-10 11:25 09°51.680N 094°03.360E 3777m LV SAMPLING START (FIRST CAST)
PA-10 11:49 09°51.670N 094°03.320E 3776m SUNSET & PUT ON REGULATION LIGHTS
PA-10 12:38 09°51.600N 094°03.390E 3776m LV SAMPLING NO.1 (3792 M)
PA-10 12:40 09°51.580N 094°03.400E 3776m LV SAMPLING NO.2 (3792 M)
PA-10 12:46 09°51.550N 094°03.410E 3776m LV SAMPLING NO.3 (3692 M)
PA-10 12:52 09°51.540N 094°03.420E 3776m LV SAMPLING NO.4 (3500 M)
PA-10 13:51 09°51.280N 094°03.710E 3776m LV SAMPLING FINISH
PA-10 14:17 09°51.800N 094°03.510E 3776m LV SAMPLING START 7 TH CAST
PA-10 15:11 09°51.850N 094°03.430E 3780m LV SAMPLING NO.1 (3000 M)
PA-10 15:13 09°51.850N 094°03.430E 3781m LV SAMPLING NO.2 (3000 M)
PA-10 15:23 09°51.890N 094°03.400E 3783m LV SAMPLING NO.3 (2500 M)
PA-10 15:42 09°51.920N 094°03.370E 3775m LV SAMPLING NO.4 (1500 M)
PA-10 16:05 09°51.870N 094°03.310E 3776m LV SAMPLING FINISH
PA-10 16:33 09°51.540N 094°03.420E 3775m LV SAMPLING START (8TH CAST)
PA-10 16:46 09°51.490N 094°03.420E 3778m LV SAMPLING NO1 (400M)
PA-10 16:52 09°51.520N 094°03.460E 3775m LV SAMPLING NO2 (200M)
PA-10 16:56 09°51.510N 094°03.460E 3779m LV SAMPLING NO3 (100M)
PA-10 16:59 09°51.510N 094°03.490E 3779m LV SAMPLING NO 4 (50 M)
PA-10 17:04 09°51.530N 094°03.510E 3776m LV SAMPLING FINISH
----- 02 FEB.97 (GMT) -----
S-25 00:57 08°15.270N 096°41.460E 536m SURFACE SAMPLING START
S-25 01:05 08°13.940N 096°43.080E 538m SURFACE SAMPLING FINISH
----- 08 FEB.97 (GMT) -----
S-31 00:56 01°56.850N 102°19.570E 50m SURFACE SAMPLING START
S-31 00:56 01°56.850N 102°19.570E 50m SURFACE SAMPLING START
S-31 01:01 01°55.790N 102°20.870E 42m WATER CURRENT & POSITION LOGGING OF
S-31 01:01 01°55.790N 102°20.870E 42m WATER CURRENT & POSITION LOGGING OF
S-31 01:02 01°55.630N 102°21.060E 42m SURFACE SAMPLING FINISH
S-31 01:02 01°55.630N 102°21.060E 42m SURFACE SAMPLING FINISH
----- 09 FEB.97 (GMT) -----
S-32 00:58 04°56.110N 106°26.850E 75m SURFACE SAMPLING START
S-32 00:58 04°56.110N 106°26.850E 75m SURFACE SAMPLING START
----- 10 FEB.97 (GMT) -----
S 33 00:56 09°42.370N 110°27.170E 2495m SURFACE SAMPLING START
S 33 00:56 09°42.370N 110°27.170E 2495m SURFACE SAMPLING START
S 33 01:00 09°43.330N 110°27.980E 2691m SURFACE SAMPLING FINISH
S 33 01:00 09°43.330N 110°27.980E 2691m SURFACE SAMPLING FINISH
----- 11 FEB.97 (GMT) -----
S-34 00:58 14°40.230N 114°40.930E 4157m SURFACE SAMPLING START
S-34 00:58 14°40.230N 114°40.930E 4157m SURFACE SAMPLING START
S-34 01:02 14°41.110N 114°41.700E 4269m SURFACE SAMPLING FINISH

S-34 01:02 14°41.110N 114°41.700E 4269m SURFACE SAMPLING FINISH
PA-11 04:49 15°22.020N 115°16.690E 4577m PISTON CORING STARTED
PA-11 04:49 15°22.020N 115°16.690E 4577m PISTON CORING STARTED
PA-11 06:16 15°22.620N 115°16.720E 6318m PISTON CORER LANDED
PA-11 06:16 15°22.620N 115°16.720E 6318m PISTON CORER LANDED
PA-11 07:31 15°22.740N 115°16.840E 4240m PISTON CORING ENDED
PA-11 07:31 15°22.740N 115°16.840E 4240m PISTON CORING ENDED
PA-11 08:03 15°22.060N 115°17.080E 4239m LV SAMPLING START (1ST CAST)
PA-11 08:03 15°22.060N 115°17.080E 4239m LV SAMPLING START (1ST CAST)
PA-11 08:35 15°22.300N 115°17.120E 4238m LV SAMPLING (NO
PA-11 08:35 15°22.300N 115°17.120E 4238m LV SAMPLING (NO
PA-11 08:42 15°22.370N 115°17.130E 4235m LV SAMPLING (NO
PA-11 08:42 15°22.370N 115°17.130E 4235m LV SAMPLING (NO
PA-11 08:49 15°22.420N 115°17.160E 5694m LV SAMPLING (NO
PA-11 08:49 15°22.420N 115°17.160E 5694m LV SAMPLING (NO
PA-11 08:55 15°22.450N 115°17.210E 4243m LV SAMPLING (NO
PA-11 08:55 15°22.450N 115°17.210E 4243m LV SAMPLING (NO
PA-11 09:08 15°22.450N 115°17.220E 4236m LV SAMPLING FINISH
PA-11 09:08 15°22.450N 115°17.220E 4236m LV SAMPLING FINISH
PA-11 09:15 15°22.760N 115°17.530E 4243m
PA-11 09:15 15°22.760N 115°17.530E 4243m
PA-11 09:38 15°23.780N 115°18.440E 5694m LV SAMPLING START (2ND
PA-11 09:38 15°23.780N 115°18.440E 5694m LV SAMPLING START (2ND
PA-11 10:24 15°24.200N 115°18.470E 5694m NORPAC NET START
PA-11 10:24 15°24.200N 115°18.470E 5694m NORPAC NET START
PA-11 10:24 15°24.210N 115°18.460E 4238m SUNSET & PUT ON REGULATION LIGHTS
PA-11 10:24 15°24.210N 115°18.460E 4238m SUNSET & PUT ON REGULATION LIGHTS
PA-11 10:36 15°24.400N 115°18.350E 4234m NORPAC NET FINISH
PA-11 10:36 15°24.400N 115°18.350E 4234m NORPAC NET FINISH
PA-11 10:44 15°24.480N 115°18.390E 4237m NORPAC NET START
PA-11 10:44 15°24.480N 115°18.390E 4237m NORPAC NET START
PA-11 10:56 15°24.640N 115°18.300E 4235m NORPAC NET FINISH
PA-11 10:56 15°24.640N 115°18.300E 4235m NORPAC NET FINISH
PA-11 11:02 15°24.720N 115°18.340E 4235m NORPAC NET START (3)
PA-11 11:02 15°24.720N 115°18.340E 4235m NORPAC NET START (3)
PA-11 11:14 15°24.910N 115°18.250E 5694m NORPAC NET FINISH
PA-11 11:14 15°24.910N 115°18.250E 5694m NORPAC NET FINISH
PA-11 11:28 15°24.940N 115°18.370E 5694m LV SAMPLING (NO
PA-11 11:28 15°24.940N 115°18.370E 5694m LV SAMPLING (NO
PA-11 11:35 15°24.950N 115°18.380E 5694m LV SAMPLING (NO
PA-11 11:35 15°24.950N 115°18.380E 5694m LV SAMPLING (NO
PA-11 11:43 15°25.010N 115°18.400E 5694m LV SAMPLING (NO
PA-11 11:43 15°25.010N 115°18.400E 5694m LV SAMPLING (NO
PA-11 12:42 15°25.370N 115°18.590E 5694m LV SAMPLING FINISH
PA-11 12:42 15°25.370N 115°18.590E 5694m LV SAMPLING FINISH
PA-11 12:43 15°25.380N 115°18.580E 5694m LV FAULTED
PA-11 12:43 15°25.380N 115°18.580E 5694m LV FAULTED
PA-11 13:09 15°24.200N 115°18.930E 5694m LV SAMPLING START (3 CAST)
PA-11 13:09 15°24.200N 115°18.930E 5694m LV SAMPLING START (3 CAST)
PA-11 14:11 15°24.510N 115°18.900E 5694m LV SAMPLING (NO 1) (2000 M)
PA-11 14:11 15°24.510N 115°18.900E 5694m LV SAMPLING (NO 1) (2000 M)
PA-11 14:24 15°24.680N 115°18.900E 5694m LV SAMPLING NO.2 (1500 M)
PA-11 14:24 15°24.680N 115°18.900E 5694m LV SAMPLING NO.2 (1500 M)
PA-11 14:37 15°24.860N 115°18.910E 5694m LV SAMPLING NO.3 (1250 M)
PA-11 14:37 15°24.860N 115°18.910E 5694m LV SAMPLING NO.3 (1250 M)
PA-11 14:45 15°24.990N 115°18.910E 5694m LV SAMPLING NO 4 (1000M)
PA-11 14:45 15°24.990N 115°18.910E 5694m LV SAMPLING NO 4 (1000M)
PA-11 15:05 15°25.180N 115°18.810E 5694m LV SAMPLING FINISH
PA-11 15:05 15°25.180N 115°18.810E 5694m LV SAMPLING FINISH
PA-11 15:15 15°25.280N 115°18.740E 4236m CTD+CAROUSEL STRAT
PA-11 15:15 15°25.280N 115°18.740E 4236m CTD+CAROUSEL STRAT
PA-11 16:48 15°25.820N 115°18.230E 4240m CTD+CAROUSEL DEEPEST

PA-11 16:48 15°25.820N 115°18.230E 4240m CTD+CAROUSEL DEEPEST
PA-11 18:27 15°26.700N 115°17.730E 4879m CTD+CAROUSEL FINISH
PA-11 18:27 15°26.700N 115°17.730E 4879m CTD+CAROUSEL FINISH
PA-11 19:10 15°24.870N 115°19.760E 4234m MULTI STARTED
PA-11 19:10 15°24.870N 115°19.760E 4234m MULTI STARTED
PA-11 20:29 15°25.270N 115°20.200E 4235m MULTI HIT BOTTOM
PA-11 20:29 15°25.270N 115°20.200E 4235m MULTI HIT BOTTOM
PA-11 21:34 15°25.550N 115°20.210E 4236m MULTI ON DECK
PA-11 21:34 15°25.550N 115°20.210E 4236m MULTI ON DECK
PA-11 21:57 15°24.890N 115°19.710E 4231m CTD+CAROUSEL STRAT
PA-11 21:57 15°24.890N 115°19.710E 4231m CTD+CAROUSEL STRAT
PA-11 22:19 15°25.030N 115°19.590E 4234m CTD+CAROUSEL DEEPEST
PA-11 22:19 15°25.030N 115°19.590E 4234m CTD+CAROUSEL DEEPEST
PA-11 22:46 15°25.230N 115°19.450E 4236m SUNRISE & PUT OFF REGULATION LIGHTS
PA-11 22:46 15°25.230N 115°19.450E 4236m SUNRISE & PUT OFF REGULATION LIGHTS
PA-11 22:50 15°25.250N 115°19.390E 4233m CTD+CAROUSEL FINISH
PA-11 22:50 15°25.250N 115°19.390E 4233m CTD+CAROUSEL FINISH
PA-11 23:34 15°25.440N 115°19.930E 4236m LV SAMPLING START (4TH
PA-11 23:34 15°25.440N 115°19.930E 4236m LV SAMPLING START (4TH
----- 12 FEB.97 (GMT) -----
PA-11 00:01 15°25.720N 115°20.070E 4231m LV SAMPLING (NO
PA-11 00:01 15°25.720N 115°20.070E 4231m LV SAMPLING (NO
PA-11 00:09 15°25.740N 115°20.110E 4233m LV SAMPLING NO.2 (750 M)
PA-11 00:09 15°25.740N 115°20.110E 4233m LV SAMPLING NO.2 (750 M)
PA-11 00:17 15°25.760N 115°20.100E 4231m LV SAMPLING NO.3 (500 M)
PA-11 00:17 15°25.760N 115°20.100E 4231m LV SAMPLING NO.3 (500 M)
PA-11 00:23 15°25.780N 115°20.100E 4236m LV SAMPLING NO.4 (400 M)
PA-11 00:23 15°25.780N 115°20.100E 4236m LV SAMPLING NO.4 (400 M)
PA-11 00:31 15°25.800N 115°20.110E 4231m LV SAMPLING FINISH (4 CAST)
PA-11 00:31 15°25.800N 115°20.110E 4231m LV SAMPLING FINISH (4 CAST)
PA-11 01:03 15°24.480N 115°19.810E 4237m LV SAMPLING START (5 CAST)
PA-11 01:03 15°24.480N 115°19.810E 4237m LV SAMPLING START (5 CAST)
PA-11 01:18 15°24.620N 115°19.910E 4236m LV SAMPLING NO.1(300 M)
PA-11 01:18 15°24.620N 115°19.910E 4236m LV SAMPLING NO.1(300 M)
PA-11 01:23 15°24.640N 115°19.890E 4233m LV SAMPLING NO2 (200M)
PA-11 01:23 15°24.640N 115°19.890E 4233m LV SAMPLING NO2 (200M)
PA-11 01:29 15°24.680N 115°19.880E 4231m LV SAMPLING NO3 (100M)
PA-11 01:29 15°24.680N 115°19.880E 4231m LV SAMPLING NO3 (100M)
PA-11 01:30 15°24.680N 115°19.890E 4234m LV SAMPLING NO4 (100M)
PA-11 01:30 15°24.680N 115°19.890E 4234m LV SAMPLING NO4 (100M)
PA-11 01:36 15°24.700N 115°19.870E 4234m LV SAMPLING FINISH (5CAST)
PA-11 01:36 15°24.700N 115°19.870E 4234m LV SAMPLING FINISH (5CAST)
PA-11 02:04 15°24.760N 115°19.660E 4231m LV SAMPLING START (6 CAST)
PA-11 02:04 15°24.760N 115°19.660E 4231m LV SAMPLING START (6 CAST)
PA-11 03:03 15°24.990N 115°19.740E 4231m LV SAMPLING NO.1 (3000 M)
PA-11 03:03 15°24.990N 115°19.740E 4231m LV SAMPLING NO.1 (3000 M)
PA-11 03:05 15°24.980N 115°19.740E 4235m LV SAMPLING NO.2 (3000 M)
PA-11 03:05 15°24.980N 115°19.740E 4235m LV SAMPLING NO.2 (3000 M)
PA-11 03:18 15°25.020N 115°19.770E 4239m LV SAMPLING NO.3 (2500 M)
PA-11 03:18 15°25.020N 115°19.770E 4239m LV SAMPLING NO.3 (2500 M)
PA-11 03:38 15°25.100N 115°19.780E 4237m LV SAMPLING NO.4 (1500 M)
PA-11 03:38 15°25.100N 115°19.780E 4237m LV SAMPLING NO.4 (1500 M)
PA-11 04:31 15°24.990N 115°19.630E 4231m LV SAMPLING START
PA-11 04:31 15°24.990N 115°19.630E 4231m LV SAMPLING START
PA-11 05:54 15°25.560N 115°19.920E 4212m LV SAMPLING NO 1 (4000 M)
PA-11 05:54 15°25.560N 115°19.920E 4212m LV SAMPLING NO 1 (4000 M)
PA-11 05:57 15°25.580N 115°19.930E 4238m LV SAMPLING NO 2 (4000M)
PA-11 05:57 15°25.580N 115°19.930E 4238m LV SAMPLING NO 2 (4000M)
PA-11 06:03 15°25.630N 115°19.960E 4163m LV SAMPLING NO 3 (4150 M)
PA-11 06:03 15°25.630N 115°19.960E 4163m LV SAMPLING NO 3 (4150 M)
PA-11 06:09 15°25.620N 115°19.950E 4239m LV SAMPLING NO 4 (4000 M)
PA-11 06:09 15°25.620N 115°19.950E 4239m LV SAMPLING NO 4 (4000 M)

PA-11 07:11 15°26.350N 115°20.210E 4178m LV SAMPLING FINISH
PA-11 07:11 15°26.350N 115°20.210E 4178m LV SAMPLING FINISH
PA-11 07:48 15°24.970N 115°19.790E 4233m LV SAMPLING START (7TH CAST)
PA-11 07:48 15°24.970N 115°19.790E 4233m LV SAMPLING START (7TH CAST)
PA-11 08:17 15°25.610N 115°19.780E 4235m LV SAMPLING (NO
PA-11 08:17 15°25.610N 115°19.780E 4235m LV SAMPLING (NO
PA-11 08:20 15°25.700N 115°19.780E 4234m LV SAMPLING (NO
PA-11 08:20 15°25.700N 115°19.780E 4234m LV SAMPLING (NO
PA-11 08:26 15°25.890N 115°19.780E 4239m LV SAMPLING (NO
PA-11 08:26 15°25.890N 115°19.780E 4239m LV SAMPLING (NO
PA-11 08:30 15°25.960N 115°19.760E 4249m LV SAMPLING (NO
PA-11 08:30 15°25.960N 115°19.760E 4249m LV SAMPLING (NO
PA-11 08:34 15°26.080N 115°19.850E 4234m LV SAMPLING FINISH
PA-11 08:34 15°26.080N 115°19.850E 4234m LV SAMPLING FINISH

6. Topographic maps with location of the stations

6-1. Sulu Sea

Data source is the ETOPO5 5-minute gridded elevation data mounted in "Global Relief CD-ROM" distributed by the National Geophysical Data Center of NOAA in USA.

6-2. North Australia Basin

Data source is the ETOPO5 5-minute gridded elevation data mounted in "Global Relief CD-ROM" distributed by the National Geophysical Data Center of NOAA in USA.

6-3. Southeast Indian Ridge

Data source is the ETOPO5 5-minute gridded elevation data mounted in "Global Relief CD-ROM" distributed by the National Geophysical Data Center of NOAA in USA.

6-4. Perth Basin

Data source is the ETOPO5 5-minute gridded elevation data mounted in "Global Relief CD-ROM" distributed by the National Geophysical Data Center of NOAA in USA.

6-5. Cuvier Plateau

Data source is the ETOPO5 5-minute gridded elevation data mounted in "Global Relief CD-ROM" distributed by the National Geophysical Data Center of NOAA in USA.

6-6. Vening Meinesz SMTS

Data source is the ETOPO5 5-minute gridded elevation data mounted in "Global Relief CD-ROM" distributed by the National Geophysical Data Center of NOAA in USA.

6-7. Ninetyeast Ridge and Bay of Bengal

Data source is the ETOPO5 5-minute gridded elevation data mounted in "Global Relief CD-ROM" distributed by the National Geophysical Data Center of NOAA in USA.

6-8. Andaman Basin

Data source is the ETOPO5 5-minute gridded elevation data mounted in "Global Relief CD-ROM" distributed by the National Geophysical Data Center of NOAA in USA.

6-9. South China Sea

Data source is the ETOPO5 5-minute gridded elevation data mounted in "Global Relief CD-ROM" distributed by the National Geophysical Data Center of NOAA in USA.

7. Shipboard working groups

7-1. Group organization for shipboard observation works

	Leg-1	Leg-2	Leg-3
Superintendent	Gamo, Hasumoto	Gamo, Hasumoto	Gamo, Hasumoto
CTD-hydrocast	Nakaguchi*, Isshiki, Maruo, Obata, Alibo, Manaka, Jordan, Mori, Kimura, Hattori, Li, Nagato, Ikehara, Pascual, Sister, Kakiuchi	Nakayama*, Sohrin, Minami, Obata, Tsunogai, Alibo, Jordan, Mori, Kimura, Hattori, Nagato, Narita (Y.), Kakiuchi	Minami*, Alibo, Mori, Kimura, Hattori, Takeda, Hasumoto, Nagato, Zhang, Kakiuchi, Kojima
Large volume water sampling	Nakanishi*, Aono, Haque, Amakawa, Yamamoto, Zhang, Yamada Kobayashi,	Nakanishi*,Aono, Haque, Amakawa, Yamamoto, Kobayashi, Yamada, Zhang	Yamada*, Zhang, Amakawa, Haque, Yamamoto, Hayashi
Piston coring Multiple coring	Kato*, Narita(H.), Okuno, Jordan, Kuramoto, Kakiuchi	Kato*, Narita(H.), Murayama, Jordan, Kimoto, Tadai, Hayashi, Kakiuchi	Murayama*, Kimoto, Tadai, Hayashi, Kakiuchi
In situ filtration	Yamada*, Zhang, Aono	Yamada*, Zhang, Aono, Miura	
Atmospheric studies	Li, Nagato, Kakiuchi, Ikehara, Ichikawa, Zhang, Aono	Miura, Nagato, Kakiuchi, Narita (Y.), Zhang, Aono, Minami	Kojima, Nagato, Takeda, Kakiuchi, Zhang, Minami

(*Group leader)

7-2. Allotment of routine analysis

	Leg-1	Leg-2	Leg-3
Data assembling & arrangement	Hasumoto, Zhang, Yamada	Hasumoto, Zhang, Yamada	Hasumoto, Zhang, Yamada
Salinity	Maruo, Obata, Yamamoto, Mori, Kakiuchi	Sohrin, Obata, Yamamoto, Mori, Kakiuchi	Yamamoto, Mori, Kakiuchi, Takeda
Dissolved oxygen	Amakawa, Haque, Kobayashi, Isshiki, Ikehara	Amakawa, Haque, Kobayashi, Narita (Y.)	Amakawa, Haque
Nutrients	Nakaguchi, Kimura, Hattori	Kimura, Hattori	Kimura, Hattori
pH & Alkalinity	Narita (H.), Kuramoto, Li, Manaka, Nagato, Aono	Narita (H.), Aono, Hayashi, Nagato, Tsunogai, Aono	Hayashi, Nagato, Zhang, Alibo
Chlorophyll a	Isshiki, Jordan, Maruo, Hasumoto	Jordan, Minami, Hasumoto	Minami, Hasumoto

8. Explanatory notes and shipboard data of water column observation

8-1. Major instruments

8-1-1. CTD Carousel Multi Sampling (CTD-CMS) system

CTD-hydrocast group

The CTD-CMS (CTD-Carousel Multi Sampling system) used during the KH-96-5 cruise consists of the following instruments.

CTD fish (Seabird, Model 9 plus, pressure rating: 6800m) with a DO sensor
Carousel Multi-Sampling system (Seabird, Carousel-36)
Lever-action Niskin samplers (General Oceanics, 12-liter type)
Niskin Samplers (General Oceanics, 12-liter type)
Pinger (Benthos, Model 2216)

The CTD-CMS system, attached at the end of the titanium armored cable (8mm o.d.) from the No.2 winch of R.V. Hakuho Maru, was controlled on board the ship by a CTD deck unit (Seabird, Model 11 plus) connected with an IBM compatible desktop computer. The array frame (Carousel) has a capability to hold 36 water samplers with a volume of 12 liters. A pinger was installed inside the frame to monitor the distance between the system and the sea bottom. The ship stays at a fixed position, where the system is lowered to a depth of several meters above the bottom. Water samples are taken by triggering the samplers at appropriate depths while the system is coming up to the surface.

Two kinds of water samplers were used: lever-action Niskin samplers and ordinary Niskin samplers. In order to reduce the contamination level as low as possible, all the samplers had been completely coated with teflon paint on their inside walls before the cruise. Silastic tubing (a kind of silicone rubber) is used as rubber spring for the Niskin samplers because of its contamination-free characteristics. On board the ship, the samplers were cleaned thoroughly using 2% Extran MA01 (Merck) solution, 0.1*M* HCl solution and Milli-Q pure water just before use.

Collected samples were split for routine analyses of salinity, dissolved oxygen, pH, alkalinity, nutrients (Si, PO_4, NO_3), and chlorophyll a. In addition to these routine measurements, various chemical components in seawater will also be measured by responsible scientists on board the ship or in shorebased laboratories in charge. Their brief objectives and methods are shown in chapter 10 of this cruise report.

8-1-2. Large volume water sampling system

Large volume water sampling group

There is an increasing need for the collection of large volume seawater samples from all depths for the determination of trace elements, isotopes, and natural and artificial radionuclides. During the KH-96-5 cruise large volume water sampling was carried out as

Fig. 1 Side elevation view of the large-volume water sampler used in the KH-96-5 cruise.

follows.

Large volume (≥ 200 *l*) surface seawater samples were obtained by the use of a pump or from the pumping system of R.V. Hakuho-Maru.

About 250 *l* of seawater from a range of depths, from 10 m deep down to the bottom (~5500 m), were collected using a new-type large-volume water sampler. The specially constructed large-volume water sampler (model N12-1000, Nichiyu-Giken-Kohgyo Co. Ltd., Japan; Table 1) was first used on the KH-96-5 cruise and is equipped with the following units (Fig. 1): (i) four rigid-PVC (poly(vinyl chloride)) sampling tubes, each of which has a 250 *l* nominal capacity and bears a reversing digital thermometer and digital manometer couple in a thermometer frame, (ii) a motor-driven trigger unit for stepwise closure of sampling tube, (iii) an acoustic unit which feeds electric power to the motor-driven trigger unit on receiving an acoustic command from the ship and sends an acoustic signal back to the ship immediately after each sampling and (iv) a battery unit (24 V and 12 V). On sending an acoustic command from the ship to the sampler at the sampling depth, the acoustic unit of the sampler feeds electric power to the motor-driven trigger unit. On triggering with the motor, hinged lids, fitted with strong rubber springs and rubber gaskets, are snapped into place at each end of a sampling tube and the thermometer frame rotates. By repeating the operational procedure, four 250 *l* seawater samples per cast can be obtained.

Table 1 Specification of the large-volume water sampler used in the KH-96-5 cruise.

maximum permissible operating depth	7,000 m
construction materials	frame: stainless steel (SUS304) aluminium alloy (A7075-T6) titanium alloy (TITA 1) sampling tube (482 mm i.d.): rigid PVC (poly(vinyl chloride))
outer dimensions	1650 mm(W) × 1650 mm(D) × 2571 mm(H)
weight	715 kgf(in air), 538 kgf(in water)
sampling capacity	1,000 *l* (250 *l*/tube × 4 tubes)
mode of control	controlled by acoustic transmission
trigger	motor-driven trigger
electric power supply	24V and 12V from 24 of 1.5V dry cell

8-1-3. *In situ* filtrating system

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Center for Radioecology, National Institute of Radiological Sciences

In situ particle sampler (CHALLENGER OCEANIC SYSTEMS & SERVICES) is designed to filter over one cubic metre of water in a few hours at midwater depths in the open ocean. The aim is to provide sufficient quantities of particulate material for the subsequent analysis of radiochemical moieties. The basic unit consists of a 293 mm diameter polypropylene filter housing (with two in-line MnOx impregnated scavengers after the filter for the simultaneous extraction of dissolved radionuclides), a centrifugal pump mounted on the end cap of a pressure tube containing a motor and an alkaline battery pack (32 V). Two scavengers are used in order to check the removal efficiency. A magnetically swiched preprogrammable electronic timer controls the sampling and the volume sampled is monitored by a mechanical displacement flow meter. Delay to start of pumping can be from 0 to 999.9 hours and duration of sampling up to 9.9 hours, both in 6 minute steps. The volume sampled depends on the concentration of the suspended particulate matter and the duration of pumping. The units are built for a safe working depth of 5500 m. In situ particle samplers were deployed by wire from the No.1 or No.4 winch of R/V Hakuho Maru.

8-2. Methods of Routine Analyses

8-2-1. Salinity

Salinity group

Salinity was measured with a salinometer, (Autosal, Model 8400A) in the usual way. The cell temperature was 24°C. IAPSO standard seawater (Ocean Scientific International Ltd., Batch : P129, Date22-Nov-95, K15=0.99996) was used for calibration.

8-2-2. Dissolved Oxygen

Hiroshi AMAKAWA & DO group

Each seawater is collected to an oxygen bottle with a volume of 100 cm^3, avoiding the introduction of bubbles. After the collection, 0.5 ml of $MnCl_2$ solution and 0.5 ml of KI-NaOH solution are successively added to the bottle. This procedure quantitatively fixes dissolved oxygen in seawater sample as $MnO(OH)_2$. After standstill for more than one day for the precipitate to settling down to the bottom of the bottle, the supernatant (10-20 ml) is removed to reduce the sample volume. Then, 5 ml of *6M* HCl is added to dissolved the precipitation to release I_2. The color of the solution in the bottle turns into yellow. Then, I_2 is titrated by sodium thiosulfate ($Na_2S_2O_3$) standard solution using an automatic titrating machine (Hirama, Model ART-3). The sodium thiosulfate standard solution is calibrated by using CSK standard of 0.0100M potassium iodate (KIO_3) solution (WAKO Pure Chemical Industries, LTD.).

8-2-3. Nutrients

Y. NAKAGUCHI, M. KIMURA and H. HATTORI

Method

Seawater samples were collected in 100 cm^3 polyethylene bottles, and aliquots of 10 cm^3 were used for analyses.

Nitrate + Nitrite Nitrogen: Nitrate is reduced quantitatively to nitrite by cadmium metal in the form of an open tubular cadmium reactor (OTCR). The nitrite thus formed plus any originally present in the sample is determined as an azo dye (absorbance maximum, 543 nm) following its diazotization with sulfanilamide and subsequent coupling with N-1-naphthylethylenediamine.

Phosphate: Phosphate reacts with molybdenum(VI) and antimony(III) in an acid medium to form a phosphoantimonylmolybdenum complex which is subsequently reduced by ascorbic acid to a heteropolyblue with an absorbance maximum at 880 nm.

Silicate: B-molybdosilicic acid is formed by the reaction of silicate with molybdate at a pH of 1 to 1.8. The B-molybdosilicic acid is reduced by tin(II) to form molybdenum blue with an absorbance maximum at 820 nm.

Apparatus and reagents

Nitrate + nitrite, phosphate and silicate are analyzed by a rapid flow analyzer (ALPKEM RFA300). The Reaction system is shown in Fig.1.

Reagents for nitrate + nitrite analysis

Stock imidazole buffer (0.1*M*): Insert a pH electrode and a magnetic stirring bar into approximately 900 mL of deionized Milli-Q water contained in a 1L beaker. Turn on the stirrer and dissolve 6.81 g of imidazole in the deionized Milli-Q water. Adjust the pH of the solution to pH 7.5 with concentrated hydrochloric acid. Transfer the solution to a 1L volumetric flask and dilute it to the mark with deionized water. Store the buffer in a sealed bottle at 2-6 °C.

Working imidazole buffer: Mix together 50 mL of stock imidazole buffer, 50 mL of deionized water, 100 mL of 0.01*M* cupric sulfate, and 0.1 mL of Brij 35. Prepare the amount of working buffer needed for the day's run.

Stock sulfanilamide(1%): Carefully add 100 mL of hydrochloric acid to approximately 700 mL of deionized Milli-Q water contained in a 1 L volumetric flask. Dissolve 10 g of sulfanilamide in the acid solution. Dilute the solution to the mark with deionized water and mix it well. The solution may be stored in a sealed bottle either at room temperature or refrigerated at 2-6 °C.

Working sulfanilamide: Mix together 50 mL of sulfanilamide(1%) and 0.1 mL of Brij-35. Prepare the amount of sulfanilamide needed for the day's run.

N-(1-naphthyl)ethylenediamine Dihydrochloride(NED) solution: Dissolve 1g of NED in approximately 900 mL of deionized Milli-Q water contained in a 1L volumetric flask. Dilute the solution to the mark with deionized water. Store the solution in an amber bottle in a refrigerator.

Cupric Sulfate(2% w/v): Dissolve 20 g of cupric sulfate in approximately 900 mL of deionized Milli-Q water contained in a 1L volumetric flask. Dilute the solution to the mark

Fig. 1 Reaction system of measurement.

with deionized water. Store the solution in a sealed bottle at room temperature.

Buffered Copper solution: Mix together 20 mL of imidazole buffer and 20 mL of 2% cupric sulfate in 50 mL beaker.

Reagents for phosphate analysis

Sodium Lauryl Sulfate(SLS) (15% w/w): Dissolve 15 g of dodecyl sodium sulfate in 85 mL of deionized Milli-Q water.

Stock Sulfuric Acid(5N): Cautiously added 70 mL of concentrated sulfuric acid to 300 mL of deionized Milli-Q water contained in a 1000 mL Erlenmeyer flask. Cool to room temperature and transfer to a 500 mL volumetric flask. Dilute to the mark with deionized Milli-Q water.

Stock Antimony Potassium Tartrate: Dissolve 0.3g of antimony potassium tartrate in 80 mL of deionized Milli-Q water contained in a 100 mL volumetric flask. Dilute to the mark with deionized Milli-Q water. Store at 4 °C in a dark bottle.

Stock Ammonium Molybdate: Dissolve 4 g of ammonium molybdate in 70 mL of deionized water contained in a 100 mL volumetric flask. Dilute to the mark with deionized water. Store at 4 °C in a polyethylene bottle.

Stock Ascorbic Acid: Dissolve 3 g of ascorbic acid in 100 mL of deionized Milli-Q water and added 100 mL of acetone.

Working Reagent: Mix together 50 mL of stock sulfuric acid, 5 mL of stock antimony potassium tartrate, 15 mL of stock ammonium molybdate, 4 mL of SLS and 30 mL of deionized Milli-Q water.

Working Ascorbic Acid: Mix together 10 mL of stock ascorbic acid and 50 mL of deionized Milli-Q water and added 2 mL of SLS.

Reagents for silicate analysis

Stock Ammonium Molybdate: While carefully stirring, add 2.8 mL of sulfuric acid to approximately 900 mL of deionized Milli-Q water contained in a 1L volumetric flask. Dissolve 10.8 g of ammonium molybdate in the acidic solution. Dilute the solution to the mark with deionized Milli-Q water and mix it well. Store the reagent in a plastic container.

Working Molybdate Reagent: Mix together 100 mL of ammonium molybdate and 2 mL of SLS. Prepare daily the quantity sufficient for the day's run.

Tartaric Acid(10% w/v): Dissolve 100 g of tartaric acid in approximately 700 mL of deionized Milli-Q water contained in 1 L volumetric flask. Dilute the solution to the mark with deionized Milli-Q water and mix it well. Add 2 drops of chloroform. Store the reagent in a plastic container and refrigerate it at 2-6 °C.

Stock Stannous Chloride: While stirring carefully add, 10 mL of hydrochloric acid to 10 mL of deionized Milli-Q water. Dissolve 10 g of stannous chloride in the acidic solution.

Working Stannous Chloride Reagent: Mix together 0.5 mL of stock stannous chloride and 50 mL of 1.2N hydrochloric acid in a plastic container. Prepare fresh reagent daily.

Calibrants

Stock Nitrate Nitrogen (10mM): Dissolve 1.01 g of dry potassium nitrate in approximately 900 mL of deionized Milli-Q water contained in a 1 L volumetric flask. Dilute the solution to the mark with deionized Milli-Q water and mix it well.

Stock Phosphate(1mM): Dissolve 1.36 g of dry potassium dihydrogen phosphate in 400 mL of deionized Milli-Q water contained in a 500 mL volumetric flask. Dilute the solution

to the mark with deionized Milli-Q water and mix it well (0.02*M* phosphate stock solution). Then remove 50 mL of 0.02*M* phosphate stock solution to a 1L volumetric flask. Dilute the solution to the mark with deionized Milli-Q water and mix it well.

Stock Silicate(5mM): Silica gel (SiO_2) for chromatography is washed with hydrochloric acid and ethyl alcohol. Add 0.3004 g of SiO_2 to a platinum melting pot containing 2 g of potassium carbonate, and heat in an electric furnace. After melting, dissolve with deionized Milli-Q water. Quantitatively transfer the solution to a 1 L volumetric flask. Dilute the solution to the mark with deionized Milli-Q water.

Working calibrants are shown in Table 1. Working calibrants are normalized by the Marine Nutrients Standards Kit (MNSK) which contains nutrient standard solutions and low nutrient seawater (Ocean Scientific International Ltd.).

Table 1 Working calibrants for nutrients

	NO_3-N(mM)	PO_4-P(mM)	SiO_2(mM)
S-1	1.2	0.10	5.0
S-2	3.0	0.25	12.5
S-3	6.0	0.5	25
S-4	12	1.0	50
S-5	24	2.0	100
S-6	36	3.0	150
S-7	48	4.0	200

8-2-4. Determination of pH and Alkalinity

Hisashi NARITA & pH-Alkalinity group

pH measurement

Seawater samples were collected in 100 ml polyethylene bottles with sufficient overflow (about 100 ml), in order to avoid exchange of CO_2 with the atmosphere during sampling. About 40 ml of this seawater sample enclosed in a glass measurement container, which is necessary in order to ensure reliable pH results, was analyzed using a high precision pH meter (model PHM93, Radiometer Analytical A/S).

Analysis time of each seawater sample is 7 minutes, with the temperature controlled at 25 °C(±0.1) during the whole measurement. The calibration of the pH meter used pH 4.0 and pH 7.0 buffer solutions. Therefore, the correction of pH drift during each sample through all stations used TRIS (2-amino-2-hydroxymethyl-1, 3-propanediol)/HCl buffer in a synthetic seawater of 35 ‰ salinity. The RSD of duplicate or triplicate analyses for surface seawater samples at each station was less than 0.02 %.

Alkalinity measurement

Seawater was poured into 250 ml polyethylene bottles with sufficient overflow (about 250 ml), in order to avoid exchange of CO_2 with the atmosphere during sample collection. An aliquot of 50 ml was used for alkalinity measurement by the inflection point titration method using Titralab TM (Radiometer Analytical A/S) system. The temperature was

controlled at 25 °C(± 0.1) during the alkalinity measurement. The titrant (0.1 N HCl containing 35 g NaCl /1000 ml) was calibrated by 0.0025 N Na_2CO_3 standard solution [1.32 g Na_2CO_3 (oven-dried at 600 °C for 3-6 hours) dissolved in Milli-Q water and diluted to 1000 ml]. The RSD of duplicate or triplicate analyses for surface seawater samples at each station was normally less than 0.2 %.

8-2-5. Chlorophyll a

Kenji ISSHIKI, Hideki MINAMI and Hiroshi HASUMOTO

During this cruise, a method to obtain the highest possible extraction efficiency for chlorophyll a (Chl-a) was adapted. The points of the method are as follows; addition of $MgCO_3$ to increase the collection efficiency of microplankton on the filter and to prevent the decomposition of Chl-a, use of N,N-dimethyl formamide (DMF) as an extractant instead of acetone, and application of ultrasonic waves during extraction to increase the extraction efficiency of Chl-a.

Seawater from depths of 0 m to 250 m was taken with a CTD-CMS system. Samples were treated according to the following procedure immediately after the collection. 1 ml of $MgCO_3$ suspension was added to 0.5 L of sample water. Then the sample water was filtered through a Whatman GF/F glass fiber filter (25 mm diameter). Each filter was soaked with 5 ml of DMF in test tubes, ultrasonic waves were applied to them for 5 minutes and they were stored for 1 day in a refrigerator. After centrifugation for 10 min at 3000 rpm to precipitate the fragment of the glass fiber filter, the fluorescence of the supernatant DMF in each test tube was measured with a Turner Design Model 110 fluorometer. The fluorescence was measured again after the addition of a drop of 0.5 *M* hydrochloric acid. The concentration of Chl-a was calculated according to the following equation.

$$\text{Chl-a}/\mu\text{gL}^{-1} = (Fo - Fa) \times F \times 5 / V/L$$

Fo: Fluorescence value before adding acid
Fa: Fluorescence value after adding acid
F : Factor (shown in Table 1)
V : Volume of sample seawater (normally 0.5 L)

Table 1 Calibration Coefficients for the fluorometer

Range1	Range2	F
1	1	2.42
1	3.16	0.806
1	10	0.257
1	31.6	0.071
100	1	0.0173
100	3.16	0.00472
100	10	0.00175

8-3. Routine analytical data for the CTD hydrocast samples

Data tables at stations PA1, 2, 4, 5, 7, 9, 10, and 11 are shown in the following 16 pages. Each station has two tables; one is for the shallow cast, and the other for the deep cast.

Some common remarks for all the tables are described below.

The 1-st column: Bottle No. (from 1 to 36). "0" and "Pump0" mean the surface water samples taken with a plastic bucket and with a pump, respectively.

The 2-nd column: Type of samplers. "Niskin" and "LA" stand for a Niskin bottle and a lever-action Niskin bottle, respectively (see 8-1-1).

The 5-th column: *In situ* temperature measured with the CTD at the instant of the Carousel sampling (see 8-1-1).

The 6-th column: Salinity measured with the CTD at the instant of the Carousel sampling (see 8-1-1).

The 12-th column: Salinity measured with the salinometer on board the ship (see 8-2-1).

The 15th to 20-th columns: Interpolated values of pressure (P), in situ temperature (T), salinity (S), dissolved oxygen (O2), and density (sigma-T) for standard layers. Data were taken during the downward CTD operation. The O_2 sensor seems to have given unreliable data with large systematic shifts.

Shaded values: Possibly suspicious data.

The last row "Pinger-Bottom": the distance between the sea floor and the sonar pinger attached to the CTD-CMS when the deepest sample was taken.

St.		PA1	Date	Dec. 25			Lat.	08°50.08'N		Depth	4949 m							
Shallow cast			Time(JST-1) 15:58-16:05				Long.	121°48.33'E							CTD	Down		CAST
No.	Bottle	m	db	℃	psu	O2	SiO2	PO4	NO2+NO3	Chl-a	PSU	PH	ALK	db	℃	psu	ml/L	
Bottle	Type	Depth	Pres	T(CTD)	S(CTD)	ml/L	μM	μM	μM	μg/L	S			P	T	S	O2	Sigma-T
0	-	0	0	-	-	4.58	1.36	0.01	0.00	0.284	33.639	8.255	2276.2	2	27.666	33.617	3.69	21.463
36	Niskin	2	2	27.657	33.617	4.64	1.04	0.02	0.03	0.405	33.639	8.255	2271.2	10	27.641	33.616	3.78	21.471
35	-	-	-	-	-	-	-	-	-	-	-	-	-	20	27.584	33.616	3.83	21.489
34	LA	10	10	27.642	33.615	4.63	1.29	0.00	0.59	0.490	33.636	8.249	2270.9	30	27.501	33.626	3.82	21.523
33	Niskin	15	15	27.606	33.616	4.64	1.06	0.00	0.23	-	33.639	8.249	2269.0	40	27.358	33.645	3.83	21.583
32	LA	20	21	27.577	33.616	4.66	1.14	0.00	0.09	0.469	33.638	8.247	2267.7	50	27.267	33.680	3.77	21.639
31	LA	30	30	27.477	33.627	4.66	0.82	0.00	0.22	0.682	33.651	8.243	2270.8	75	24.920	34.092	2.59	22.679
30	Niskin	30	30	27.462	33.628	4.60	1.06	0.01	0.19	-	33.651	8.239	2268.8	100	23.215	34.171	2.33	23.243
29	Niskin	40	40	27.380	33.639	4.60	1.06	0.06	0.18	0.937	33.673	8.245	2268.8	125	20.186	34.343	2.07	24.212
28	Niskin	50	51	27.295	33.680	4.43	1.87	0.07	0.49	0.888	33.730	8.235	2274.6	150	18.032	34.383	2.03	24.792
27	LA	50	50	27.293	33.681	4.51	1.79	0.07	0.42	-	33.715	8.238	2273.8	175	15.977	34.475	1.93	25.349
26	Niskin	50	50	27.292	33.683	4.42	2.28	0.09	0.64	-	33.753	8.230	2296.2	200	14.828	34.528	2.20	25.645
25	LA	70	71	25.325	34.065	3.12	10.42	0.50	7.65	0.362	34.095	8.131	2273.8	250	13.393	34.490	1.88	25.918
24	Niskin	75	76	24.799	34.087	3.02	11.59	0.62	8.74	-	34.112	8.114	2297.7	300	12.748	34.468	1.53	26.031
23	LA	80	80	24.531	34.097	2.97	11.74	0.67	9.01	0.156	34.121	8.103	2295.3	400	11.611	34.462	1.86	26.244
22	Niskin	101	102	22.709	34.213	2.62	15.25	0.80	11.97	0.109	34.215	8.052	2307.0	500	10.896	34.452	1.91	26.367
21	Niskin	101	102	22.637	34.199	2.64	15.24	0.83	11.67	-	34.213	8.052	2306.5	600	10.475	34.445	1.86	26.437
20	LA	101	101	22.526	34.196	2.65	15.38	0.87	11.73	-	34.214	8.052	2302.1	800	10.165	34.441	1.72	26.487
19	Niskin	100	101	22.367	34.187	2.66	15.28	0.84	11.52	-	34.223	8.052	2305.5	-	-	-	-	-
18	LA	124	125	20.151	34.327	2.38	20.61	1.05	15.05	0.048	34.349	7.996	2318.1	-	-	-	-	-
17	Niskin	124	125	20.140	34.325	2.42	20.91	1.03	14.95	-	34.347	7.994	2315.4	-	-	-	-	-
16	LA	150	151	17.825	34.449	2.13	24.54	1.22	17.68	0.015	34.466	7.941	2322.3	-	-	-	-	-
15	Niskin	149	150	17.769	34.452	2.18	24.88	1.16	18.04	-	34.467	7.938	2321.7	-	-	-	-	-
14	Niskin	174	175	15.948	34.460	2.25	30.13	1.15	19.29	0.004	34.485	7.907	2498.7	-	-	-	-	-
13	LA	200	201	14.862	34.516	2.39	29.81	1.14	19.32	0.004	34.537	7.900	2330.8	-	-	-	-	-
12	Niskin	199	201	14.859	34.516	2.37	29.34	1.13	19.53	-	34.534	7.902	2338.2	-	-	-	-	-
11	Niskin	199	200	14.858	34.516	2.35	29.66	1.12	19.45	-	34.533	7.900	2332.2	-	-	-	-	-
10	LA	250	251	13.432	34.487	2.05	39.54	1.48	22.84	0.006	34.500	7.851	2335.9	-	-	-	-	-
9	Niskin	249	250	13.429	34.486	2.08	40.26	1.10	22.59	-	34.501	7.854	2335.6	-	-	-	-	-
8	Niskin	301	303	12.786	34.463	1.63	49.59	1.83	25.27	-	34.478	7.796	2340.7	-	-	-	-	-
7	LA	299	301	12.777	34.463	1.55	49.76	1.84	25.55	-	34.478	7.791	2336.0	-	-	-	-	-
6	LA	398	401	11.600	34.458	1.85	50.57	1.83	25.97	-	34.472	7.793	2350.7	-	-	-	-	-
5	LA	500	503	10.864	34.448	1.96	54.31	1.90	26.53	-	34.465	7.784	2348.8	-	-	-	-	-
4	Niskin	498	501	10.834	34.448	2.08	54.07	1.89	26.24	-	34.465	7.783	2343.7	-	-	-	-	-
3	LA	597	601	10.456	34.443	2.06	57.09	1.95	26.58	-	34.463	7.776	2354.3	-	-	-	-	-
2	Niskin	696	701	10.286	34.441	2.03	60.03	1.93	27.07	-	34.455	7.771	2354.7	-	-	-	-	-
1	LA	796	802	10.163	34.441	1.84	63.61	2.00	27.84	-	34.460	7.766	2355.6	-	-	-	-	-
		Pinger-Bottom		m														

St.		PA1	Date	Dec. 25			Lat.	08°50.61'N		Depth	4949 m							
Deep Cast			Time(JST-1) 07:00-10:57				Long.	121°48.39'E							CTD	Down		CAST
No.	Bottle	m	db	℃	psu	O2	SiO2	PO4	NO2+NO3	Chl-a	S	PH	ALK	P	T	S	O2	Sigma-T
Bottle	Tyoe	Depth	Pres	T(CTD)	S(CTD)	ml/L	μM	μM	μM	μg/L	PSU			db	℃	psu	ml/L	
0	-	0	0	-	-	-	-	-	-	-	-	-	-	2	27.630	33.618	3.93	21.475
36	Niskin	794	800	10.165	34.441	1.82	64.70	1.93	27.56	-	34.455	7.778	2432.9	10	27.623	33.618	3.95	21.478
35	LA	992	1000	10.090	34.440	1.73	67.08	1.92	27.76	-	34.459	7.754	2358.6	20	27.627	33.617	3.96	21.476
34	LA	992	1000	10.090	34.440	1.74	67.64	2.00	27.96	-	34.455	7.756	2363.6	30	27.621	33.618	4.00	21.479
33	Niskin	992	1000	10.090	34.440	-	-	-	-	-	-	-	-	40	27.604	33.621	4.01	21.486
32	LA	1240	1250	10.084	34.442	1.63	71.85	2.05	28.14	-	34.454	7.753	2358.2	50	27.543	33.638	3.99	21.519
31	LA	1486	1500	10.098	34.444	1.62	68.51	1.97	27.15	-	34.460	7.767	2355.6	75	24.644	34.081	2.72	22.754
30	Niskin	1486	1500	10.098	34.444	1.55	76.54	2.07	28.43	-	34.467	7.753	2360.9	100	22.550	34.186	2.39	23.445
29	Niskin	1486	1500	10.098	34.444	1.54	76.26	2.09	28.34	-	34.455	7.750	2366.3	125	19.824	34.315	2.20	24.286
28	Niskin	1733	1750	10.121	34.447	1.60	81.21	2.14	28.64	-	34.460	7.748	2367.9	150	17.607	34.440	2.04	24.939
27	LA	1979	2000	10.148	34.450	1.45	84.84	2.20	28.66	-	34.461	7.759	2375.5	175	15.969	34.471	2.17	25.348
26	Niskin	1979	2000	10.148	34.450	1.48	84.75	2.13	28.88	-	34.460	7.756	2375.6	200	14.882	34.514	2.31	25.623
25	LA	1979	2000	10.148	34.450	1.50	84.77	2.14	28.89	-	34.459	7.756	2368.0	250	13.455	34.485	1.91	25.902
24	Niskin	2226	2250	10.177	34.453	1.52	86.95	2.12	28.76	-	34.462	7.759	2380.0	300	12.711	34.462	1.50	26.033
23	LA	2472	2500	10.209	34.456	1.39	90.63	2.13	29.00	-	34.465	7.765	2390.2	400	11.617	34.456	1.85	26.239
22	Niskin	2472	2500	10.209	34.456	1.44	90.65	2.14	28.83	-	34.466	7.763	2388.1	500	10.863	34.448	1.92	26.370
21	Niskin	2717	2750	10.245	34.458	1.42	93.41	2.17	29.27	-	34.469	7.758	2397.1	600	10.453	34.443	1.93	26.439
20	LA	2962	3000	10.282	34.459	1.34	93.43	2.20	28.84	-	34.470	7.769	2393.2	800	10.164	34.44	1.77	26.487
19	Niskin	2962	3000	10.282	34.459	1.33	93.79	2.13	28.81	-	34.471	7.767	2384.3	1000	10.089	34.440	1.70	26.500
18	LA	2962	3000	10.282	34.459	1.28	93.48	2.15	28.75	-	34.471	7.769	2393.9	1250	10.084	34.442	1.59	26.502
17	Niskin	3207	3250	10.321	34.460	1.37	94.40	2.19	28.81	-	34.470	7.773	2390.9	1500	10.098	34.444	1.50	26.501
16	LA	3452	3500	10.360	34.461	1.28	96.34	2.22	28.82	-	34.467	7.771	2403.1	1750	10.121	34.447	1.40	26.499
15	Niskin	3452	3500	10.360	34.461	1.29	95.95	2.19	28.76	-	34.474	7.771	2398.9	2000	10.148	34.450	1.36	26.497
14	Niskin	3697	3751	10.400	34.461	1.32	96.73	2.20	28.72	-	34.476	7.766	2400.0	2250	10.177	34.453	1.33	26.494
13	LA	3942	4001	10.441	34.462	1.25	96.51	2.21	28.54	-	34.475	7.773	2405.4	2500	10.209	34.456	1.31	26.491
12	Niskin	3942	4001	10.441	34.462	1.38	96.62	2.21	28.61	-	34.476	7.769	2399.8	2750	10.245	34.458	1.30	26.487
11	Niskin	4185	4250	10.482	34.462	1.39	96.81	2.22	28.55	-	34.475	7.769	2402.7	3000	10.282	34.459	1.34	26.481
10	LA	4429	4501	10.524	34.462	1.56	73.00	1.58	26.65	-	34.473	7.777	2385.7	3250	10.321	34.461	1.36	26.476
9	Niskin	4429	4500	10.524	34.462	1.30	97.20	2.23	28.65	-	34.474	7.771	2400.0	3500	10.360	34.461	1.39	26.469
8	Niskin	4672	4750	10.567	34.462	1.22	97.36	2.23	28.74	-	34.473	7.769	2399.7	3750	10.400	34.461	1.41	26.462
7	LA	4854	4937	10.599	34.462	1.20	97.28	2.21	28.60	-	34.475	7.769	2403.9	4000	10.441	34.461	1.55	26.455
6	LA	4854	4937	10.599	34.462	1.20	97.12	2.21	28.62	-	34.474	7.768	2400.8	4250	10.482	34.462	1.61	26.448
5	LA	4899	4983	10.607	34.462	1.19	97.12	2.21	28.70	-	34.475	7.770	2404.6	4500	10.524	34.462	1.83	26.441
4	Niskin	4898	4983	10.607	34.463	1.32	97.04	2.22	28.75	-	34.474	7.770	2404.8	4750	10.567	34.462	1.95	26.434
3	LA	4944	5030	10.615	34.462	1.30	96.88	2.24	28.67	-	34.475	7.769	2398.9	5000	10.610	34.463	2.30	26.427
2	Niskin	4944	5029	10.615	34.462	1.24	97.21	2.20	28.69	-	34.475	7.772	2392.9	5029	10.615	34.462	2.45	26.426
1	LA	4943	5029	10.615	34.462	1.17	96.88	2.22	28.60	-	34.480	7.779	2400.6	-	-	-	-	-
		Pinger-Bottom		6 m														

St.		PA2	Date	Jan 01			Lat.	12°50.27'S		Depth	5638 m							
Shallow Cast			Time(JMT)	14:45-15:50			Long.	116° 59.84'E							CTD	Down		CAST
No.	Bottle	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S	PH	ALK	P	T	S	O2	Sigma-T
Bottle	Tyoe	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU			db	℃	psu	ml/L	
0pump		0								0.087	34.521							
0	-	0	0	28.650	-	4.59	1.37	0.02	0.15	0.284	34.512	8.266	2321.0	2	28.375	34.492	3.56	21.890
36	Niskin	6	6	28.443	34.490	4.52	1.54	0.05	0.09	0.405	34.511	8.268	2321.1	10	28.187	34.492	3.58	21.952
35	LA	10	10	28.260	34.489	4.51	1.46	0.05	0.05	-	34.510	8.270	2320.7	20	28.147	34.491	3.59	21.964
34	LA	14	14	28.171	34.490	4.49	1.46	0.05	0.06	0.490	34.510	8.270	2320.6	30	28.136	34.492	3.58	21.968
33	Niskin	19	20	28.154	34.490	4.55	1.43	0.07	0.10	-	34.510	8.268	2316.9	40	28.127	34.492	3.56	21.971
32	LA	29	29	28.140	34.490	4.56	1.50	0.06	0.04	0.469	34.511	8.270	2320.0	50	26.414	34.501	3.64	22.527
31	LA	30	30	28.140	34.489	4.58	1.49	0.06	0.18	0.682	34.511	8.268	2319.1	75	25.157	34.601	3.15	22.992
30	Niskin	39	39	28.130	34.489	4.46	1.39	0.07	0.10	-	34.511	8.268	2317.8	100	22.597	34.483	2.39	23.657
29	Niskin	49	49	28.103	34.490	4.55	1.46	0.05	0.02	0.937	34.512	8.268	2314.0	125	20.741	34.635	2.28	24.286
28	Niskin	49	50	28.090	34.490	4.47	1.53	0.07	0.04	0.888	34.512	8.267	2315.3	150	19.740	34.913	2.42	24.764
27	LA	49	50	28.081	34.489	4.59	1.52	0.06	0.01	-	34.512	8.269	2322.4	175	17.308	34.765	2.24	25.260
26	Niskin	49	49	28.015	34.488	4.51	1.51	0.07	0.02	-	34.510	8.262	2316.9	200	15.724	34.783	2.26	25.643
25	LA	49	49	27.615	34.476	4.56	1.49	0.07	0.01	0.362	34.506	8.233	2318.6	250	12.762	34.686	2.20	26.197
24	Niskin	59	59	26.130	34.486	4.37	2.62	0.11	0.19	-	34.533	-	-	300	10.945	34.580	2.11	26.458
23	LA	70	71	25.356	34.573	4.03	4.10	0.27	2.66	0.156	34.597	8.197	2323.2	400	9.366	34.597	2.07	26.743
22	Niskin	73	73	25.127	34.562	3.82	5.03	0.35	3.66	0.109	34.579	8.182	2318.0	500	8.171	34.582	1.98	26.920
21	Niskin	99	99	22.538	34.463	-	-	-	-	-	-	-	-	600	7.381	34.577	1.84	27.032
20	LA	98	99	22.611	34.471	2.92	12.14	0.76	10.56	-	34.497	8.070	2317.9	700	6.525	34.570	1.81	27.145
19	Niskin	98	98	22.569	34.467	2.95	12.12	0.77	10.42	-	34.496	8.072	2317.0	-	-	-	-	-
18	LA	98	98	22.340	34.438	2.88	12.73	0.80	10.79	0.048	34.472	8.065	2317.2	-	-	-	-	-
17	Niskin	124	125	20.661	34.628	2.74	15.64	0.96	13.06	-	34.651	8.026	2324.7	-	-	-	-	-
16	LA	124	125	20.667	34.627	2.70	15.69	0.96	13.09	0.015	34.655	8.026	2325.8	-	-	-	-	-
15	Niskin	149	150	19.659	34.893	2.85	15.51	0.92	12.76	-	34.916	8.023	2312.3	-	-	-	-	-
14	Niskin	199	200	15.569	34.780	2.56	26.78	1.35	18.75	0.004	34.804	7.925	2346.0	-	-	-	-	-
13	LA	198	199	15.457	34.780	2.55	26.85	1.37	18.85	0.004	34.802	7.925	2344.6	-	-	-	-	-
12	Niskin	198	199	15.402	34.781	2.57	27.08	1.34	20.80	-	34.799	7.922	2348.7	-	-	-	-	-
11	Niskin	247	248	12.643	34.662	2.45	36.93	1.66	23.20	-	34.685	7.845	2348.0	-	-	-	-	-
10	LA	301	302	10.803	34.575	2.33	44.57	1.65	25.79	-	34.601	7.804	2354.0	-	-	-	-	-
9	Niskin	299	300	10.790	34.568	2.38	45.26	1.91	25.92	-	34.588	7.796	2350.9	-	-	-	-	-
8	Niskin	298	300	10.821	34.571	2.37	45.09	1.92	25.99	-	34.589	7.796	2350.5	-	-	-	-	-
7	LA	298	300	10.794	34.568	2.28	45.31	1.92	26.14	-	34.588	7.796	2351.6	-	-	-	-	-
6	LA	397	400	9.362	34.593	2.31	50.73	2.05	27.92	-	34.610	7.767	2360.8	-	-	-	-	-
5	LA	497	501	8.175	34.580	2.21	60.23	2.30	30.67	-	34.599	7.734	2367.5	-	-	-	-	-
4	Niskin	497	500	8.173	34.580	2.28	60.55	2.26	30.28	-	34.594	7.736	2370.3	-	-	-	-	-
3	LA	497	500	8.173	34.580	2.22	60.09	2.29	30.53	-	34.597	7.736	2369.4	-	-	-	-	-
2	Niskin	596	600	7.378	34.574	2.11	72.39	2.44	32.42	-	34.591	7.709	2395.6	-	-	-	-	-
1	LA	699	704	6.5085	34.574	2.05	83.8	2.56	33.60	-	34.590	7.699	2390.0	-	-	-	-	-
		Pinger-Bott		m														

St.		PA2	Date	Jan. 01			Lat.	12°49.15'S		Depth	5638 m							
Deep Cast			Time(JST-1) 06:17-10:24				Long.	117° 02.61'E							CTD	down		CAST
No.	Bottle	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S	PH	ALK	db	℃	psu	ml/L	Sigma-T
Bottle	Type	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU			P	T	S	O2	
0		0	0	28.00	-	-	-	-	-	-	-	-	-	5	28.078	34.504	3.27	21.996
36	Niskin	796	801	5.731	34.574	2.12	95.96	2.52	34.23	-	34.589	7.693	2414.9	10	28.089	34.503	3.27	21.992
35	LA	893	900	5.208	34.579	2.18	100.00	2.52	34.10	-	34.608	7.699	2403.9	20	28.093	34.503	3.25	21.991
34	LA	997	1005	4.757	34.585	2.18	110.70	2.59	35.17	-	34.603	7.685	2438.5	30	28.091	34.503	3.25	21.991
33	Niskin	995	1003	4.762	34.585	2.19	110.55	2.59	35.70	-	34.602	7.689	2435.8	40	28.092	34.503	3.25	21.991
32	LA	993	1001	4.765	34.585	2.18	111.05	2.60	35.20	-	34.603	7.687	2437.0	50	25.996	34.463	3.24	22.63
31	LA	1238	1249	4.036	34.611	2.35	120.12	2.59	35.42	-	34.627	7.690	2446.9	75	23.622	34.582	2.51	23.436
30	Niskin	1489	1502	3.397	34.665	2.61	123.89	2.59	35.20	-	34.683	7.701	2454.9	100	21.268	34.654	2.25	24.158
29	Niskin	1487	1501	3.399	34.664	2.62	123.90	2.58	35.01	-	34.682	7.697	2457.7	125	20.330	34.770	2.27	24.499
28	Niskin	1731	1748	2.830	34.698	2.94	127.43	2.54	34.85	-	34.716	7.713	2463.7	150	19.343	34.906	2.32	24.861
27	LA	1982	2003	2.406	34.711	3.20	131.66	2.49	33.82	-	34.728	7.727	2462.2	175	16.906	34.740	2.14	25.337
26	Niskin	1981	2001	2.405	34.711	3.19	131.81	2.48	34.47	-	34.728	7.723	2457.3	200	15.429	34.804	2.20	25.725
25	LA	1979	1999	2.407	34.711	3.18	131.96	2.48	34.63	-	34.728	7.725	2465.6	250	12.644	34.729	2.19	26.254
24	Niskin	2225	2250	2.164	34.713	3.36	134.59	2.44	34.28	-	34.730	7.734	2460.4	300	11.061	34.671	2.18	26.508
23	LA	2474	2503	1.964	34.712	3.49	137.07	2.43	34.11	-	34.729	7.741	2464.4	400	9.113	34.594	2.06	26.782
22	Niskin	2472	2500	1.966	34.712	3.51	138.18	2.47	35.00	-	34.727	7.741	2466.7	500	7.895	34.579	1.80	26.959
21	Niskin	2716	2749	1.806	34.711	3.63	138.74	2.40	34.15	-	34.727	7.746	2462.5	600	6.951	34.576	1.79	27.092
20	LA	2964	3002	1.657	34.709	3.75	140.50	2.38	33.67	-	34.724	7.751	2473.4	800	5.732	34.576	1.85	27.251
19	Niskin	2962	3000	1.658	34.709	3.76	140.81	2.39	33.13	-	34.726	7.751	2474.2	1000	4.801	34.586	1.93	27.370
18	LA	3207	3250	1.481	34.706	3.94	141.61	2.36	32.88	-	34.719	7.758	2471.3	1250	4.037	34.614	2.04	27.475
17	Niskin	3452	3500	1.322	34.703	3.76	139.73	2.36	33.26	-	34.725	7.751	2452.6	1500	3.426	34.662	2.28	27.575
16	LA	3451	3499	1.321	34.703	4.07	140.58	2.34	32.90	-	34.719	7.767	2459.4	1750	2.858	34.698	2.53	27.657
15	Niskin	3696	3750	1.218	34.701	4.24	140.23	2.29	32.71	-	34.717	7.770	2456.8	2000	2.439	34.710	2.74	27.703
14	Niskin	3941	4000	1.168	34.699	4.30	139.96	2.28	32.30	-	34.714	7.775	2464.2	2250	2.168	34.713	2.90	27.729
13	LA	3940	3999	1.168	34.699	4.32	139.53	2.27	32.31	-	34.714	7.777	2459.3	2500	1.957	34.713	3.03	27.745
12	Niskin	4184	4250	1.161	34.699	4.35	139.82	2.27	32.32	-	34.715	7.779	2461.2	2750	1.797	34.711	3.15	27.756
11	Niskin	4433	4504	1.172	34.698	4.36	139.86	2.27	32.26	-	34.711	7.781	2464.7	3000	1.641	34.709	3.26	27.766
10	LA	4431	4502	1.172	34.698	4.37	139.83	2.27	32.34	-	34.714	7.781	2458.2	3250	1.456	34.706	3.40	27.777
9	Niskin	4429	4500	1.172	34.698	4.22	140.14	2.27	32.91	-	34.712	7.779	2462.7	3500	1.311	34.703	3.55	27.785
8	Niskin	4671	4749	1.192	34.698	4.33	139.84	2.28	32.82	-	34.711	7.781	2462.5	3750	1.214	34.701	3.66	27.790
7	LA	4914	4999	1.219	34.698	4.37	139.86	2.26	32.80	-	34.711	7.783	2457.7	4000	1.166	34.699	3.73	27.793
6	LA	4914	4999	1.219	34.698	4.36	140.12	2.28	32.69	-	34.712	7.783	2461.6	4250	1.161	34.699	3.77	27.792
5	LA	5396	5496	1.279	34.697	4.34	140.46	2.28	32.64	-	34.707	7.785	2463.5	4500	1.171	34.698	3.80	27.791
4	Niskin	5585	5690	1.305	34.697	4.35	140.72	2.27	32.43	-	34.701	7.783	2465.5	4750	1.192	34.698	3.82	27.790
3	LA	5584	5689	1.305	34.697	4.37	140.50	2.28	32.00	-	34.707	7.786	2468.3	5000	1.220	34.697	3.83	27.787
2	Niskin	5634	5741	1.312	34.697	4.36	140.52	2.28	31.98	-	34.705	7.785	2464.7	5250	1.248	34.697	3.86	27.785
1	LA	5634	5741	1.312	34.697	4.36	139.99	2.25	31.82	-	34.708	7.785	2468.3	5500	1.280	34.697	3.86	27.783
		Pinger-Bott		4 m														

St.		PA4	Date	Jan. 15			Lat.	40°00. 36'S		Depth	4637 m							
Shallow Cast			Time(JST-1) 04:10-05:10				Long.	109° 59.75'E							CTD	Down		CAST
No.	Bottle	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU	PH	ALK	db	℃	psu	ml/L	Sigma-T
Bottle	Tyoe	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S			P	T	S	O2	
0		0	0	15.400	-	6.00	0.14	0.28	3.61	0.14	-	8.114	2374.325	3	15.398	35.015	4.79	25.895
36	Niskin	802	808	7.718	34.487	5.06	11.02	2.36	18.71	-	34.512	7.898	2332.0	10	15.386	35.014	4.80	25.898
35	LA	4	4	15.333	34.997	6.02	0.08	0.27	3.75	0.19	35.018	8.117	2376.0	20	15.320	35.036	4.84	25.929
34	LA	11	11	15.330	34.998	6.06	0.17	0.27	3.49	0.09	35.023	8.116	2372.3	30	14.927	35.017	4.94	26.001
33	Niskin	11	11	15.333	34.997	6.03	0.10	0.26	3.73	-	35.027	8.114	2371.8	40	14.002	34.960	5.03	26.156
32	LA	20	20	15.288	35.030	6.09	0.12	0.33	3.01	0.05	35.056	8.119	2375.0	50	12.750	34.916	5.17	26.378
31	Niskin	31	31	14.512	34.979	6.27	0.05	0.47	4.17	0.18	35.001	8.111	2369.1	75	11.900	34.861	5.15	26.500
30	Niskin	31	31	14.512	34.979	6.27	0.07	0.49	4.19	-	34.998	8.111	2372.5	100	11.332	34.863	5.13	26.608
29	Niskin	31	31	14.510	34.977	6.28	0.16	0.52	4.34	-	34.991	8.108	2376.6	125	11.182	34.937	5.06	26.693
28	Niskin	50	50	12.870	34.913	6.35	0.18	0.57	5.77	-	34.937	8.079	2354.5	150	11.265	34.983	4.95	26.714
27	LA	50	50	12.866	34.913	6.34	0.27	0.75	5.74	-	34.935	8.079	2360.3	175	11.025	34.950	4.93	26.732
26	Niskin	50	50	12.906	34.914	6.38	0.26	0.76	4.98	-	34.936	8.077	2362.6	200	10.911	34.929	4.93	26.736
25	LA	50	50	12.840	34.908	6.43	0.26	0.69	5.21	0.31	34.909	8.075	2365.0	250	10.475	34.852	4.85	26.754
24	Niskin	75	76	11.822	34.864	6.25	1.40	0.84	7.19	-	34.869	8.046	2355.2	300	9.999	34.765	5.01	26.769
23	LA	74	75	11.825	34.865	6.27	1.40	0.86	7.20	0.19	34.872	8.046	2356.9	400	9.674	34.715	5.00	26.785
22	Niskin	101	102	11.328	34.872	6.22	1.72	0.90	7.16	-	34.880	8.038	2363.9	500	9.378	34.668	4.91	26.797
21	Niskin	101	101	11.339	34.871	6.21	1.64	0.86	6.66	-	34.879	8.038	2357.6	600	9.156	34.635	4.81	26.807
20	LA	101	101	11.335	34.871	6.19	1.72	0.89	6.75	0.11	34.881	8.036	2361.4	700	8.782	34.588	4.60	26.830
19	Niskin	99	100	11.338	34.872	6.19	1.47	0.79	7.25	-	34.891	8.045	2344.4	800	7.800	34.494	4.16	26.906
18	LA	124	125	11.451	35.015	5.98	1.44	0.65	7.17	0.06	35.029	8.042	2374.6	-	-	-	-	-
17	Niskin	124	124	11.457	35.017	5.96	1.43	0.62	7.13	-	35.032	8.042	2366.6	-	-	-	-	-
16	LA	149	150	11.335	34.998	6.01	1.34	0.68	7.77	0.01	35.012	8.039	2366.1	-	-	-	-	-
15	Niskin	149	150	11.331	34.997	6.02	1.41	0.66	7.94	-	35.016	8.039	2368.2	-	-	-	-	-
14	Niskin	174	175	11.073	34.959	5.95	1.40	0.66	8.72	0.01	34.981	8.032	2367.7	-	-	-	-	-
13	LA	198	199	10.859	34.915	6.14	1.55	0.71	8.27	0.00	34.933	8.029	2361.0	-	-	-	-	-
12	Niskin	198	200	10.860	34.915	6.02	1.38	0.75	8.76	-	34.934	8.027	2354.1	-	-	-	-	-
11	Niskin	198	199	10.861	34.916	6.06	1.45	0.74	8.32	-	34.936	8.025	2362.4	-	-	-	-	-
10	LA	248	250	10.453	34.847	5.89	2.01	0.69	9.88	0.00	34.875	8.010	2345.0	-	-	-	-	-
9	Niskin	299	301	9.989	34.762	5.97	2.57	1.19	12.13	-	34.784	7.993	2351.0	-	-	-	-	-
8	Niskin	298	300	9.994	34.763	5.93	2.57	1.22	11.99	-	34.783	7.993	2360.2	-	-	-	-	-
7	LA	298	300	9.993	34.763	5.90	2.57	1.22	11.95	-	34.782	7.991	2351.6	-	-	-	-	-
6	LA	397	400	9.665	34.713	6.01	2.90	1.28	11.18	-	34.736	7.991	2355.4	-	-	-	-	-
5	LA	498	501	9.379	34.667	5.92	3.47	1.34	13.86	-	34.691	7.976	2340.5	-	-	-	-	-
4	Niskin	497	501	9.381	34.668	5.93	3.47	1.53	13.70	-	34.690	7.976	2344.6	-	-	-	-	-
3	LA	497	501	9.379	34.667	5.92	3.47	1.49	13.53	-	34.690	7.976	2351.1	-	-	-	-	-
2	Niskin	596	601	9.149	34.634	5.83	4.12	1.56	13.37	-	34.654	7.963	2349.4	-	-	-	-	-
1	LA	695	701	8.764	34.585	5.54	5.67	1.70	15.93	-	34.609	7.941	2345.8	-	-	-	-	-
		Pinger-Bott		m														

St.		PA4	Date	Jan 14			Lat.	12°50.27'S		Depth	4637 m							
Deep Cast			Time(JMT)	14:45-15:50			Long.	116° 59.84'E							CTD	Down		CAST
No.	Bottle	m	db	℃	psu	ml/L	µM	µM	µM	µg/L	PSU	PH	ALK	db	℃	psu	ml/L	Sigma-T
Bottle	Type	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S			P	T	S	O2	
0		0	0	15.600	-	-	-	-	-	-	-	-	-	5	15.588	35.068	5.46	25.894
36	Niskin	4631	4708	0.871	34.685		-	-	-	-	-	-	-	10	15.564	35.076	5.16	25.905
35	LA	794	800	7.956	34.502	5.03	9.70	1.62	21.23	-	34.527	7.896	2355.5	20	15.465	35.068	4.95	25.922
34	LA	892	899	6.774	34.433	4.62	17.98	1.86	25.22	-	34.454	7.843	2349.6	30	14.627	35.006	4.94	26.058
33	Niskin	996	1004	5.420	34.372	4.56	27.52	2.13	29.51	-	34.396	7.811	2354.1	40	13.850	34.959	4.92	26.186
32	LA	995	1003	5.456	34.374	4.56	27.17	2.09	28.31	-	34.397	7.809	2356.7	50	13.073	34.940	4.91	26.332
31	Niskin	992	1000	5.495	34.375	4.55	27.24	2.09	28.11	-	34.396	7.825	2358.7	75	11.914	34.872	4.94	26.506
30	Niskin	990	998	5.482	34.374	4.58	27.56	2.01	28.06	-	34.395	7.813	2352.2	100	11.246	34.863	4.93	26.624
29	Niskin	1486	1500	3.089	34.478	3.95	69.95	2.46	33.09	-	34.498	7.731	2399.4	125	11.505	35.019	4.76	26.697
28	Niskin	1486	1499	3.091	34.477	3.92	70.19	2.40	33.14	-	34.499	7.738	2399.9	150	11.184	34.970	4.80	26.719
27	LA	1485	1498	3.091	34.477	3.90	69.32	2.49	33.10	-	34.502	7.739	2398.7	175	10.956	34.934	4.80	26.732
26	Niskin	1485	1498	3.089	34.478	3.92	70.36	2.31	33.27	-	34.500	7.738	2390.4	200	10.816	34.909	4.79	26.738
25	LA	1981	2002	2.576	34.646	3.80	91.90	2.17	32.51	-	34.668	7.745	2419.6	250	10.464	34.851	4.70	26.755
24	Niskin	1981	2001	2.576	34.646	3.83	92.09	2.21	32.47	-	34.667	7.741	2421.1	300	10.142	34.793	4.69	26.766
23	LA	1980	2000	2.577	34.646	3.80	92.71	2.21	32.38	-	34.668	7.741	2422.7	400	9.614	34.703	4.72	26.785
22	Niskin	1979	2000	2.576	34.646	3.82	92.39	2.24	32.38	-	34.668	7.743	2418.3	500	9.374	34.668	4.63	26.798
21	Niskin	2472	2501	2.175	34.713	4.19	99.20	2.04	30.87	-	34.734	7.769	2427.5	600	9.102	34.630	4.59	26.812
20	LA	2471	2500	2.174	34.713	4.18	98.04	2.10	30.81	-	34.736	7.769	2426.8	700	8.667	34.576	4.44	26.839
19	Niskin	2471	2500	2.174	34.713	4.20	98.55	2.10	30.86	-	34.735	7.769	2424.7	800	7.865	34.499	4.12	26.901
18	LA	2963	3000	1.750	34.724	4.50	104.89	2.01	30.17	-	34.745	7.781	2428.3	1000	5.396	34.371	3.88	27.130
17	Niskin	2963	3001	1.750	34.724	4.49	105.38	2.11	29.93	-	34.745	7.781	2430.0	1250	3.641	34.389	3.64	27.336
16	LA	2963	3000	1.750	34.724	4.49	105.67	2.06	30.14	-	34.744	7.780	2426.8	1500	3.097	34.477	3.30	27.459
15	Niskin	2962	3000	1.750	34.724	4.50	105.30	2.08	30.06	-	34.745	7.781	2429.1	1750	2.785	34.573	3.15	27.563
14	Niskin	3454	3501	1.318	34.710	4.70	117.00	2.14	30.35	-	34.729	7.780	2429.9	2000	2.561	34.650	3.19	27.645
13	LA	3453	3501	1.318	34.710	4.67	117.13	2.10	30.32	-	34.729	7.782	2432.0	2250	2.390	34.687	3.35	27.689
12	Niskin	3452	3500	1.320	34.711	4.66	117.01	2.10	30.34	-	34.728	7.780	2428.7	2500	2.183	34.712	3.54	27.727
11	Niskin	3943	4002	0.941	34.692	4.81	128.74	2.12	30.82	-	34.711	7.777	2432.8	2750	1.999	34.724	3.70	27.751
10	LA	3943	4002	0.941	34.692	4.80	127.12	2.12	30.87	-	34.711	7.779	2430.5	3000	1.751	34.724	3.81	27.770
9	Niskin	3941	4000	0.941	34.692	4.82	128.26	2.15	30.86	-	34.710	7.777	2432.4	3250	1.537	34.720	3.93	27.783
8	Niskin	3940	3999	0.941	34.692	4.82	129.58	2.09	30.95	-	34.714	7.777	2431.8	3500	1.321	34.710	3.98	27.791
7	LA	4429	4501	0.858	34.686	4.83	132.60	2.07	31.21	-	34.703	7.777	2429.1	3750	1.090	34.700	4.05	27.798
6	LA	4428	4500	0.858	34.686	4.84	132.10	2.09	31.40	-	34.703	7.781	2436.8	4000	0.935	34.692	4.11	27.802
5	LA	4546	4620	0.861	34.686	4.85	131.53	2.11	31.32	-	34.703	7.798	2433.6	4250	0.867	34.688	4.13	27.803
4	Niskin	4545	4619	0.861	34.686	4.87	132.04	2.10	31.25	-	34.705	7.783	2434.4	4500	0.858	34.686	4.16	27.802
3	LA	4627	4704	0.870	34.685	4.83	132.05	2.05	31.19	-	34.703	7.781	2439.3	-	-	-	-	-
2	Niskin	4629	4706	0.871	34.685	4.87	131.98	2.11	31.21	-	34.704	7.783	2435.0	-	-	-	-	-
1	LA	4630	4707	0.871	34.685	4.84	131.99	2.05	31.28	-	34.704	7.783	2433.6	-	-	-	-	-
		Pinger-Bottom		7 m														

St.		PA5	Date	Jan. 18			Lat.	29°59.77'S		Depth	5500 m							
Shallow Cast			Time(JST-1)	15:41-16:1052			Long.	110°00.01'E							CTD	Down		CAST
No.	Bottle	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU	PH	ALK	db	℃	psu	ml/L	Sigma-T
Bottle	Type	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S			P	T	S	O2	
0		0	0			5.02	1.47	0.32	0.00	0.05	35.846	8.213	2419.7	6	21.129	35.882	4.22	25.130
36	Niskin	6	6	21.732	35.829	5.05	1.49	0.24	0.00	0.08	35.850	8.220	2416.1	10	21.111	35.883	4.20	25.136
35	LA	10	10	21.736	35.828	5.05	1.50	0.22	0.00	0.04	35.854	8.219	2408.7	20	21.093	35.883	4.20	25.141
34	LA	10	10	21.740	35.828	5.07	1.36	0.25	0.00	-	35.858	8.219	2412.1	30	21.081	35.882	4.19	25.144
33	Niskin	10	10	21.739	35.827	5.05	1.38	0.20	0.00	-	35.860	8.219	2408.6	40	20.997	35.878	4.19	25.164
32	LA	20	20	21.096	35.881	5.14	1.47	0.22	0.00	0.09	35.903	8.215	2411.8	50	20.856	35.873	4.20	25.197
31	Niskin	30	31	21.078	35.881	5.14	1.41	0.23	0.00	-	35.903	8.216	2414.9	75	19.413	35.871	4.23	25.580
30	Niskin	30	30	21.079	35.881	5.13	1.42	0.19	0.00	0.10	35.901	8.216	2416.3	100	18.853	35.913	4.09	25.757
29	Niskin	30	30	21.077	35.881	5.15	1.44	0.21	0.00	-	35.902	8.212	2414.8	125	18.291	35.927	4.17	25.910
28	Niskin	52	52	20.836	35.870	5.15	1.46	0.32	0.00	-	35.892	8.214	2414.7	150	17.471	35.878	4.22	26.074
27	LA	53	53	20.820	35.869	5.17	1.46	0.28	0.00	0.12	35.891	8.216	2414.8	175	16.797	35.840	4.27	26.208
26	Niskin	52	52	20.832	35.869	5.16	1.47	0.23	0.00	-	35.891	8.214	2413.6	200	16.238	35.796	4.38	26.305
25	LA	52	52	20.832	35.868	5.16	1.47	0.18	0.00	-	35.891	8.214	2415.5	250	14.836	35.597	4.43	26.468
24	Niskin	77	77	19.139	35.873	5.11	1.39	0.19	0.11	-	35.895	8.192	2414.6	300	13.622	35.378	4.52	26.559
23	LA	76	76	19.112	35.875	5.12	1.39	0.18	0.23	0.21	35.895	8.191	2425.1	400	11.274	34.981	4.79	26.711
22	Niskin	98	99	18.736	35.915	4.93	1.48	0.25	0.70	-	35.937	8.170	2419.1	500	9.909	34.752	4.89	26.774
21	Niskin	100	100	18.734	35.916	4.91	1.48	0.28	0.65	-	35.936	8.172	2417.7	600	9.206	34.645	4.83	26.807
20	LA	99	99	18.734	35.915	4.90	1.40	0.29	0.57	0.30	35.937	8.172	2418.8	700	8.338	34.552	4.42	26.871
19	Niskin	99	99	18.693	35.915	4.93	1.50	0.36	0.60	-	35.937	8.171	2416.5	800	6.817	34.450	3.97	27.010
18	LA	125	125	17.879	35.895	4.98	1.12	0.30	1.33	0.09	35.921	8.159	2417.3	-	-	-	-	-
17	Niskin	124	125	17.947	35.898	4.97	2.06	0.30	1.27	-	35.922	8.160	2414.9	-	-	-	-	-
16	LA	149	150	17.125	35.860	5.12	0.87	0.30	1.24	0.04	35.881	8.150	2416.1	-	-	-	-	-
15	Niskin	149	150	17.107	35.858	5.14	0.95	0.30	1.28	-	35.879	8.150	2419.7	-	-	-	-	-
14	Niskin	201	202	15.716	35.723	5.28	0.48	0.38	1.56	-	35.745	8.132	2413.5	-	-	-	-	-
13	LA	203	204	15.685	35.719	5.29	0.56	0.36	1.90	0.01	35.748	8.132	2412.9	-	-	-	-	-
12	Niskin	202	203	15.679	35.718	5.30	0.72	0.32	1.99	-	35.736	8.128	2407.8	-	-	-	-	-
11	Niskin	249	250	14.536	35.540	5.28	0.73	0.42	3.83	-	35.561	8.096	2401.4	-	-	-	-	-
10	LA	300	302	13.124	35.286	5.30	1.04	0.65	5.78	-	35.367	8.070	2395.6	-	-	-	-	-
9	Niskin	299	301	13.165	35.293	5.32	1.04	0.63	5.73	-	35.306	8.055	2391.4	-	-	-	-	-
8	Niskin	298	300	13.154	35.291	5.31	1.11	0.58	5.45	-	35.306	8.060	2384.4	-	-	-	-	-
7	LA	398	400	11.120	34.951	5.49	1.75	0.83	9.17	-	34.968	8.013	2372.5	-	-	-	-	-
6	LA	497	500	9.795	34.732	5.55	2.93	0.97	12.80	-	34.754	7.980	-	-	-	-	-	-
5	LA	497	500	9.794	34.732	5.55	2.77	0.94	12.16	-	34.848	8.001	2362.8	-	-	-	-	-
4	Niskin	597	601	9.220	34.647	-	4.04	1.19	15.41	-	34.670	7.960	2349.7	-	-	-	-	-
3	LA	695	701	8.428	34.557	5.09	7.29	1.41	19.27	-	34.577	7.921	2343.9	-	-	-	-	-
2	Niskin	795	801	6.855	34.450	4.63	18.15	1.40	25.14	-	34.468	7.849	2343.1	-	-	-	-	-
1	LA	795	801	6.856	34.449	4.59	18.2	1.93	24.96	-	34.472	7.851	2347.1	-	-	-	-	-

St.		PA 5	Date	Jan 18			Lat.	29° 58.86'S		Depth	5500 m							
Deep Cast			Time(JST)	03:53-07: 24			Long.	110° 58.86'E							CTD	Down		CAST
No.	Bottle	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU	PH	ALK	db	℃	psu	ml/L	Sigma-T
Bottle	Type	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S			P	T	S	O2	
0		0	0	21.900	-	-	-	-	-	-	-	-	-	5	21.078	35.881	4.02	25.143
36	Niskin	991	999	4.629	34.425	3.84	52.01	2.25	31.12	-	34.444	7.773	2372.3	10	21.077	35.880	4.03	25.143
35	LA	991	999	4.625	34.426	3.81	52.09	2.21	31.13	-	34.446	7.774	2377.3	20	21.081	35.880	4.04	25.142
34	LA	991	999	4.622	34.426	3.81	52.40	2.18	31.40	-	34.443	7.767	2371.8	30	21.082	35.881	4.03	25.142
33	Niskin	1486	1500	3.104	34.588	3.39	90.87	2.26	33.22	-	34.606	7.733	2419.2	40	21.083	35.881	4.01	25.142
32	LA	1487	1501	3.092	34.588	3.37	91.03	2.47	32.88	-	34.605	7.733	2408.7	50	21.071	35.879	4.03	25.144
31	Niskin	1486	1499	3.100	34.587	3.41	90.38	2.51	32.79	-	34.604	7.733	2416.3	75	20.137	35.868	4.10	25.388
30	Niskin	1984	2004	2.424	34.687	3.63	111.65	2.04	31.80	-	34.704	7.753	2439.4	100	18.872	35.906	4.02	25.747
29	Niskin	1983	2003	2.425	34.687	3.58	111.40	2.06	31.88	-	34.706	7.750	2439.2	125	18.225	35.915	4.04	25.917
28	Niskin	1981	2002	2.426	34.687	3.59	111.56	2.34	31.91	-	34.705	7.752	2439.3	150	17.474	35.880	4.13	26.076
27	LA	1980	2000	2.426	34.687	3.59	111.61	2.43	31.84	-	34.705	7.753	2437.0	175	16.686	35.826	4.18	26.223
26	Niskin	2476	2505	1.993	34.708	3.85	121.41	2.41	31.37	-	34.725	7.768	2443.8	200	15.986	35.754	4.27	26.331
25	LA	2474	2503	1.995	34.707	3.89	121.09	2.42	31.21	-	34.725	7.767	2447.0	250	14.329	35.503	4.35	26.506
24	Niskin	2471	2500	1.996	34.707	3.85	121.33	2.40	30.87	-	34.724	7.767	2442.9	300	13.133	35.308	4.50	26.605
23	LA	2960	2998	1.707	34.709	4.06	125.71	2.32	31.18	-	34.725	7.775	2448.2	400	11.077	34.949	4.69	26.722
22	Niskin	2961	2999	1.707	34.709	4.07	125.86	2.35	31.44	-	34.729	7.775	2451.7	500	9.810	34.737	4.83	26.779
21	Niskin	2959	2997	1.708	34.709	4.07	125.46	2.35	31.18	-	34.727	7.775	2451.0	600	9.212	34.645	4.76	26.806
20	LA	3452	3500	1.460	34.704	-	-	-	-	-	-	-	-	700	8.316	34.549	4.35	26.872
19	Niskin	3453	3501	1.460	34.704	4.25	130.96	2.34	31.37	-	34.721	7.780	2459.6	800	6.851	34.451	3.89	27.007
18	LA	3451	3499	1.460	34.704	4.21	130.72	2.37	31.40	-	34.722	7.783	2447.0	1000	4.579	34.437	3.22	27.276
17	Niskin	3944	4004	1.287	34.700	4.39	133.07	2.28	31.73	-	34.717	7.787	2449.1	1250	3.660	34.511	2.87	27.431
16	LA	3942	4002	1.287	34.700	4.40	133.37	2.35	31.15	-	34.717	7.786	2451.4	1500	3.137	34.581	2.82	27.538
15	Niskin	3939	3999	1.288	34.700	4.40	132.87	2.35	31.79	-	34.717	7.786	2448.4	1750	2.697	34.650	2.96	27.633
14	Niskin	4428	4501	1.204	34.697	4.52	132.70	2.35	31.45	-	34.711	7.790	2445.3	2000	2.414	34.688	3.01	27.688
13	LA	4429	4501	1.204	34.697	4.51	133.07	2.33	31.62	-	34.710	7.791	2451.4	2250	2.183	34.703	3.08	27.719
12	Niskin	4428	4500	1.204	34.697	4.51	132.98	2.31	30.80	-	34.710	7.786	2448.4	2500	1.985	34.708	3.22	27.739
11	Niskin	4917	5002	1.113	34.692	4.69	131.12	2.27	31.05	-	34.707	7.788	2442.5	2750	1.825	34.709	3.32	27.753
10	LA	4915	5000	1.115	34.692	4.67	130.39	2.31	30.68	-	34.719	7.791	2438.0	3000	1.693	34.709	3.41	27.762
9	Niskin	4913	4998	1.114	34.693	4.66	131.17	2.31	31.32	-	34.709	7.787	2439.4	3250	1.584	34.708	3.50	27.770
8	Niskin	5403	5503	1.063	34.688	4.77	131.98	2.23	30.97	-	34.706	7.784	2435.9	3500	1.478	34.705	3.54	27.775
7	LA	5401	5501	1.062	34.688	4.76	131.80	2.26	31.10	-	34.705	7.787	2439.1	3750	1.377	34.703	3.63	27.780
6	LA	5399	5500	1.063	34.688	4.74	131.62	2.30	31.64	-	34.706	7.784	2439.4	4000	1.297	34.700	3.70	27.784
5	LA	5449	5551	1.062	34.688	4.75	131.53	2.30	31.18	-	34.705	7.785	2441.5	4250	1.246	34.698	3.76	27.786
4	Niskin	5446	5548	1.062	34.687	4.77	131.35	2.30	31.40	-	34.705	7.784	2438.4	4500	1.213	34.697	3.82	27.787
3	LA	5495	5598	1.068	34.682	4.77	131.33	2.30	30.83	-	34.706	7.787	2442.0	4750	1.179	34.695	3.90	27.789
2	Niskin	5495	5598	1.068	34.681	4.76	131.71	2.32	31.12	-	34.706	7.783	2440.0	5000	1.118	34.693	4.00	27.790
1	LA	5494	5598	1.068	34.687	4.75	132.16	2.35	31.09	-	34.707	7.783	2435.50	5500	1.060	34.688	4.11	27.791
		Pinger-Bottom		6 m														

St.		PA7	Date	Jan. 23			Lat.	10°00. 36'S		Depth	5597 m							
Shallow Cast			Time(JST-1)	13:27-14:29			Long.	102° 59.75'E							CTD	Down		CAST
No.		m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU	PH	ALK	db	℃	psu	ml/L	Sigma-T
Bottle		Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S			P	T	S	O2	
0pump		0																
0		0	0	-	-	4.64	0.67	0.06	0.15	0.11	34.110	8.285	2255.0	3	28.581	34.078	3.56	21.511
36	Niskin	794	800	6.474	34.659	-	-	-	-	-	-	-	-	10	28.594	34.079	3.55	21.508
35	LA	4	4	28.596	34.083	4.62	0.77	0.03	0.05	0.06	34.111	8.284	2279.0	20	28.577	34.080	3.53	21.514
34	LA	11	11	28.596	34.083	4.64	0.96	0.06	0.05	0.10	34.109	8.284	2283.2	30	28.474	34.093	3.55	21.558
33	Niskin	11	11	28.599	34.083	4.61	1.08	0.10	0.00	-	34.110	8.285	2276.3	40	27.560	34.225	3.66	21.954
32	LA	11	11	28.600	34.083	4.69	1.09	0.09	0.05	-	34.112	8.285	2285.0	50	26.379	34.304	3.51	22.390
31	Niskin	20	20	28.574	34.082	4.71	1.09	0.12	0.02	0.05	34.111	8.282	2282.9	75	23.682	34.433	2.61	23.306
30	Niskin	30	30	28.556	34.086	4.62	1.10	0.15	0.04	0.11	34.121	8.282	2283.4	100	20.887	34.478	2.18	24.127
29	Niskin	30	31	28.554	34.088	4.62	1.10	0.13	0.05	-	34.132	8.280	2283.6	125	18.437	34.520	2.13	24.796
28	Niskin	30	30	28.477	34.097	4.67	1.11	0.11	0.03	-	34.158	8.277	2282.3	150	15.774	34.535	2.10	25.441
27	LA	49	50	26.812	34.274	4.70	1.79	0.12	0.10	0.05	34.301	8.247	2295.2	175	14.433	34.557	2.06	25.753
26	Niskin	50	50	26.802	34.274	4.65	1.95	0.12	0.09	-	34.303	8.245	2296.6	200	13.333	34.578	1.96	25.999
25	LA	49	50	26.753	34.277	4.64	1.95	0.15	0.10	-	34.307	8.245	2295.7	250	11.701	34.623	1.78	26.353
24	Niskin	49	50	26.445	34.290	4.53	2.17	0.17	0.12	-	34.316	8.241	2298.4	300	10.606	34.689	1.59	26.604
23	LA	77	77	23.660	34.421	3.31	8.64	0.63	7.69	0.24	34.445	8.119	2304.6	400	9.689	34.743	1.55	26.804
22	Niskin	75	75	23.851	34.411	3.30	8.49	0.64	7.50	-	34.443	8.121	2305.2	500	8.923	34.760	1.45	26.942
21	Niskin	99	100	21.003	34.452	2.71	15.87	1.01	13.25	-	34.478	8.026	2312.4	600	7.958	34.739	1.36	27.075
20	LA	100	100	20.985	34.454	2.72	16.02	1.01	13.32	-	34.479	8.026	2318.8	700	7.062	34.677	1.47	27.156
19	Niskin	100	101	20.923	34.459	2.74	16.02	1.00	13.22	-	34.469	8.026	2317.3	800	6.490	34.666	1.53	27.225
18	LA	101	101	20.857	34.460	2.68	16.39	1.04	13.49	0.09	34.480	8.023	2313.5	-	-	-	-	-
17	Niskin	124	125	18.472	34.507	2.59	21.82	1.22	16.55	-	34.525	7.972	2331.9	-	-	-	-	-
16	LA	124	125	18.411	34.505	2.56	22.12	1.22	16.75	0.05	34.526	7.970	2336.2	-	-	-	-	-
15	Niskin	149	149	15.651	34.526	2.54	28.93	1.41	20.26	0.01	34.542	7.911	2349.1	-	-	-	-	-
14	Niskin	148	149	15.607	34.526	2.49	29.01	1.40	20.61	-	34.539	7.911	2347.4	-	-	-	-	-
13	LA	199	201	13.186	34.582	2.30	36.19	1.63	24.81	-	34.592	7.841	2362.7	-	-	-	-	-
12	Niskin	199	200	13.182	34.581	2.25	36.28	1.61	24.42	-	34.595	7.840	2358.0	-	-	-	-	-
11	Niskin	199	200	13.167	34.581	2.27	36.36	1.60	23.80	-	34.592	7.838	2367.8	-	-	-	-	-
10	LA	248	249	11.666	34.620	2.08	40.53	1.59	25.49	0.00	34.629	7.792	2365.2	-	-	-	-	-
9	Niskin	299	301	10.586	34.677	1.86	43.18	1.56	27.75	-	34.688	7.750	2369.1	-	-	-	-	-
8	Niskin	300	302	10.585	34.678	1.92	43.27	1.53	27.47	-	34.690	7.750	2372.0	-	-	-	-	-
7	LA	297	299	10.587	34.676	1.89	43.05	1.49	28.03	-	34.690	7.750	2376.8	-	-	-	-	-
6	LA	395	398	9.689	34.753	4.63	0.67	0.00	0.00	-	34.097	8.284	2278.7	-	-	-	-	-
5	LA	501	504	8.862	34.760	1.69	49.64	2.16	32.30	-	34.775	7.703	2383.9	-	-	-	-	-
4	Niskin	500	504	8.844	34.760	1.76	49.46	2.21	35.37	-	34.773	7.705	2385.5	-	-	-	-	-
3	LA	496	500	8.874	34.760	1.69	49.51	2.21	29.61	-	34.772	7.703	2383.6	-	-	-	-	-
2	Niskin	596	600	7.934	34.734	1.72	65.1	2.46	31.63	-	34.746	7.684	2399.0	-	-	-	-	-
1	LA	795	801	6.474	34.659	1.85	85.8	2.58	34.11	-	34.677	7.678	2420.5	-	-	-	-	-
		Pinger-Bott		m														

St.		PA 7	Date	Jan 18			Lat.	09°56.56'S		Depth	5597 m							
Deep Cast			Time(JST-1)	05:56-09: 21			Long.	102°00.09'E							CTD	Down		CAST
No.		m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU	PH	ALK	db	℃	psu	ml/L	Sigma-T
Bottle		Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S			P	T	S	O2	
0		0	0	28.80	-	-	-	-	-	-	-	-	-	3	28.516	34.056	3.49	21.516
36	Niskin	992	1000	5.245	34.621	2.06	103.53	2.49	35.61	-	34.635	7.685	2431.6	10	28.523	34.056	3.47	21.513
35	LA	992	1000	5.245	34.621	1.96	97.53	2.31	34.91	-	34.657	7.689	2423.3	20	28.516	34.058	3.47	21.518
34	LA	992	1000	5.241	34.620	2.06	-	2.48	35.56	-	34.636	7.682	2430.5	30	27.761	34.195	3.60	21.867
33	Niskin	1486	1500	3.628	34.694	2.57	119.12	2.63	35.72	-	34.709	7.699	2450.3	50	26.296	34.303	3.41	22.415
32	LA	1486	1500	3.628	34.694	2.55	119.20	2.63	35.70	-	34.710	7.700	2446.6	75	22.183	34.437	2.25	23.739
31	Niskin	1487	1501	3.627	34.694	2.60	119.06	2.58	35.56	-	34.710	7.698	2449.5	100	19.667	34.501	2.11	24.468
30	Niskin	1979	2000	2.569	34.720	3.25	126.94	2.49	34.52	-	34.735	7.729	2453.7	125	17.207	34.521	2.11	25.097
29	Niskin	1980	2000	2.569	34.720	3.24	126.49	2.23	34.38	-	34.738	7.728	2454.6	150	15.809	34.535	2.12	25.433
28	Niskin	1979	2000	2.568	34.720	3.27	126.58	2.40	34.59	-	34.734	7.728	2455.8	175	14.667	34.560	2.04	25.705
27	LA	1979	2000	2.567	34.720	4.13	138.69	2.39	33.00	-	34.717	7.771	2459.0	200	13.306	34.593	1.93	26.016
26	Niskin	2476	2505	2.020	34.715	3.69	132.13	2.44	33.69	-	34.732	7.749	2458.4	250	11.309	34.626	1.78	26.428
25	LA	2475	2503	2.020	34.715	3.66	131.99	2.44	33.61	-	34.731	7.748	2461.8	300	10.510	34.706	1.56	26.634
24	Niskin	2473	2502	2.021	34.715	3.69	132.39	2.43	33.95	-	34.733	7.751	2455.6	400	9.864	34.790	1.46	26.811
23	LA	2961	2998	1.656	34.706	3.91	137.12	2.23	33.53	-	34.723	7.764	2458.3	500	8.997	34.760	1.46	26.931
22	Niskin	2961	2999	1.655	34.706	3.92	138.68	2.36	33.57	-	34.724	7.762	2460.0	600	8.161	34.749	1.35	27.052
21	Niskin	2962	2999	1.654	34.706	3.93	137.61	2.23	33.29	-	34.724	7.762	2462.3	700	7.000	34.663	1.50	27.153
20	LA	3450	3498	1.376	34.699	4.23	140.11	2.07	32.78	-	34.716	7.773	2458.6	800	6.410	34.650	1.56	27.223
19	Niskin	3450	3498	1.376	34.699	4.20	139.66	2.16	32.80	-	34.716	7.775	2461.2	1000	5.205	34.621	1.76	27.351
18	LA	3451	3499	1.374	34.699	4.20	140.34	2.00	32.81	-	34.717	7.770	2459.5	1250	4.339	34.640	1.91	27.464
17	Niskin	3940	3999	1.212	34.695	4.40	139.03	2.12	32.46	-	34.713	7.780	2453.2	1500	3.627	34.695	2.15	27.582
16	LA	3939	3999	1.211	34.695	4.40	138.65	2.12	32.14	-	34.713	7.779	2458.0	1750	3.066	34.723	2.41	27.658
15	Niskin	3939	3999	1.211	34.695	4.43	138.27	2.14	32.18	-	34.714	7.779	2455.9	2000	2.551	34.721	2.72	27.702
14	Niskin	4428	4499	1.163	34.693	4.52	136.51	2.10	31.75	-	34.708	7.786	2457.1	2250	2.247	34.719	2.90	27.727
13	LA	4427	4499	1.164	34.693	4.57	136.90	2.09	31.98	-	34.707	7.785	2456.8	2500	2.030	34.716	3.05	27.742
12	Niskin	4427	4498	1.164	34.693	4.55	136.61	1.82	31.82	-	34.701	7.787	2456.4	2750	1.854	34.712	3.17	27.752
11	Niskin	4914	4999	1.196	34.692	4.50	136.31	2.26	31.72	-	34.705	7.785	2454.7	3000	1.677	34.707	3.28	27.762
10	LA	4914	4999	1.196	34.692	4.50	136.25	2.25	31.79	-	34.708	7.787	2455.4	3250	1.530	34.703	3.38	27.770
9	Niskin	4913	4998	1.195	34.692	4.51	135.45	2.22	31.60	-	34.708	7.786	2455.0	3500	1.400	34.700	3.50	27.777
8	Niskin	5399	5498	1.254	34.692	4.52	135.65	2.24	31.69	-	34.711	7.784	2451.8	3750	1.285	34.697	3.61	27.783
7	LA	5398	5498	1.254	34.692	4.53	135.47	2.23	31.51	-	34.708	7.788	2453.5	4000	1.214	34.696	3.70	27.786
6	LA	5398	5497	1.254	34.692	3.97	137.21	2.36	32.15	-	34.719	7.764	2462.6	4250	1.174	34.694	3.78	27.788
5	LA	5536	5640	1.272	34.691	4.54	135.26	2.25	30.91	-	34.710	7.787	2453.4	4500	1.164	34.693	3.84	27.788
4	Niskin	5535	5639	1.272	34.691	4.55	135.62	2.26	31.33	-	34.709	7.787	2454.6	4750	1.173	34.693	3.86	27.787
3	LA	5587	5693	1.279	34.692	4.54	135.29	2.24	31.51	-	34.711	7.786	2450.5	5000	1.195	34.692	3.89	27.785
2	Niskin	5587	5692	1.279	34.692	4.55	135.49	2.25	30.65	-	34.711	7.786	2459.3	5250	1.225	34.692	3.91	27.783
1	LA	5587	5692	1.279	34.691	4.53	135.46	2.26	31.73	-	34.712	7.786	2453.2	5500	1.254	34.691	3.92	27.780
		Pinger-Bottom		10 m														

St.		PA9	Date	Jan. 28			Lat.	08°00. 02'N		Depth	3603 m							
Shallow Cast			Time(JMT)	22:43-23:34			Long.	88° 59.73'E							CTD	Down		CAST
No.	Bottle	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S	PH	ALK	P	T	S	O2	Sigma-T
Bottle	Type	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU			db	℃	psu	ml/L	
0		0	0	-	-	4.60	1.56	0.10	0.00	0.09	33.54	8.28	2257.10					
36	Niskin	5	5	27.778	33.510	4.61	1.11	0.09	0.00	0.12	33.532	8.285	2253.7	2	27.783	33.514	4.07	21.348
35	LA	10	10	27.775	33.510	4.61	1.12	0.08	0.00	0.11	33.531	8.285	2257.0	10	27.787	33.514	4.06	21.347
34	LA	10	10	27.777	33.511	4.62	1.06	0.07	0.00	-	33.531	8.283	2253.6	20	27.788	33.513	4.06	21.346
33	Niskin	10	10	27.777	33.511	4.59	0.99	0.08	0.00	-	-	8.284	2257.6	30	27.776	33.555	4.06	21.381
32	LA	20	20	27.775	33.526	4.64	1.00	0.08	0.00	0.08	33.555	8.284	2257.0	40	27.828	33.621	4.06	21.414
31	Niskin	30	30	27.813	33.595	4.60	1.09	0.09	0.00	-	33.645	8.282	2262.6	50	27.918	33.848	4.04	21.555
30	Niskin	30	31	27.812	33.595	4.62	1.10	0.07	0.00	0.15	33.687	8.282	2262.0	75	27.846	34.049	3.76	21.730
29	Niskin	30	30	27.813	33.596	4.58	1.03	0.06	0.00	-	33.726	8.282	2267.1	100	24.309	34.196	2.06	22.941
28	Niskin	50	51	27.909	33.846	4.56	1.10	0.12	0.37	-	33.869	8.278	2272.2	125	21.739	34.624	1.35	24.005
27	LA	50	51	27.909	33.845	4.57	1.10	0.09	0.52	0.16	33.869	8.278	2269.1	150	18.311	34.721	0.95	24.981
26	Niskin	50	50	27.910	33.845	4.54	1.10	0.10	0.32	-	33.871	8.278	2276.6	175	15.618	34.925	0.24	25.777
25	LA	50	50	27.909	33.846	4.54	1.02	0.08	0.42	-	33.872	8.280	2275.0	200	14.392	34.989	0.28	26.096
24	Niskin	75	75	27.645	34.168	4.01	2.16	0.23	2.10	-	34.217	8.227	2286.6	250	12.300	35.007	0.23	26.536
23	LA	75	76	27.534	34.181	3.93	2.38	0.30	2.37	0.41	34.262	8.218	2291.4	300	11.392	35.026	0.31	26.724
22	Niskin	100	101	24.047	34.200	2.29	11.77	0.98	14.06	-	34.236	8.053	2288.3	400	10.419	35.023	0.44	26.897
21	Niskin	100	100	24.054	34.195	2.28	11.69	1.00	13.39	-	34.244	8.053	2291.9	500	9.727	35.007	0.49	27.004
20	LA	100	100	24.047	34.216	2.25	11.69	1.01	13.16	0.11	34.256	8.053	2288.8	600	8.847	34.981	0.61	27.128
19	Niskin	99	100	23.943	34.354	2.20	11.82	1.02	13.52	-	34.353	8.046	2296.6	-	-	-	-	-
18	LA	124	125	21.388	34.613	1.51	17.69	1.39	18.83	0.02	34.633	7.947	2322.0	-	-	-	-	-
17	Niskin	124	125	21.291	34.605	1.52	18.14	1.46	19.02	-	34.628	7.943	2324.4	-	-	-	-	-
16	LA	149	150	18.133	34.753	0.93	24.92	1.77	24.14	0.01	34.764	7.842	2346.7	-	-	-	-	-
15	Niskin	149	150	18.142	34.752	1.05	24.98	1.81	24.60	-	34.766	7.838	2343.6	-	-	-	-	-
14	Niskin	148	149	18.082	34.786	0.90	24.89	1.83	25.26	-	34.784	7.833	2334.4	-	-	-	-	-
13	LA	200	201	14.106	34.976	0.33	32.73	2.27	31.20	0.00	34.995	7.694	2371.2	-	-	-	-	-
12	Niskin	199	200	14.117	34.976	0.35	32.64	2.28	29.94	-	34.995	7.698	2367.1	-	-	-	-	-
11	Niskin	200	201	14.072	34.974	0.39	32.78	2.27	31.11	-	34.993	7.698	2368.3	-	-	-	-	-
10	LA	199	200	14.001	34.981	0.33	32.52	2.24	31.13	-	34.997	7.697	2367.5	-	-	-	-	-
9	Niskin	248	250	12.192	34.997	0.41	38.30	2.35	32.70	0.00	35.013	7.658	2377.6	-	-	-	-	-
8	Niskin	296	298	11.386	35.022	0.43	39.59	2.37	33.79	-	35.040	7.646	2381.3	-	-	-	-	-
7	LA	295	297	11.392	35.023	0.38	39.82	2.46	34.92	-	35.038	7.642	2381.2	-	-	-	-	-
6	LA	295	297	11.392	35.023	0.57	39.75	2.56	34.48	0.02	35.034	7.644	2385.5	-	-	-	-	-
5	LA	398	400	10.393	35.019	0.52	46.14	2.63	36.21	-	35.034	7.644	2383.4	-	-	-	-	-
4	Niskin	504	507	9.680	35.006	0.71	54.06	2.74	34.85	-	35.016	7.632	2403.0	-	-	-	-	-
3	LA	503	506	9.687	35.005	0.52	53.99	2.74	34.22	-	35.016	7.633	2394.8	-	-	-	-	-
2	Niskin	502	505	9.693	35.005	0.67	53.76	2.70	34.04	-	35.016	7.636	2392.3	-	-	-	-	-
1	LA	596	600	8.853	34.979	0.67	62.60	2.70	34.44	-	34.996	7.633	2406.8	-	-	-	-	-
		Pinger-Bottom		m														

St.		PA 9	Date	Jan 28			Lat.	08° 00.07'N		Depth	3596 m							
Deep Cast			Time(JMT-1)	07:11-09:41			Long.	88° 59.07'E							CTD	Down		CAST
No.	Bottle	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S	PH	ALK	P	T	S	O2	Sigma-T
Bottle	Type	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU			db	℃	psu	ml/L	
0pump		0																
0		0												3	27.782	33.617	3.74	21.425
36	Niskin	695	700	8.051	34.959	0.78	74.66	2.72	36.40	-	34.974	7.622	2414.8	10	27.786	33.618	3.71	21.425
35	LA	796	802	7.481	34.940	0.82	79.42	3.24	36.54	-	34.960	7.627	2417.8	20	27.788	33.618	3.70	21.424
34	LA	794	800	7.487	34.940	0.85	81.59	3.16	37.06	-	34.582	7.624	2421.5	30	27.791	33.620	3.69	21.425
33	Niskin	995	1003	6.245	34.893	1.34	95.46	3.11	36.66	-	34.909	7.644	2432.8	40	27.816	33.648	3.68	21.438
32	LA	994	1002	6.248	34.893	1.30	95.80	3.06	35.77	-	34.908	7.634	2430.3	50	27.868	33.760	3.65	21.505
31	Niskin	993	1000	6.250	34.893	1.32	95.99	3.05	35.84	-	34.908	7.641	2433.2	75	26.853	34.446	2.71	22.348
30	Niskin	1239	1249	5.166	34.853	1.69	108.73	2.96	35.37	-	34.867	7.661	2444.4	100	23.049	34.576	1.56	23.598
29	Niskin	1491	1504	4.195	34.819	2.08	119.56	2.86	35.46	-	34.835	7.675	2449.8	125	18.409	34.667	1.06	24.915
28	Niskin	1489	1503	4.199	34.819	2.06	119.07	2.79	35.75	-	34.833	7.675	2451.5	150	16.402	34.896	0.27	25.575
27	LA	1487	1500	4.199	34.819	2.03	119.17	2.68	35.99	-	34.834	7.675	2452.9	175	14.852	34.961	0.30	25.974
26	Niskin	1734	1751	3.303	34.783	2.47	129.88	2.78	35.03	-	34.798	7.690	2462.1	200	13.492	35.001	0.29	26.294
25	LA	1981	2001	2.718	34.757	2.78	137.05	2.66	34.84	-	34.772	7.706	2465.6	250	12.227	35.001	0.31	26.546
24	Niskin	1980	2000	2.719	34.757	2.80	137.11	2.63	35.44	-	34.773	7.704	2466.8	300	11.341	35.013	0.43	26.723
23	LA	1979	2000	2.719	34.757	2.78	136.85	2.62	34.64	-	34.772	7.704	2465.0	400	10.390	35.016	0.53	26.896
22	Niskin	2226	2251	2.312	34.739	3.07	141.27	2.54	35.19	-	34.755	7.717	2466.5	500	9.724	35.007	0.73	27.004
21	Niskin	2471	2500	2.025	34.727	3.37	143.77	2.49	34.90	-	34.742	7.729	2467.6	600	8.688	34.977	0.97	27.150
20	LA	2471	2499	2.026	34.727	3.26	143.82	2.49	34.69	-	34.741	7.729	2470.3	700	7.910	34.956	1.17	27.253
19	Niskin	2471	2499	2.026	34.727	3.32	143.64	2.46	34.56	-	34.741	7.729	2469.0	800	7.372	34.939	1.25	27.318
18	LA	2716	2749	1.871	34.720	3.41	145.94	2.50	34.62	-	34.733	7.738	2471.0	1000	6.195	34.893	1.64	27.443
17	Niskin	2962	3000	1.741	34.714	3.53	147.14	2.47	34.43	-	34.729	7.748	2471.7	1250	5.138	34.853	1.83	27.542
16	LA	2962	2999	1.741	34.714	3.52	147.19	2.47	33.72	-	34.729	7.750	2472.6	1500	4.184	34.819	2.01	27.623
15	Niskin	2962	2999	1.742	34.714	3.54	146.86	2.51	34.09	-	34.729	7.750	2473.0	1750	3.260	34.782	2.40	27.687
14	Niskin	3206	3249	1.538	34.706	3.72	148.21	2.44	33.63	-	34.719	7.765	2472.7	2000	2.688	34.756	2.69	27.718
13	LA	3452	3499	1.458	34.703	3.81	149.03	2.40	32.93	-	34.716	7.770	2476.7	2250	2.296	34.739	2.95	27.738
12	Niskin	3451	3499	1.458	34.703	3.82	148.70	2.40	33.01	-	34.718	7.770	2476.7	2500	2.012	34.727	3.14	27.752
11	Niskin	3451	3499	1.457	34.703	3.82	148.98	2.38	33.06	-	34.717	7.772	2478.9	2750	1.864	34.720	3.25	27.758
10	LA	4	4	27.774	33.616	-	-	-	-	-	-	-	-	3000	1.731	34.714	3.36	27.764
9	Niskin	298	300	11.630	35.003	0.44	40.20	2.04	32.61	-	35.017	7.659	2375.7	3250	1.530	34.706	3.56	27.772
8	Niskin	3553	3603	1.433	34.702	3.74	153.66	2.34	34.08	-	34.718	7.768	2484.2	3500	1.457	34.703	3.64	27.775
7	LA	3553	3603	1.433	34.702	3.75	153.64	2.35	34.77	-	34.717	-	-	-	-	-	-	-
6	LA	3552	3602	1.434	34.702	-	-	-	-	-	34.750	-	-	-	-	-	-	-
5	LA	3552	3602	1.434	34.702	3.78	153.23	2.36	34.74	-	34.716	7.770	2484.2	-	-	-	-	-
4	Niskin	3551	3601	1.434	34.702	3.76	153.36	2.33	34.68	-	34.716	7.770	2482.5	-	-	-	-	-
3	LA	3590	3641	1.431	34.701	3.72	154.32	2.35	34.96	-	34.717	7.773	2484.5	-	-	-	-	-
2	Niskin	3589	3640	1.431	34.701	3.74	154.22	1.90	34.58	-	34.716	7.773	2486.0	-	-	-	-	-
1	LA	3591	3642	1.431	34.701	3.74	154.2	1.92	34.49	-	34.716	7.781	2483.8	-	-	-	-	-
		Pinger-Bott		5 m														

St.		PA 10	Date	Jan 31			Lat.	09° 51.29'N		Depth	3788 m							
shallow cast			Time(JMT-1)	03:59-04:56			Long.	94° 02.94'E							CTD	Down		CAST
No.	Bottle	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S	PH	ALK	P	T	S	O2	Sigma-T
Bottle	Type	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU			db	℃	psu	ml/L	
0pump		0	-	-	-	-	-	-	-	-	32.969	-	-	-	-	-	-	-
0		0	-	26.700	-	4.66	1.26	0.03	0.40	0.16	32.975	8.276	2232.1	2	27.608	32.939	3.98	20.972
36	Niskin	696	701	8.486	34.962	1.04	69.09	2.65	35.02	-	34.988	7.650	2392.1	10	27.607	32.939	3.98	20.973
35	LA	5	5	27.598	32.942	4.61	1.30	0.02	0.58	0.12	32.967	8.278	2215.1	20	27.571	32.953	4.00	20.995
34	LA	10	10	27.592	32.941	4.66	1.43	0.04	0.50	-	32.968	8.279	2215.2	30	27.576	32.970	3.99	21.006
33	Niskin	10	10	27.598	32.941	4.61	1.48	0.02	0.61	-	32.967	-	-	40	27.336	33.344	3.31	21.364
32	LA	10	10	27.594	32.941	4.61	1.45	0.04	0.21	-	32.968	8.279	2216.7	50	26.601	34.076	2.40	22.148
31	Niskin	20	20	27.597	32.943	4.71	1.57	0.04	0.18	0.15	32.979	8.279	2215.8	75	24.005	34.422	1.38	23.202
30	Niskin	31	31	27.578	32.964	4.62	1.62	0.06	0.29	0.21	33.003	8.275	2217.1	100	22.843	34.453	1.12	23.564
29	Niskin	31	31	27.575	32.962	4.38	2.13	0.10	0.95	-	33.115	-	-	125	18.235	34.720	0.49	24.999
28	Niskin	52	52	26.954	33.737	3.12	5.50	0.51	5.81	0.39	33.868	8.154	2256.4	150	17.024	34.789	0.38	25.347
27	LA	51	52	26.949	33.821	3.10	5.41	0.50	5.62	-	33.905	8.152	2264.6	175	15.923	34.863	0.27	25.660
26	Niskin	51	51	26.968	33.884	3.10	5.17	0.54	5.82	-	33.988	-	-	200	13.194	34.957	0.33	26.320
25	LA	51	51	26.953	33.901	3.10	5.01	0.53	5.72	-	34.022	8.151	2269.3	250	11.908	34.990	0.44	26.599
24	Niskin	74	75	25.766	34.224	2.36	8.81	0.85	10.87	-	34.250	-	-	300	11.051	35.009	0.53	26.774
23	LA	74	75	25.715	34.223	2.37	8.72	0.85	10.82	0.23	34.253	8.074	2276.5	400	10.158	35.004	0.62	26.928
22	Niskin	100	101	22.831	34.450	1.30	15.42	1.35	18.10	0.03	34.484	7.947	2285.7	500	9.510	34.989	0.69	27.026
21	Niskin	100	101	22.755	34.450	1.33	15.71	1.39	18.26	-	34.479	7.946	2296.7	600	9.061	34.979	0.77	27.092
20	LA	100	101	22.818	34.443	1.26	16.00	1.39	18.63	-	34.484	7.941	2290.8	700	8.544	34.964	0.86	27.162
19	Niskin	100	101	22.680	34.440	1.29	16.35	1.39	18.55	-	34.489	-	-	-	-	-	-	-
18	LA	125	125	17.503	34.749	0.55	27.47	1.92	24.31	0.01	34.772	7.783	2314.2	-	-	-	-	-
17	Niskin	125	125	17.563	34.739	0.61	27.69	1.93	23.96	-	34.780	-	-	-	-	-	-	-
16	LA	150	150	15.858	34.856	0.37	28.64	2.20	24.22	0.00	34.878	7.734	2326.4	-	-	-	-	-
15	Niskin	150	150	15.819	34.855	0.48	29.30	2.23	27.47	-	34.880	7.729	2325.9	-	-	-	-	-
14	Niskin	150	151	15.680	34.859	0.42	29.88	2.20	26.77	-	34.882	-	-	-	-	-	-	-
13	LA	200	201	12.561	34.963	0.44	36.77	2.35	30.00	0.01	34.981	7.676	2343.4	-	-	-	-	-
12	Niskin	200	201	12.567	34.963	0.49	37.28	2.36	30.67	-	34.981	7.674	2337.1	-	-	-	-	-
11	Niskin	200	201	12.545	34.963	0.51	37.72	2.38	30.61	-	34.982	-	-	-	-	-	-	-
10	LA	249	250	11.924	34.980	0.50	39.63	2.42	29.92	0.01	35.001	7.667	2347.0	-	-	-	-	-
9	Niskin	301	303	10.880	35.008	0.66	43.60	2.38	31.07	-	35.032	7.656	2350.8	-	-	-	-	-
8	Niskin	300	301	10.886	35.007	0.69	43.75	2.38	33.57	-	35.027	-	-	-	-	-	-	-
7	LA	301	303	10.879	35.007	0.68	43.58	2.36	34.22	0.01	35.022	7.657	2355.7	-	-	-	-	-
6	LA	399	401	9.999	34.998	0.85	51.82	2.38	34.66	-	35.013	-	-	-	-	-	-	-
5	LA	398	401	10.000	34.998	0.70	51.50	2.37	33.04	-	35.013	7.647	2359.6	-	-	-	-	-
4	Niskin	499	502	9.453	34.986	0.87	56.88	2.42	33.85	-	35.003	7.647	2368.7	-	-	-	-	-
3	LA	498	501	9.455	34.986	0.77	57.48	2.37	32.09	-	35.001	7.646	2375.9	-	-	-	-	-
2	Niskin	497	501	9.456	34.986	0.83	57.46	2.36	35.09	-	35.002	7.651	2373.8	-	-	-	-	-
1	LA	597	601	8.938	34.974	0.85	63.36	2.37	34.94	-	34.991	7.648	2386.3	-	-	-	-	-

St.		PA 10	Date	Jan 31			Lat.	09° 51.40'N		Depth	3788 m							
Deep Cast			Time(JMT-1)	11:06-13:48			Long.	94° 03.24'E							CTD	Down		CAST
No.	Bottle	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S	PH	ALK	P	T	S	O2	Sigma-T
Bottle	Type	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU			db	℃	psu	ml/L	
0		0	-	-	-	-	-	-	-	-	-	-	-	2	27.665	33.000	3.88	20.999
36	Niskin	795	801	7.311	34.924	1.16	83.94	2.63	35.60	-	34.943	7.675	2448.8	10	27.662	33.000	3.94	21.001
35	LA	794	800	7.303	34.924	1.05	82.08	2.63	35.40	-	34.957	7.657	2394.9	20	27.659	33.000	3.96	21.001
34	LA	996	1004	6.415	34.894	1.34	94.06	2.68	35.69	-	34.917	7.655	2415.2	30	27.651	32.999	3.96	21.004
33	Niskin	995	1003	6.417	34.894	1.39	94.90	2.65	35.72	-	34.916	7.653	2411.9	40	27.436	33.265	3.56	21.273
32	LA	993	1001	6.414	34.894	1.36	94.50	2.69	35.70	-	34.915	7.653	2412.2	50	26.656	34.059	2.46	22.118
31	Niskin	1240	1251	5.534	34.864	1.55	102.17	2.69	36.08	-	34.891	7.660	2421.4	75	23.852	34.280	1.54	23.140
30	Niskin	1492	1506	5.061	34.848	1.75	110.46	2.67	36.57	-	34.870	7.667	2429.3	100	22.224	34.477	0.99	23.758
29	Niskin	1490	1504	5.063	34.848	1.76	110.22	2.67	36.07	-	34.869	7.664	2428.6	125	18.126	34.745	0.40	25.046
28	Niskin	1489	1502	5.062	34.848	1.77	110.28	2.68	36.17	-	34.867	7.665	2428.9	150	16.541	34.830	0.28	25.492
27	LA	1487	1501	5.067	34.848	1.76	110.49	2.68	35.95	-	34.873	7.667	2428.1	175	15.546	34.874	0.26	25.753
26	Niskin	1734	1751	4.988	34.845	1.78	111.59	2.66	35.91	-	34.866	7.665	2434.3	200	13.258	34.950	0.29	26.302
25	LA	1984	2004	4.932	34.842	1.77	112.69	2.64	35.89	-	34.870	7.667	2435.0	250	11.333	35.010	0.45	26.722
24	Niskin	1982	2003	4.932	34.842	1.80	113.10	2.69	36.01	-	34.883	7.667	2431.4	300	10.976	35.011	0.50	26.789
23	LA	1981	2001	4.932	34.842	1.78	112.82	2.68	35.99	-	34.865	7.665	2432.3	400	10.028	35.003	0.58	26.950
22	Niskin	2231	2256	4.944	34.841	1.83	113.31	2.65	36.04	-	34.865	7.669	2435.4	500	9.415	34.990	0.64	27.043
21	Niskin	2472	2500	4.965	34.841	1.84	113.19	2.66	36.07	-	34.862	7.672	2434.0	600	8.812	34.972	0.74	27.126
20	LA	2472	2500	4.965	34.841	1.81	113.90	2.66	36.17	-	34.862	7.669	2433.1	700	7.950	34.949	0.91	27.241
19	Niskin	2471	2500	4.965	34.841	1.84	113.62	2.63	36.06	-	34.862	7.669	2431.8	800	7.458	34.931	1.01	27.300
18	LA	2716	2749	4.992	34.841	1.82	113.09	2.65	35.94	-	34.861	7.669	2434.3	1000	6.398	34.895	1.25	27.418
17	Niskin	2961	2998	5.021	34.841	1.83	113.38	2.65	35.97	-	34.862	7.671	2436.1	1250	5.449	34.862	1.49	27.513
16	LA	2962	2999	5.021	34.841	1.81	114.59	2.64	35.87	-	34.861	7.667	2430.1	1500	5.079	34.849	1.59	27.546
15	Niskin	2962	2999	5.021	34.841	1.84	116.53	2.65	35.90	-	34.862	7.669	2429.3	1750	4.991	34.845	1.60	27.553
14	Niskin	3206	3249	5.051	34.841	1.85	115.63	2.63	35.86	-	34.859	7.671	2433.7	2000	4.943	34.842	1.64	27.557
13	LA	3451	3499	5.082	34.841	1.82	115.03	2.64	35.89	-	34.858	7.669	2432.5	2250	4.946	34.842	1.65	27.556
12	Niskin	3451	3499	5.082	34.841	1.86	114.20	2.62	35.92	-	34.858	7.669	2433.3	2500	4.966	34.841	1.65	27.554
11	Niskin	3452	3499	5.082	34.841	1.85	113.38	2.64	36.00	-	34.863	7.671	2434.9	2750	4.992	34.841	1.65	27.550
10	LA	3549	3599	5.094	34.841	1.70	101.54	2.60	35.62	-	34.870	7.673	2423.9	3000	5.021	34.841	1.65	27.547
9	Niskin	3549	3599	5.094	34.841	1.85	113.60	2.65	36.84	-	34.862	7.669	2439.3	3250	5.051	34.841	1.68	27.543
8	Niskin	3677	3730	5.111	34.841	1.85	113.29	2.66	36.21	-	34.870	7.669	2435.6	3500	5.082	34.841	1.72	27.540
7	LA	3677	3730	5.111	34.841	1.84	113.13	2.64	36.46	-	34.861	7.673	2431.8	3750	5.114	34.841	1.66	27.536
6	LA	3677	3730	5.111	34.841	1.88	113.58	2.65	36.12	-	34.860	7.673	2433.7	-	-	-	-	-
5	LA	3724	3778	5.118	34.841	1.82	113.73	2.64	36.21	-	34.861	7.671	2434.3	-	-	-	-	-
4	Niskin	3725	3779	5.118	34.841	1.87	113.41	2.65	36.17	-	34.861	7.671	2435.1	-	-	-	-	-
3	LA	3779	3835	5.125	34.841	1.83	113.72	2.64	36.22	-	34.861	7.669	2432.5	-	-	-	-	-
2	Niskin	3779	3834	5.125	34.841	1.90	113.10	2.64	36.11	-	34.862	7.671	2433.5	-	-	-	-	-
1	LA	3778	3833	5.125	34.841	1.84	113.47	2.64	36.20	-	34.865	7.673	2435.8	-	-	-	-	-
			Pinger-Bott	10m														

St.		PA 11	Date	Feb. 12			Lat.	25° 25.03'N		Depth	4235 m							
shallow cast			Time(JMT-1)	05:59-04:59			Long.	115° 19.58'E							CTD	Down		CAST
No.	Bottle	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S	PH	ALK	P	T	S	O2	Sigma-T
Bottle	Type	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU			db	℃	psu	ml/L	
0		0		26.800	-	4.77	1.92	0.15	0.05	0.13	33.067	8.253	2203.8	5	26.875	33.045	3.64	21.286
36	Niskin	695	700	6.744	34.432	2.13	92.79	2.40	32.49	-	34.448	8.262	2198.2	10	26.877	33.045	3.62	21.285
35	LA	4	4	26.870	33.046	4.70	1.84	0.19	0.05	0.13	33.069	7.700	2194.2	20	26.842	33.045	3.62	21.296
34	LA	11	11	26.864	33.046	4.73	1.85	0.16	0.03	0.1	33.069	8.260	2203.9	30	25.991	33.030	3.72	21.551
33	Niskin	11	11	26.866	33.046	-	-	-	-	-	-	-	-	40	25.913	33.027	3.72	21.573
32	LA	10	10	26.869	33.046	4.72	1.86	0.16	0.04	-	33.069	8.258	2200.4	50	26.190	33.169	3.70	21.594
31	Niskin	21	21	26.874	33.046	4.72	1.86	0.17	0.07	0.14	33.067	8.260	2202.0	75	22.929	34.293	3.40	23.418
30	Niskin	30	30	26.553	33.054	4.81	1.86	0.17	0.06	-	33.071	8.262	2201.0	100	19.700	34.547	2.72	24.495
29	Niskin	30	30	26.537	33.054	4.78	1.86	0.16	0.05	-	33.070	8.265	2202.2	125	17.592	34.598	2.35	25.064
28	Niskin	50	50	26.185	33.167	4.80	1.77	0.15	0.00	0.17	33.181	8.266	2208.4	150	16.225	34.590	2.36	25.381
27	LA	50	51	26.195	33.171	-	-	-	-	-	-	-	-	175	15.238	34.570	2.42	25.588
26	Niskin	50	50	26.172	33.161	4.82	1.77	0.13	0.04	-	33.179	8.268	2208.9	200	14.408	34.546	2.45	25.750
25	LA	50	50	26.212	33.185	4.79	1.69	0.10	0.04	-	33.208	8.273	2282.0	250	13.083	34.502	2.36	25.991
24	Niskin	75	76	21.298	34.442	-	-	-	-	-	-	-	-	300	11.805	34.459	2.30	26.206
23	LA	75	75	21.276	34.440	3.82	6.36	0.41	4.84	0.29	34.467	8.268	2288.4	400	10.149	34.423	2.11	26.476
22	Niskin	100	101	18.607	34.558	2.87	13.25	0.87	12.80	0.09	34.579	8.122	2290.2	500	8.736	34.409	1.89	26.697
21	Niskin	100	101	18.608	34.557	2.88	13.25	0.84	12.75	-	34.579	8.017	2291.0	600	7.764	34.417	1.74	26.851
20	LA	100	101	18.592	34.558	2.87	13.17	0.87	12.75	-	34.585	8.014	2296.9	700	6.749	34.433	1.70	27.007
19	Niskin	99	100	18.558	34.557	-	-	-	-	-	-	-	-	-	-	-	-	-
18	LA	124	125	17.179	34.589	2.81	16.32	1.00	14.46	0.02	34.612	8.016	2297.7	-	-	-	-	-
17	Niskin	124	125	17.155	34.588	-	-	-	-	-	-	-	-	-	-	-	-	-
16	LA	148	149	15.870	34.578	2.84	19.75	1.07	15.76	0.01	34.601	7.985	2303.6	-	-	-	-	-
15	Niskin	148	149	15.865	34.577	-	-	-	-	-	-	-	-	-	-	-	-	-
14	Niskin	148	149	15.862	34.576	-	-	-	-	-	-	-	-	-	-	-	-	-
13	LA	198	199	14.361	34.538	2.85	25.06	1.23	17.55	0.00	34.566	7.964	2301.3	-	-	-	-	-
12	Niskin	198	199	14.366	34.538	2.89	25.12	1.22	17.56	-	34.563	7.924	2301.7	-	-	-	-	-
11	Niskin	197	198	14.340	34.536	2.87	25.26	1.23	17.60	0.00	34.563	7.929	2311.8	-	-	-	-	-
10	LA	249	250	12.915	34.488	-	-	-	-	-	-	-	-	-	-	-	-	-
9	Niskin	297	299	11.821	34.454	2.68	39.15	1.58	22.05	0.00	34.476	7.922	2325.5	-	-	-	-	-
8	LA	398	401	10.120	34.416	2.45	52.51	1.83	25.58	-	34.437	7.850	2312.0	-	-	-	-	-
7	Niskin	298	300	11.813	34.453	2.62	39.13	1.56	22.03	-	34.476	7.795	2327.1	-	-	-	-	-
6	Niskin	399	401	10.110	34.416	-	-	-	-	-	-	-	-	-	-	-	-	-
5	LA	398	401	10.046	34.413	2.40	53.05	1.85	25.63	-	34.435	7.807	2334.9	-	-	-	-	-
4	Niskin	495	499	8.747	34.405	2.25	67.01	2.08	28.63	-	34.426	7.865	2361.8	-	-	-	-	-
3	LA	496	499	8.696	34.406	2.19	67.13	2.09	28.66	-	34.426	7.747	2379.3	-	-	-	-	-
2	Niskin	495	498	8.706	34.405	2.23	67.43	2.08	28.74	-	34.427	7.743	2398.6	-	-	-	-	-
1	LA	596	600	7.724	34.414	2.07	79.77	2.27	30.85	-	34.436	7.741	2396.9	-	-	-	-	-
		Pinger-Bott		m														

St.		PA 11	Date	Feb. 10-11			Lat.	15° 25.19'N		Depth	4235 m							
Deep Cast			Time(JMT-1)	23:23-02:26			Long.	115°18.86'E							CTD	Down		CAST
No.	Bottle	Depth	Pres	T(CTD)	S(CTD)	O2	SiO2	PO4	NO2+NO3	Chl-a	S	PH	ALK	P	T	S	O2	Sigma-T
Bottle	Type	m	db	℃	psu	ml/L	μM	μM	μM	μg/L	PSU			db	℃	psu	ml/L	
0		0	0	-	-	-	-	-	-	-	33.067	-	-	8	26.875	33.026	3.65	21.272
36	Niskin	796	802	5.754	34.456	1.99	106.80	2.47	33.84	-	34.476	7.716	2424.9	10	26.877	33.027	3.67	21.271
35	LA	795	801	5.752	34.456	1.99	106.13	2.46	33.81	-	34.476	7.668	2427.6	20	26.873	33.029	3.67	21.274
34	LA	997	1005	4.533	34.507	1.98	127.09	2.62	35.56	-	34.526	7.673	2406.0	30	26.718	33.081	3.67	21.362
33	Niskin	995	1003	4.537	34.507	1.97	127.31	2.60	35.52	-	34.527	7.661	2444.0	40	26.465	33.303	3.68	21.609
32	LA	993	1001	4.539	34.507	1.97	126.45	2.62	35.45	-	34.526	7.654	2484.7	50	25.190	33.902	3.28	22.454
31	Niskin	1241	1252	3.464	34.552	2.12	144.64	2.71	36.52	-	34.572	7.655	2453.4	75	21.732	34.364	2.92	23.809
30	Niskin	1490	1504	2.926	34.576	-	-	-	-	-	-	-	-	100	19.890	34.519	2.69	24.424
29	Niskin	1489	1502	2.927	34.576	2.22	152.75	2.69	36.93	-	34.594	7.655	2453.0	125	18.184	34.575	2.34	24.901
28	Niskin	1488	1502	2.927	34.576	2.24	152.61	2.70	36.85	-	34.595	7.657	2417.3	150	16.370	34.594	2.42	25.350
27	LA	1487	1501	2.927	34.576	2.20	152.56	2.72	36.82	-	34.592	7.662	2459.1	175	15.276	34.571	2.42	25.580
26	Niskin	1733	1750	2.671	34.587	2.34	154.95	2.70	36.92	-	34.605	7.663	2462.3	200	14.373	34.543	2.44	25.756
25	LA	1982	2003	2.519	34.594	2.40	156.09	2.67	36.93	-	34.611	7.663	2459.2	250	13.019	34.497	2.35	26.000
24	Niskin	1981	2002	2.519	34.594	2.38	155.84	2.66	36.88	-	34.610	7.665	2457.4	300	11.857	34.459	2.31	26.196
23	LA	1980	2001	2.519	34.594	2.39	155.43	2.65	36.89	-	34.610	7.661	2458.0	400	10.191	34.417	2.17	26.464
22	Niskin	2227	2251	2.434	34.598	2.46	156.08	2.64	36.88	-	34.615	7.659	2462.8	500	8.742	34.408	1.90	26.695
21	Niskin	2473	2502	2.392	34.601	-	-	-	-	-	-	-	-	600	7.764	34.417	1.76	26.851
20	LA	2473	2501	2.392	34.601	2.46	156.32	2.65	37.01	-	34.618	7.669	2455.2	700	6.866	34.431	1.72	26.989
19	Niskin	2472	2501	2.393	34.601	2.50	156.31	2.65	36.84	-	34.620	7.681	2455.7	800	6.036	34.450	1.72	27.113
18	LA	2718	2751	2.375	34.602	2.54	155.82	2.63	36.76	-	34.620	7.671	2454.0	1000	4.736	34.500	1.69	27.309
17	Niskin	2966	3004	2.370	34.603	2.57	154.99	2.65	36.69	-	34.619	7.667	2457.6	1250	3.544	34.549	1.75	27.474
16	LA	2965	3002	2.370	34.603	2.59	155.09	2.62	36.62	-	34.621	7.677	2462.0	1500	2.942	34.575	1.84	27.551
15	Niskin	2963	3001	2.369	34.603	2.61	155.18	2.60	36.64	-	34.620	7.676	2457.6	1750	2.682	34.587	1.91	27.584
14	Niskin	3207	3250	2.380	34.604	2.60	154.97	2.62	36.61	-	34.623	7.675	2457.3	2000	2.520	34.594	1.97	27.604
13	LA	3454	3503	2.395	34.604	2.58	154.88	2.62	36.59	-	34.623	7.679	2457.4	2250	2.433	34.598	2.08	27.614
12	Niskin	3454	3502	2.395	34.604	2.65	154.85	2.61	36.58	-	34.622	7.673	2457.5	2500	2.398	34.601	2.07	27.619
11	Niskin	3453	3501	2.394	34.604	-	-	-	-	-	-	-	-	2750	2.378	34.602	2.11	27.622
10	LA	3697	3750	2.415	34.604	2.58	154.73	2.63	36.63	-	34.619	7.682	2458.9	3000	2.372	34.603	2.16	27.623
9	Niskin	3941	4000	2.434	34.604	2.64	154.31	2.61	36.58	-	34.613	7.677	2455.3	3250	2.380	34.604	2.18	27.623
8	Niskin	3940	4000	2.434	34.604	2.63	153.97	2.63	36.55	-	34.617	7.683	2459.8	3500	2.396	34.604	2.21	27.622
7	LA	3940	3999	2.434	34.604	2.66	153.96	2.65	36.73	-	34.621	7.685	2460.2	3750	2.416	34.604	2.23	27.621
6	Niskin	4184	4250	2.457	34.604	-	-	-	-	-	-	-	-	4000	2.433	34.604	2.29	27.619
5	LA	4183	4249	2.456	34.604	2.67	153.36	2.63	36.67	-	34.621	7.683	2459.3	4250	2.457	34.604	2.37	27.617
4	Niskin	4182	4248	2.456	34.604	2.66	152.84	2.63	36.73	-	34.621	7.680	2456.2	-	-	-	-	-
3	LA	4232	4299	2.462	34.605	2.64	153.23	2.63	36.63	-	34.622	7.683	2456.2	-	-	-	-	-
2	Niskin	4232	4298	2.462	34.605	2.67	153.70	2.65	36.62	-	34.622	7.688	2439.3	-	-	-	-	-
1	LA	4231	4298	2.462	34.605	2.64	153.5	2.65	36.59	-	34.623	7.691	2435.6	-	-	-	-	-
		Pinger-Bott		4 m														

8-4. Routine data for the Large Volume water samples

Large volume smpler				Large volume smpler			
PA1	Date Dec. 25	Lat. 08°50.00'N		PA4	Date Jan.14	Lat.40°00.74'N	
Time(JST-1)20:15-0315		Long.121°48.29'E Depth 4988m		Time(JST-1)19:58-06:25		Long.109°59.51'E Depth 4653m	
No. Bottle	Depth m	Temperature °C	S PSU	No. Bottle	Depth m	Temperature °C	S PSU
0K	-	-	33.665	0Z	-	-	35.020
0R	-	-	33.670	10K	12	15.396	35.045
0Z	-	-	33.650	20K	20	15.318	35.046
10K	11	27.32	33.679	40K	40	13.815	35.039
20K	20	27.29	33.681	50Y	54	12.828	35.076
40K	40	27.11	33.699	60K	62	12.165	35.096
50Y	51	27.45	33.745	80K	80	11.752	35.059
60K	60	26.91	33.726	100K	101	11.233	35.118
80K	81	23.37	34.175	100R	103	11.235	35.124
100K	100	20.44	34.359	100Z	103	11.223	35.123
100R	100	21.90	34.263	150K	151	11.302	35.010
100Z	98	20.27	34.361	200R	203	10.856	34.936
150K	152	17.19	34.480	200Y	202	10.849	34.935
200R	199	14.55	34.526	300R	299	9.968	34.778
200Y	198	-	34.517	400Y	396	9.717	-
300R	299	12.73	34.482	500R	512	9.365	34.686
400Y	389	11.58	34.470	600Y	595	9.103	-
500R	502	10.89	34.465	750R	752	8.148	34.540
600Y	605	10.39	34.458	800Y	788	7.903	-
750R	746	10.23	34.462	1000A	993	5.562	34.391
800Y	799	10.15	-	1000R	989	5.559	34.389
1000A	1012	10.08	34.458	1000Y	990	5.397	
1000R	1000	10.09	34.456	1000Z	971	5.577	34.390
1000Y	1000	10.08	34.456	1200Y	1197	3.868	-
1000Z	1008	10.09	34.457	1250R	1257	3.628	34.403
1200Y	1189	10.08	-	1500R	1491	3.072	34.502
1250R	1236	10.08	34.458	1500Y	1511	3.058	34.496
1500R	1502	10.07	34.426	2000A	2016	2.553	34.663
1500Y	1508	10.08	34.457	2000R	2013	2.559	34.664
2000R	2003	10.15	34.465	2000Z	1992	2.561	34.665
2000Z	2000	10.15	34.465	3000A	3028	1.730	34.738
2500R	2496	10.20	34.470	3000R	3022	1.740	34.736
3000R	2958	10.28	34.471	4000A	4042	0.907	34.706
4000A	4049	10.43	34.475	4000R	4020	0.917	34.705
4000R	3984	10.42	-	B-100R	4603	0.846	34.703
4600R	4650	10.55	34.475	B.R	4692	0.865	34.701
B-100R	4931	10.59	34.476	B.Z	4706	0.853	34.703
B.R	5032	10.59	34.475				
B.Z	5023	10.61	34.474				

Large volume smpler					Large volume smpler				
PA5	Date Jan 17-19		Lat.29°59.43'N		PA7	Date Dec. 25		Lat.09°5974'S	
Time(JST-1)	20:04-09:00		Long.109°59.92'E		Time(JST-1)	22:08-07:50		Long.101°5938'	
			Depth 5507 m					Depth 3626m	
No. Bottle	Depth m	Pres. db	Temperature °C	S PSU	No. Bottle	Depth m	Pres. db	Temperature °C	S PSU
0A	0		-	35.902	0AK	0		-	34.132
10K	10	10	21.09	35.902	0AP	0		-	-
20K	20	20	21.08	35.900	0R	0		-	34.163
40K	40	40	21.03	35.899	0Z	0		-	34.075
50Y	50	50	21.14	-	10K	13	13	28.51	34.079
60K	61	61	20.75	35.889	20K	21	21	28.49	34.080
80K	80	80	19.142	35.893	40K	42	42	27.31	34.266
100K	99	100	18.723	35.929	50Y	51	51	27.27	-
100R	97	98	18.761	35.922	60K	61	61	25.23	34.372
150K	147	148	17.332	35.883	80K			-	34.447
200R	202	203	15.890	35.767	100K	96	97	20.43	34.507
200Y	236	237	14.794	-	100R	99	100	20.46	34.509
300R	298	300	12.860	35.264	100Y	97	98	20.13	-
400Y	397	400	10.903	-	150K	150	151	15.817	34.547
500R	500	503	9.753	35.743	200R	199	200	13.123	34.603
600Y	599	603	9.206	-	200Y	197	198	13.039	-
750R	739	744	7.992	35.544	300R	297	299	10.658	34.777
800Y	787	793	7.141	34.483	400Y	391	394	9.752	-
1000R	972	980	4.483	34.435	500R	478	481	9.043	34.804
1000Y	991	999	4.501	34.423	600Y	592	596	8.203	34.765
1200Y	1190	1200	3.721	34.512	750R	744	749	6.873	34.705
1250R	1242	1253	3.584	34.532	800Y	768	774	6.556	34.693
1500R	1475	1488	3.101	34.602	1000R	976	984	5.323	34.651
1500Y	1497	1511	3.085	34.604	1000Y	966	974	5.313	34.650
2000A	1967	1987	2.447	34.700	1200Y	1191	1201	4.425	34.649
2000R	1957	1977	2.466	34.701	1250R	1237	1248	4.328	34.659
2500R	2478	2507	1.988	34.718	1500R	1465	1478	3.713	34.711
3000R	2986	3024	2.791	34.728	2000A	0		-	34.704
4000A	3954	4013	1.288	34.716	2000R	0		-	34.751
4000R	3736	3790	1.302	34.716	2500R	0		2.003	34.721
5000R	4994	5081	1.098	34.710	3000R	0		-	34.724
B-100R	5397	5496	1.064	34.706	4000A	3990	4050	1.173	34.720
B.R	5504	5607	1.049	34.706	4000R	3968	4028	1.192	34.713
					5000R	4995	5082	1.192	34.712
					B-100R	5221	5315	1.227	34.709
					B.R	5318	5415	1.221	34.710

Large volume smpler					Large volume smpler				
PA9	Date Jan 17-19		Lat. 08° 00.44'N		PA10	Date Jan.01-02		Lat. 09° 51.61'N	
Time(JST-1)			Long. 88° 59.67'E		Time(JST-1)			Long. 94°03.38'E	
16'12-07'00			Depth 3626 m		22'08-01'30			Depth 3800 m	
No.	Depth	Pres.	Temperature	S	No.	Depth	Pres.	Temperature	S
Bottle	m	db	°C	PSU	Bottle	m	db	°C	PSU
0R	0	0	-	33.573	0A	0	0	-	33.014
0K	0	0	-	33.524	0R	0	0	-	33.015
0A	0	0	-	33.534	0Z	0	0	-	32.988
5R	10	10	25.49	-	25K	27	27	27.55	32.984
25K	26	26	27.78	33.527	50K	51	51	27.43	33.265
50K	51	51	27.86	33.801	50Y	51	51	27.64	-
50Y	51	51	27.93	-	75k	75	75	26.01	34.241
75K	79	79	27.03	34.523	100K	99	100	23.27	34.482
100K	99	100	23.88	34.263	100R	99	100	22.94	34.478
100R	99	100	24.19	34.240	100Y	100	101	23.47	-
100Y	100	101	23.75	-	100Z	99	100	22.83	34.478
200R	197	198	14.088	35.000	200R	194	195	-	34.989
200Y	194	195	13.423	-	200Y	195	196	13.503	-
300R	292	294	11.325	35.044	300R	299	301	10.934	35.023
400R	394	397	10.338	35.043	400Y	399	402	9.895	-
400Y	399	402	10.227	-	500R	494	497	9.589	35.005
500R	495	498	9.723	35.027	600R	595	599	8.829	34.990
600R	596	600	8.834	35.003	600Y	593	597	8.681	34.984
600Y	596	600	8.798	35.001	800R	784	790	7.463	34.947
800R	784	790	7.407	34.961	800Y	794	800	7.406	34.945
800Y	796	802	7.439	34.963	1000R	992	1000	6.627	34.920
1000R	997	1005	6.245	34.918	1000Y	974	982	6.584	34.916
1000Y	981	989	6.352	34.920	1000Z	997	1005	6.359	34.911
1200Y	1197	1207	5.389	34.884	1200Y	1192	1202	5.582	34.886
1250R	1246	1257	5.110	34.876	1250R	1242	1253	5.508	34.882
2000R	1973	1993	2.683	34.779	1500A	1489	1503	5.104	34.868
2500R	2496	2525	2.025	34.750	1500R	1468	1481	5.086	34.864
3000R	2973	3011	3.940?	34.739	2000R	1987	2008	4.911	34.860
3200R	3177	3219	1.587	34.734	2500R	2489	2518	4.960	34.860
B-100R	3453	3501	1.464	34.726	3000A	2993	3031	5.001	34.857
BR	3598	3649	1.415	34.725	3000R	2965	3003	5.023	34.813
BR	3598	3649	1.415	34.725	3500R	3484	3533	5.090	34.859
					B-100R	3669	3722	5.103	34.860
					B.R	3759	3814	5.123	34.856
					B.Z.	3785	3841	5.102	34.859

Large volume smpler					Niskin 23l water sampler			Niskin 23l water sampler		
PA11 Date Feb. 10-11			Lat. 25° 25.56'N		PA1 Date Dec. 25			PA4 Date Jan. 15		
Time(JST-1)			Long. 115° 19.91'E		Time(JST-1), Depth 4861m			Time(JST-1),Depth 4622		
16:02-16:32			Depth 4234 m		17:11- 18:10			05:28-06:54		
No.	Depth	Pres.	Temp.	S	Lat. 08° 50.03'N			Lat. 40° 00.85'S		
Bottle	m	db	°C	PSU	Long. 121°48.56'E			Long. 109°59.95'E		
0A	0	0	-	33.119	W.O	Depth	Temp.	W.O	Depth	Temp.
0R	0	0	-	33.020	m	m	°C	m	m	°C
0Z	0	0	-	33.033	0	0	-	0	0	-
50Y	50	50	-	-	15	15	-	10	10	-
100Z	97	98	19. 378	34.566	30	30	-	40	40	14.28
100R	98	99	19.47	34.563	50	49	-	70	75	12.25
100Y	94	95	19.56	-	75	74	-	100	100	11.41
200R	194	195	14.60	34.566	100	98	22.62	125	125	11.53
200Y	199	200	-	-	125	123	-	150	150	11.56
300R	295	297	12.13	34.485	150	147	-	175	175	11.05
400R	392	395	10.27	34.435	200	196	15.10	200	199	10.82
400Y	0		-	-	300	293	12.87	250	248	10.56
500R	497	500	8.766	34.424	-	-	-	300	298	10.47
600Y	593	597	7.127	34.441	-	-	-	400	398	9.64
750R	735	740	6.243	34.457	-	-	-	600	597	9.11
800Y	793	799	5.529	34.489	-	-	-	-	-	-
1000Y	992	1000	4.385	34.529	-	-	-	-	-	-
1000R	0	0	7.984	34.511	-	-	-	-	-	-
1000Z	998	1006	4.394	34.534	-	-	-	-	-	-
1200Y	1187	1197	3.499	34.564	-	-	-	-	-	-
1250R	1212	1222	3.570	34.569	-	-	-	-	-	-
1500R	1457	1470	2.943	34.592	-	-	-	-	-	-
1500A	1489	1503	2.927	34.548	-	-	-	-	-	-
2000R	1984	2005	2.492	34.614	-	-	-	-	-	-
2500R	2491	2520	2.380	34.620	-	-	-	-	-	-
3000A	2990	3028	2.347	34.619	-	-	-	-	-	-
3000R	2966	3004	2.369	34.619	-	-	-	-	-	-
4000R	0	0	-	34.492	-	-	-	-	-	-
B-100R	0	0	-	34.589	-	-	-	-	-	-
B	0	0	-	34.613	-	-	-	-	-	-
B	0	0	-	-	-	-	-	-	-	-

8-5. Distribution of the Large Volume water samples

(1) PA-1

	ORI	ORI	NIRS	NIRS	Nihon U.	Kanazawa U	NIRS,Kanazawa
Depth	Amakawa	Yamamoto	Yamada	Zhang	Kobayashi	Nakanishi	& Nihon U.
0m		○	○	○	○	○	○
10m					○		
20m					○		
40m					○		
50m		○					
60m					○		
80m					○		
100m				○	○		○
150m					○		
200m		○					○
300m							○
400m		○					
500m							○
600m		○					
750m							○
800m		○					
1000m	○	○		○			○
1200m		○					
1250m							○
1500m		○					○
2000m				○			○
2500m							○
3000m							○
4000m	○						○
4600m							○
B-100							○
B(4400m)				○			○

(2) PA-4

	ORI	ORI	NIRS	NIRS	Nihon U.	Kanazawa U	NIRS,Kanazawa
Depth	Amakawa	Yamamoto	Yamada	Zhang	Kobayashi	Nakanishi	& Nihon U.
0m	○	○	○	○	○	○,○ 1 ℓ	○
10m					○		
20m					○		
40m					○		
50m		○					
60m					○		
80m					○		
100m				○	○	○ 1 ℓ	○
150m					○		
200m		○				○ 1 ℓ	○
300m						○ 1 ℓ	○
400m		○					
500m						○ 1 ℓ	○
600m		○					
750m						○ 1 ℓ	○
800m		○					
1000m	○	○		○		○ 1 ℓ	○
1200m		○					
1250m						○ 1 ℓ	○
1500m		○				○ 1 ℓ	○
2000m	○			○		○ 1 ℓ	○
3000m	○					○ 1 ℓ	○
4000m	○					○ 1 ℓ	○
B-100						○ 1 ℓ	○
B(4600m)				○		○ 1 ℓ	○

(3) PA-5

	ORI	ORI	NIRS	NIRS	Nihon U.	Kanazawa U	NIRS,Kanazawa
Depth	Amakawa	Yamamoto	Yamada	Zhang	Kobayashi	Nakanishi	& Nihon U.
0m	○	○	○		○	○	○
10m					○		
20m					○		
40m					○		
50m		○					
60m					○		
80m					○		
100m					○		○
150m					○		
200m		○					○
300m							○
400m		○					
500m							○
600m		○					
750m							○
800m		○					
1000m		○					○
1200m		○					
1250m							○
1500m		○					○
2000m	○						○
2500m							○
3000m							○
4000m	○						○
5000m							○
B-100							○
B(5500m)							○

(4) PA-7

	ORI	ORI	NIRS	Kinki U.	Nihon U.	Kanazawa U	NIRS,Kanazawa
Depth	Amakawa	Yamamoto	Yamada	& Zhang	Kobayashi	Nakanishi	& Nihon U.
0m	○	○	○	○,○	○	○	○
10m					○		
20m					○		
40m					○		
50m		○					
60m					○		
80m					○		
100m		○			○		○
150m					○		
200m		○					○
300m							○
400m		○					
500m							○
600m		○					
750m							○
800m		○					
1000m		○					○
1200m		○					
1250m							○
1500m							○
2000m	○						○
2500m							○
3000m							○
4000m	○						○
5000m							○
B-100							○
B(5500m)							○

(5) PA-9

	ORI	ORI	NIRS	NIRS	Nihon U.	Kanazawa U	NIRS,Kanazawa
Depth	Amakawa	Yamamoto	Yamada	Zhang	Kobayashi	Nakanishi	& Nihon U.
0m	○	○	○		○	○	○
5m							○
25m					○		
50m		○			○		
75m					○		
100m		○			○		○
200m		○					○
300m							○
400m		○					○
500m							○
600m		○					○
800m		○					○
1000m		○					○
1200m		○					
1250m							○
2000m							○
2500m							○
3000m							○
3200m							○
B-100							○
B(3600m)							○

(6) PA-10

	ORI	ORI	NIRS	NIRS	Nihon U.	Kanazawa U	NIRS,Kanazawa
Depth	Amakawa	Yamamoto	Yamada	Zhang	Kobayashi	Nakanishi	& Nihon U.
0m	○	○	○	○	○	○	○
25m					○		
50m		○			○		
75m					○		
100m		○		○	○		○
200m		○					○
300m							○
400m		○					
500m							○
600m		○					○
800m		○					○
1000m		○		○			○
1200m		○					
1250m							○
1500m	○						○
2000m							○
2500m							○
3000m	○						○
3500m							○
B-100							○
B(3770m)				○			○

(7) PA-11

	ORI	ORI	NIRS	NIRS	Nihon U.	Kanazawa U	NIRS,Kanazawa
Depth	Amakawa	Yamamoto	Yamada	Zhang	Kobayashi	Nakanishi	& Nihon U.
0m	○	○	○	○		○	○
50m		○					
100m		○		○			○
200m		○					○
300m							○
400m		○					○
500m							○
600m		○					
750m							○
800m		○					
1000m		○		○			○
1200m		○					
1250m							○
1500m	○						○
2000m							○
2500m							○
3000m	○						○
4000m							○
B-100							○
B(4240m)				○			○

9. Explanetary notes and onboard data of sedimentary works

9-1. Group report

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Introduction

The main objective of the sediment core group is to resolve the change of ocean flux systems in the eastern Indian Ocean and adjacent regions during glacial-interglacial cycles. To meet this objective, we collected long sediment cores at 9 stations (PA-1, 3, 4, 6, 7, 8, 9, 10 and 11) using a piston corer, and simultaneously obtained short sediment cores at 3 stations (PA-1, 3 and 8) using an Asura corer equipped with 3 tubes as a trigger weight. Also we obtained sediment cores at 8 stations (PA-1, 4, 5, 7, 8, 9, 10 and 11) using a multiple corer.

On board, the following measurements were carried out; (1) magnetic susceptibility and color. After the cruise, the following parameters will be measured and investigated in land-based laboratories; (2) detailed magnetic susceptibility and polarity, soft X-ray and water content to determine physical properties and structure of the sediment, (3) assemblage analyses of calcareous and siliceous microfossils to estimate the age of the sediment, and measurements of oxygen isotopes (O-18/O-16 ratio) and radio isotopes (Th-230, Th-232 and C-14) to determine the sedimentation rate, (4) distributions of biogenic materials (organic carbon, $CaCO_3$ and SiO_2), lithogenic elements (Al, Ba, Ti, Fe, Mn, U and REEs), organic compounds (UK-37, stable isotopes of C and N, lipids and pigments) and radiogenic and cosmogenic isotopes (Pa-231/Th-230 ratio and Be-10) to determine past changes in oceanic mass fluxes.

On-Board Treatment

The on-board routine works of sediment cores obtained by a piston corer are as follows.

At first, magnetic susceptibility was measured for each whole core, then the core was cut vertically into halves, named Working 1 and 2. Both of them were immediately marked with white and blue pins at 10 and 50 cm intervals, respectively.

The core of Working 1 was used for taking a photograph, visual description and sampling vertically along a double line of cubic cups (each 2.2x2.2x2.2 cm^3) for the measurement of magnetic susceptibility, polarity and water content. The rest of the sediment

sample was cut into 2.2 cm thick segments and distributed for various investigations. The core of Working 2 was sliced for soft X-ray observation and analyses of organic matter, and the rest was divided into 2 cm sections and distributed for the chemical analysis of inorganic matter. The distribution of sediments mentioned above is detailed in Fig. 1.

For multiple core samples, one of 8 cores obtained at each station was treated in order to obtain the general information. The treatment is basically as same as that of the piston core sample. At first magnetic susceptibility was measured for the whole core and cut vertically. Using half of the core, visual description and sampling for measurements of magnetism and water content were carried out. Using another half, core samples were sliced for soft X-ray observation. The rest was reserved as the archive core. On the other hand, 7 cores obtained at each station were distributed among scientists as shown in Table 2.

On-Board data

Both the magnetic susceptibility data and the digital color data in each core were shown in same figures.

1) Magnetic susceptibility of each whole core sample was measured at 5 cm interval using by pass through typed system (Bartington, MS2).

2) Digital color data of each core sample was also measured at 54 cm intervals using by color photo spectrometer (MINOLTA, CM2002). The data shows L*(black-white), a*(red-green), b*(yellow-blue) parameters.

Overview photograph images in each core were taken by digital camera (OLYMPUS, C-800L).

9-2. Major instruments for sediment sampling

9-2-1. Piston corer

9-2-2. Multiple corer (O.R.I., Univ. of Tokyo)

Weight
(450Kg)

Pipes (X 8)
(Length:600mm, ϕ 80mm)

9-3. Locations of sediment sampling

Table 1. Piston and Multiple cores locations during the KH96-5 cruise

Piston core

station no.	Latitude	Longitude	water depth	Location	Core length	date	Lithology
st.1	8° 50.19' N	121° 48.16' E	4,857m	Sulu Sea	774.1cm	'96.12.25	Clay and very fine sand
st.3	42° 19.01' S	112° 8.43' E	4,400m	Southeast Indian Ridge	884.0cm	'97.1.13	Calcareous clay and red clay
st.4	40° 0.31' S	109° 59.34' E	4,615m	Southeast Indian Ridge	966.4cm	'97.1.15	Calcareous clay and red clay
st.6	23° 59.62' S	108° 03.13' E	2,440m	Cuvier Plateau	554.5cm	'97.1.20	Calcareous ooze
st.7	9° 59.59' S	102° 0.46' E	5,602m	Vening Meinesa SMTS	944.4cm	'97.1.23	Siliceous clayey silt
st.8-1	3° 32.09' N	90° 16.99' E	2,029m	Ninetyeast Ridge	174.0cm	'97.1.27	Foram-sand and silty clay
st.8-2	3° 40.21 N	90° 17.02' E	1,930m	Ninetyeast Ridge	127.0cm	'97.1.27	Foram-sand and silty clay
st.9	7° 56.87 N	89° 0.95' E	3,604m	Bengal Bay	464.1cm	'97.1.29	Hemipelagic clay
st.10	9° 51.58' N	94° 3.37' E	3,775m	Andaman Sea	815.2cm	'97.1.31	Hemipelagic clay
st.11	15° 22.62' N	115 16.72' E	4,230m	South China Sea	872.0cm	'97.2.11	Hemipelagic clay and tuffaceous turbidi

Multiple core

station no.	Latitude	Longitude	water depth	Location	Core length	date	Lithology
st.1	8° 50.21' N	121° 48.98' E	4,855m	Sulu Sea	46.0cm	'96.12.25	Clay and very fine sand
st.4	40° 1.07' S	109° 59.97' E	4,610m	Southeast Indian Ridge	32.8cm	'97.1.15	Calcareous clay and red clay
st.5	30° 0.20' S	110° 0.50' E	5,459m	Perth Basin	26.0cm	'97.1.18	Calcareous ooze and hemipelagic clay
st.7	9° 59.41' S	102° 0.41' E	5,616m	Vening Meinesa SMTS	41.0cm	'97.1.23	Volcanic ash and siliceous clayey silt
st.8	3° 31.86' N	90° 16.78' E	2,009m	Nintyeast Ridge	20.5cm	'97.1.27	Calcareous ooze
st.9	7° 56.83' N	89° 1.40' E	3,605m	Bengal Bay	34.5cm	'97.1.28	Calcareous ooze
st.10	9° 51.62' N	94° 3.44' E	3,774m	Andaman Sea	40.0cm	'97.1.31	Hemipelagic clay
st.11	15° 25.26' N	115 20.20' E	4,234m	South China Sea	32.0cm	'97.2.12	Hemipelagic clay

9-4. Piston core samples

9-4-1. Core logs

Piston Core Log

No. 1

Cruise KH96-5 Station PA 1 Date 96.12.25

Core Name PA1PC

Location Sulu sea

Weather Fine Wind 8.5 m/sec SeaSwell Calm

Type of PC 900 kg wt. + Ashula

Main wire 14.5 m Pilot wire 16 m Free fall 2 m

Start 11:15

		Latitude	Longitude	Depth
Sea surface	11:27	8 ° 49.79 ' N	121 ° 48.21 ' E	4858 m

Wire Speed Winch Down 1 m/sec

		Depth	Wire out
Stop	12:50	4860 m	4750 m

Restart Wire Speed ____ m/sec Tension ____ ton

		Latitude	Longitude	Depth	Wire out
On Bottom	13:00	8 ° 50.19 ' N	121 ° 48.16 ' E	4857 m	4954 m

Tension Min 2.5 ton Max 4.3 ton

Surface (winch up) ____ Wire Speed Winch Up ____ m/sec

End ____ Total ____

Remarks

Pilot Length 54 cm Core Length 748.1 cm No. of Section 8

Length of Section sec.3: 102cm, sec.4: 94 cm, sec.5: 90.5 cm, sec.6: 95 cm, sec.7: 92 cm, sec.8: 93cm, sec.9: 94.6cm, sec.10: 87 cm

Main Lithology Unconsolidated clay with very fine sand layers

Piston Core Log

No. 2

Cruise KH96-5 Station PA3 Date 1997 1.13

Core Name PA3PC

Location Southeast Indian Ridge

Weather Cloud Wind 10 m/sec SeaSwell Middle

Type of PC 900kgwt.

Main wire 16.0 m Pilot wire 16.0+ m Free fall 3.0 m

Start 10:32

		Latitude	Longitude	Depth
Sea surface	10:47	42 ° 18.68 ' S	112 ° 8.71 ' E	4,400 m

Wire Speed Winch Down 0.4 m/sec

		Depth	Wire out
Stop	12:36	4,402 m	4,309 m

Restart Wire Speed 0.5 m/sec Tension 3.45 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	12:42	42 ° 19.01 ' S	112 ° 8.43 ' E	4,400 m	4,397 m

Tension Min 2.6 ton Max 4.5 ton

Surface (winch up) 13:55 Wire Speed Winch Up 1.0 m/sec

End 14:05 Total 3h33m

Remarks

Pilot Length 39.5 cm Core Length 883.0 cm No. of Section ____

Length of Section Sec.2: 75cm, Sec.3: 93cm, Sec.4: 99cm, Sec5: 98.5cm, Sec.6: 97.5cm, Sec7: 97cm, Sec.8: 98cm, Sec.9: 99cm, Sec.10: 89cm

Main Lithology Clay and very fine sand

Piston Core Log

No. 3

Cruise KH96-5 Station PA4 Date 1997/1/15

Core Name PA4PC

Location Southeast Indian Ridge

Weather Cloud Wind 7.0 m/sec SeaSwell Middle

Type of PC 900kgwt.

Main wire 16 m Pilot wire 16+0.85 m Free fall 3 m

Start 13:30

		Latitude	Longitude	Depth	
Sea surface	13:50	40 ° 0.29 ' S	109 ° 59.63 ' E	4614 m	

Wire Speed Winch Down 0.5-1.2 m/sec

		Depth	Wire out
Stop	15:07	4612 m	4546 m

Restart Wire Speed 0.5 m/sec Tension 3.5 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	15:13	40 ° 0.31 ' S	109 ° 59.34 ' E	4615 m	m

Tension Min ton Max 4.6 ton

Surface (winch up) Wire Speed Winch Up m/sec

End 16:30 Total 3h00m

Remarks

Pilot Length cm Core Length 966.4 cm No. of Section 10

Length of Section Sec.1:69.4cm, Sec.2: 100.6cm, Sec.3: 99.4cm, Sec.4: 98cm, Sec.5: 98.8cm, Sec.6: 100cm, Sec.7: 99cm, Sec.8: 101.4cm, Sec.9: 99.8cm, Sec.10: 100cm

Main Lithology Alternation of the red clay and calcareous clay

Piston Core Log

No. 4

Cruise KH96-5 Station PA6 Date 1997.1.20

Core Name PA6PC

Location Cuvier Plateau

Weather Cloud Wind 14 m/sec SeaSwell High

Type of PC 900kgwt., pilotwt.50kg+20kg

Main wire 16.0 m Pilot wire 16.0+0.85 m Free fall 3.0 m

Start 9:00

		Latitude	Longitude	Depth	
Sea surface	9:30	23 ° 58.87 ' S	108 ° 22.66 ' E	2,440 m	

Wire Speed Winch Down 0.5 m/sec

		Depth	Wire out
Stop	-	- m	- m

Restart Wire Speed - m/sec Tension - ton

		Latitude	Longitude	Depth	Wire out
On Bottom	10:52	23 ° 59.62 ' S	180 ° 03.13 ' E	2440 m	2407 m

Tension Min ton Max 4.4 ton

Surface (winch up) Wire Speed Winch Up m/sec

End Total

Remarks 9:20, pilot wt.にバランスウエイト（オケアン用）追加
うねり高し．アシュラなし
いったん止めずに0.5m/sで着底させた

Pilot Length cm Core Length 554.5 cm No. of Section

Length of Section Sec.5: 60cm, Sec.6: 101cm, Sec.7: 97.5cm, Sec.8: 99cm, Sec.9: 93cm, Sec.10: 104cm

Main Lithology Calcareous ooze

Piston Core Log

No. 5

Cruise KH96-5 Station PA7 Date 1997.1.23

Core Name PA7PC

Location Vening Meineassa SMTS

Weather Cloud Wind 5 m/sec SeaSwell Low

Type of PC 900kgwt., pilotwt.50kg+20kg

Main wire 16.0 m Pilot wire 16.0+0.60 m Free fall 3.0 m

Start 9:31

		Latitude	Longitude	Depth
Sea surface	9:45	9 ° 59.52 ' S	102 ° 0.30 ' E	5600 m

Wire Speed *Winch Down* 0.8-1.2 m/sec

		Depth	Wire out
Stop	11:25	m	5590 m

Restart *Wire Speed* m/sec *Tension* 4.5 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	11:30	9 ° 59.59 ' S	102 ° 0.46 ' E	5602 m	5674 m

Tension Min ton *Max* 4.92 ton

Surface (winch up) Wire Speed *Winch Up* 1.5 m/sec

End 13:10 **Total** 3h39m

Remarks

Pilot Length cm Core Length 944.4 cm No. of Section

Length of Section Sec.1: 66cm, Sec.2: 94.8cm, Sec.3: 99.5cm, Sec.4: 96.2cm, Sec.5: 99cm, Sec.6: 91.5, Sec.7: 99cm, Sec.8: 98.9cm, Sec.9: 99.3cm, Sec.10: 100.2

Main Lithology Siliceous clayey silt

Piston Core Log

No. 6

Cruise KH96-5 Station PA8 Date 1997.1.27

Core Name PA8PC-1

Location Ninetyeast Ridge

Weather Fine Wind 10.6 m/sec SeaSwell Low

Type of PC 900kgwt.+Ashula (90kg)

Main wire 16.0 m Pilot wire 16.0+0.8 m Free fall 3.0 m

Start 9:35

		Latitude	Longitude	Depth
Sea surface	9:47	3 ° 31.99 ' N	90 ° 17.04 ' E	2,029 m

Wire Speed *Winch Down* 1.2 m/sec

		Depth	Wire out
Stop	10:26	2,029 m	1,929 m

Restart *Wire Speed* 0.5 m/sec *Tension* 2.1 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	10;31	3 ° 32.09 ' N	90 ° 16.99 ' E	2,029 m	2,012 m

Tension Min ton *Max* 3.2 ton

Surface (winch up) 11:15 Wire Speed *Winch Up* 1.3 m/sec

End 11:20 **Total**

Remarks 下から2m付近で曲がる.

Pilot Length cm Core Length 174.0 cm No. of Section

Length of Section Sec.6: 95cm, Sec.7: 79cm

Main Lithology Foram-sand and silty clay

Piston Core Log

No. 7

Cruise KH96-5 Station PA8 Date 1997.1.27

Core Name PA8PC-2

Location Ninetyeast Ridge

Weather Cloud Wind 10.4 m/sec SeaSwell Low

Type of PC 900kgwt. + Pilot 50kg+20kg

Main wire 16.0 m Pilot wire 16.0+0.85 m Free fall 3.0 m

Start 12:02

		Latitude	Longitude	Depth
Sea surface	12:11	3 ° 40.07 ' N	90 ° 17.00 ' E	1930 m

Wire Speed *Winch Down* 1.2 m/sec

		Depth	Wire out
Stop	12:52	1930 m	1891 m

Restart *Wire Speed* 0.5 m/sec *Tension* 2.1 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	12:55	3 ° 40.21 ' N	90 ° 17.02 ' E	1930 m	1915 m

Tension Min ____ ton *Max* 2.8 ton

Surface (winch up) 13:30 Wire Speed *Winch Up* 1.5 m/sec

End 13:40 **Total** ____

Remarks

Pilot Length ____ cm Core Length 127.0 cm No. of Section ____

Length of Section Sec.3: 82cm, Sec.4: 95.2cm

Main Lithology Foram-sand and silty clay

Piston Core Log

No. 9

Cruise KH96-5 Station PA9 Date 1997.1.29

Core Name PA9PC

Location Bengal Bay

Weather Fine Wind 8.1 m/sec SeaSwell Low

Type of PC 500kgwt. + Pilot 50kgwt.

Main wire 16.0 m Pilot wire 16.0 +0.85 m Free fall 4.0 m

Start 8:20

		Latitude	Longitude	Depth
Sea surface	8:40	7 ° 56.80 ' N	89 ° 0.97 ' E	3,607 m

Wire Speed *Winch Down* 1.2 m/sec

		Depth	Wire out
Stop	9:35	3,604 m	3,559 m

Restart *Wire Speed* 0.5 m/sec *Tension* ____ ton

		Latitude	Longitude	Depth	Wire out
On Bottom	9:41	7 ° 56.87 ' N	89 ° 0.95 ' E	3,604 m	3,599 m

Tension Min 1.0 ton *Max* 1.6 ton

Surface (winch up) 10:40 Wire Speed *Winch Up* ____ m/sec

End 10:48 **Total** ____

Remarks No.4 winch使用.
パイプ曲がる.
下約2mほどFlow in

Pilot Length ____ cm Core Length 464.1 cm No. of Section 6

Length of Section Sec.4: 59.5cm, Sec.5: 100cm, Sec.6: 100.8cm, Sec.7: 93cm, Sec.8: 97cm, Sec.9: 13.8cm

Main Lithology Massive, hemipelagic clay

Piston Core Log

No. 10

Cruise KH96-5 Station PA10 Date 1997.1.31

Core Name PA10PC

Location Andaman sea

Weather Cloud Wind 4.7 m/sec SeaSwell Calm

Type of PC 500kgwt. + Pilot 20kgwt.

Main wire 14.5 m Pilot wire 14.5+1.0 m Free fall 2.5 m

Start 8:20

		Latitude	Longitude	Depth
Sea surface	8:35	9 ° 51.59 ' N	94 ° 3.34 ' E	3,775 m

Wire Speed *Winch Down* 1.2 m/sec

		Depth	Wire out
Stop	9:42	3775 m	3755 m

Restart *Wire Speed* 0.5 m/sec *Tension* 1.43 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	9:46	9 ° 51.58 ' N	94 ° 3.37 ' E	3775 m	3787 m

Tension Min 0.96 ton *Max* 1.84 ton

Surface (winch up) 10:45 Wire Speed *Winch Up* 1.2 m/sec

End 11:00 **Total** 2h40m

Remarks

Pilot Length - cm Core Length 850 cm No. of Section 8

Length of Section Sec.2: 42cm, Sec.3: 95.5cm, Sec.4: 91.5cm, Sec.5: 94cm, Sec.6: 99cm, Sec.7: 97.5cm, Sec.8: 97.2cm, Sec.9: 98.5cm, Sec.10: 100cm

Main Lithology Massive unconsolidated clay

Piston Core Log

No. 11

Cruise KH96-5 Station PA11 Date 1997.2.11

Core Name PA11PC

Location South China Sea

Weather Cloud Wind 10.4 m/sec SeaSwell Middle

Type of PC 500kgwt.+ pilot 50kgwt.

Main wire 14.5 m Pilot wire 14.5+0.80 m Free fall 2.5 m

Start 12:48

		Latitude	Longitude	Depth
Sea surface	12:58	15 ° 22.14 ' N	115 ° 16.63 ' E	4,200 m

Wire Speed *Winch Down* 1.1 m/sec

		Depth	Wire out
Stop	14:08	m	4,169 m

Restart *Wire Speed* 0.3 m/sec *Tension* 1.5 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	14:16	15 ° 22.62 ' N	115 ° 16.72 ' E	4200- m	4237 m

Tension Min 1.1 ton *Max* 1.93 ton

Surface (winch up) 15:38 Wire Speed *Winch Up* m/sec

End 15:48 **Total** 3h00m

Remarks No.4 winch 使用

Pilot Length cm Core Length 876.1 cm No. of Section 10

Length of Section Sec.1:7cm, Sec.2: 95cm, Sed.3: 98.5cm, Sec.4: 95cm, Sec.5: 94.8cm, Sec.6: 98.7cm, Sec.7: 98.6cm, Sec.8: 95cm, Sec.9: 95cm, Sec.10: 98.5cm

Main Lithology Hemipelagic clay and tuffaceous turbidites

9-4-2. Core discription

LITHOLOGIC SYMBOLS

SEDIMENTARY STRUCTURE SYMBOLS

KH96-5 Graphic Lithology

Core: PA1PCa

KH96-5 Core: PA1PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA1PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA3PCa

Graphic Lithology

SECTION	CENTIMETERS	GRAPHIC LITHOLOGY	SED. STRUCTURE	COLOUR	LITHOLOGIC DESCRIPTION
	5, 10, 15, 20, 25, 30, 35, 40			10YR 6/3 10YR 5/3	0-7cm: Oxydized layer Moderately bioturbations (Zoophycos and Planorites) are observed . 40cm: End og the core Lithology Homogeneous calcareous ooze

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA3PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA3PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA4PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA4PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA6PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA7PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA7PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA8PC-1

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA8PC-2

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA9PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA10PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA10PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA11PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA11PC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

9-4-3. Magnetic susceptibility

KH96-5 PA3PC

Magnetic susceptibility
SUS(10*6SI)
SUS(10*6SI)
L*
L*
a*
a*
b*
b*
Core depth(cm)

KH96-5 PA4PC

Magnetic susceptibility
Sus(10*6SI)
Sus(10*6SI)
55
50
45
40
35
30
25
0
200
400
600
800
1000
L*
L*
65
60
55
50
45
40
a*
a*
10
9
8
7
6
5
4
3
2
b*
b*
20
15
10
5
0
Core depth(cm)

KH96-5 PA6PC
Magnetic susceptibility
Sus(10*6SI)
L*
a*
b*
Core depth(cm)

KH96-5 PA7PC
Magnetic susceptibility
Sus(10*6SI)
L*
a*
b*
Core depth(cm)

KH96-5 PA9PC

KH96-5 PA10PC

KH96-5 PA11PC

9-4-4. Sample distribution

KH96-5 Piston Core

Working 1

Working 2

<Working 1>

Visual description : ***On Board**
Eguchi (ORI) for Leg. 1
Kimoto, Tadai(ORI) for Legs 2, 3
Smear Slides : ***On Board**
Eguchi (ORI) for Leg. 1
Kimoto, Tadai(ORI) for Legs. 2, 3

Cube R
Physical properties
Paleomagnetism : (ORI)
etc : (ORI)

Cube L
Micro fossils :
Planktonic foraminifera: Kimoto (ORI)
Benthic foraminifera: Yasuda (Kochi Univ.)
Stable isotopes : Oka (Hokkaido Univ.)
Carbonate dissolution : Oka (Hokkaido Univ.)

L Radio isotopes : Nozaki (ORI)

R Calcareous nannoplanktons :
R. Jordan (Yamagata Univ.)
Diatoms : R. Jordan (Yamagata Univ.)

C ^{14}C, ^{10}Be :Murayama (Hokkaido Univ.)
Metals : Narita (Hokkaido Univ.)
Radio isotopes : Narita (Hokkaido Univ.)

<Working 2>

Soft-X ray
Sediment structure : (ORI)

Stainless steel case
Chemical analyses
of organic matter

Uk_{37}, Lipids analysis, Pigment :
(Hokkaido Univ.)
$\delta^{13}C$ and $\delta^{15}N$ in organic matter :
(Hokkaido Univ.)

A Carbonate content :
Kato (Tokai Univ.)
Inorganic chemical analysis
(Opal) : (Tokai Univ.)
Metals : (Tokai Univ.)

Figure 1. Sample distribution of piston cores.

9-5. Multiple core samples

9-5-1. Core logs

Multiple Core Log

Cruise KH96-5 Station PA1 Date 1996.12.25
Core Name PA1MC
Location Sulu Sea
Weather Fine Wind 2.0 m/sec SeaSwell Calm
Type of MC ORI Large Type

Start 3:00

	Latitude	Longitude	Depth
Sea surface	3:41 8 ° 50.07 ' N	121 ° 48.33 ' E	4850 m

Wire Speed Winch Down 1.0 m/sec

			Depth	Wire out
Stop			m	m
Restart	Wire Speed m/sec	Tension ton		

	Latitude	Longitude	Depth	Wire out
On Bottom	5:09 8 ° 50.21 ' N	121 ° 48.95 ' E	4855 m	4898 m

Tension Min ton Max 3.74 ton

Surface (winch up) Wire Speed Winch Up m/sec
End 6:33 Total 213min
Remarks 46cm

Main Lithology Hemipelagic clay

Multiple Core Log

Cruise KH96-5 Station PA4 Date 1997.1.15
Core Name PA4MC
Location Southeast Indian Ridge
Weather Cloud Wind 5 m/sec SeaSwell Middle
Type of MC ORI Large Type

Start 7:15

	Latitude	Longitude	Depth
Sea surface	7:24 40 ° 0.20 ' S	109 ° 59.96 ' E	4610 m

Wire Speed Winch Down 1.1 m/sec

			Depth	Wire out
Stop	8:41		4610 m	4500 m
Restart	Wire Speed 0.3 m/sec	Tension 3.2 ton		

	Latitude	Longitude	Depth	Wire out
On Bottom	8:52 40 ° 1.07 ' S	109 ° 59.97 ' E	m	m

Tension Min ton Max 3.6 ton

Surface (winch up) Wire Speed Winch Up m/sec
End Total
Remarks 32.8cm

Main Lithology Calcareous clay and red clay

Multiple Core Log

Cruise KH96-5 Station PA5 Date 1997.1.18

Core Name PA5MC

Location Perth Basin

Weather Cloud Wind 5 m/sec SeaSwell Middle

Type of MC Hemipelagic clay

Start

Sea surface	Latitude	Longitude	Depth
	° '	° '	m

Wire Speed Winch Down m/sec

Stop Depth m Wire out m

Restart Wire Speed m/sec Tension ton

On Bottom	Latitude	Longitude	Depth	Wire out
	30 ° 0.20 ' S	110 ° 0.50 ' E	5459 m	m

Tension Min ton Max 3.6 ton

Surface (winch up) Wire Speed Winch Up m/sec

End Total

Remarks 26cm

Main Lithology Calcareous ooze and hemipelagic clay

Multiple Core Log

Cruise KH96-5 Station PA7 Date 1997.1.23

Core Name PA7MC

Location Vening Meinesa SMTS

Weather Cloud Wind 8.6 m/sec SeaSwell Middle

Type of MC ORI Large Type

Start 14:45

Sea surface		Latitude	Longitude	Depth
	14:55	9 ° 59.49 ' S	102 ° 0.90 ' E	5604 m

Wire Speed Winch Down 0.5-1.0 m/sec

Stop 16:32 Depth 5603 m Wire out 5631 m

Restart Wire Speed m/sec Tension ton

On Bottom		Latitude	Longitude	Depth	Wire out
	16:38	9 ° 59.41 ' S	102 ° 0.41 ' E	5616 m	5684 m

Tension Min 3.4 ton Max 4.4 ton

Surface (winch up) Wire Speed Winch Up m/sec

End Total

Remarks 41cm

Main Lithology Volcanic ash and siliceous clay

Multiple Core Log

Cruise KH96-5 Station PA8 Date 1997.1.27

Core Name PA8MC

Location Ninetyeast Ridge

Weather Cloud Wind 10.4 m/sec SeaSwell Low

Type of MC ORI Large Type

Start 6:45

		Latitude	Longitude	Depth
Sea surface	7:00	3 ° 31.69 ' N	90 ° 16.86 ' E	2009 m

Wire Speed Winch Down 1.2 m/sec

Stop 7:36 Depth 2009 m Wire out 1974 m

Restart Wire Speed 0.3 m/sec Tension 1.64 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	7:42	3 ° 31.86 ' N	90 ° 16.78 ' E	2009 m	2021 m

Tension Min 1.04 ton Max 2.58 ton

Surface (winch up) 8:12 Wire Speed Winch Up 1.3 m/sec

End 8:15 Total 90min

Remarks 20.5cm

Main Lithology Calcareous ooze

Multiple Core Log

Cruise KH96-5 Station PA9 Date 1997.1.28

Core Name PA9MC

Location Bengal Bay

Weather Fine Wind 6.9 m/sec SeaSwell

Type of MC ORI Large Type

Start 16:15

		Latitude	Longitude	Depth
Sea surface		7 ° 56.83 ' N	89 ° 1.47 ' E	3,605 m

Wire Speed Winch Down 1.1 m/sec

Stop 17:22 Depth 3595? m Wire out 3585 m

Restart Wire Speed 0.3 m/sec Tension 1.37 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	17:26	7 ° 57.07 ' N	89 ° 1.40 ' E	3,605 m	3,619 m

Tension Min ton Max 1.8 ton

Surface (winch up) Wire Speed Winch Up m/sec

End Total

Remarks 34.5cm

Main Lithology Calcareous ooze

Multiple Core Log

Cruise KH96-5 Station PA10 Date 1997.1.31

Core Name PA10MC

Location Andaman sea

Weather Cloud Wind 8.1 m/sec SeaSwell Calm

Type of MC ORI Large Type

Start 5:20

		Latitude	Longitude	Depth
Sea surface	5:25	9 ° 51.76 ' N	94 ° 03.66 ' E	3,774 m

Wire Speed *Winch Down* 1.1 m/sec

		Depth	Wire out
Stop	6:25	- m	3761 m

Restart *Wire Speed* 0.3 m/sec *Tension* 1.47 ton

		Latitude	Longitude	Depth	Wire out
On Bottom	6:30	9 ° 51.62 ' N	94 ° 3.44 ' E	- m	3800 m

Tension Min ___ ton *Max* 1.9 ton

Surface (winch up) 7:00 Wire Speed *Winch Up* 1.2 m/sec

End 7:05 Total 100min

Remarks 40cm

Main Lithology Hemipelagic clay

Multiple Core Log

Cruise KH96-5 Station PA11 Date 1997.2.12

Core Name PA11MC

Location South China Sea

Weather Cloudy Wind 10.6 m/sec SeaSwell Middle

Type of MC ORI Large Type

Start 3:07

		Latitude	Longitude	Depth
Sea surface	3:10	15 ° 24.94 ' N	115 ° 19.72 ' E	4,234 m

Wire Speed *Winch Down* 1.0 m/sec

		Depth	Wire out
Stop	4:24	4,234 m	4,229 m

Restart *Wire Speed* 0.3 m/sec *Tension* ___ ton

		Latitude	Longitude	Depth	Wire out
On Bottom	4:29	15 ° 25.26 ' N	115 ° 20.20 ' E	4,234 m	4,258 m

Tension Min - ton *Max* 2.0 ton

Surface (winch up) 5:30 Wire Speed *Winch Up* 1.3 m/sec

End 5:40 Total 153min

Remarks 32cm

Main Lithology Hemipelagic clay

9-5-2. Core discription

KH96-5 Core: PA1MC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA4MC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA5MC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5

Core: PA7MC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5

Core: PA8MC

Graphic Lithology

SECTION	CENTIMETERS	GRAPHIC LITHOLOGY	SED. STRUCTURE	COLOUR	LITHOLOGIC DESCRIPTION
	5, 10, 15, 20			2.5Y 6/3	0-3cm: Oxydized layer 18~19cm: Dark brown to pale green patches 21cm: End of the core
	25, 30, 35, 40, 45				Lithology Grayish olive calcareous ooze

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA9MC

Graphic Lithology

SECTION	CENTIMETERS	GRAPHIC LITHOLOGY	SED. STRUCTURE	COLOUR	LITHOLOGIC DESCRIPTION
	5, 10, 15, 20, 25, 30			2.5Y5/3	0~7cm: Soupy layer 0~11cm: Oxydized layer (yellowish brown)
				2.5Y6/3	11~25cm: Slightly bioturbated (2.5Y4/3,olive brown) Lithology: Homogeneous calcareous ooze
	35, 40, 45				34.5cm: End of this core

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA10MC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

KH96-5 Core: PA11MC

Graphic Lithology

Submarine sedimentology; ORI, Univ. of Tokyo

9-5-3. Sample distribution

Table 2. Multiple cores sample distributions

Core (core no.)	core length	distribution	organizer	remarks
PA1MC				
1	-	ORI	ORI	
2	-	Kyushu-u.	Kakiuchi	
3	-	NIRS	Yamada	
4	-	ORI	Eguchi	visual description
5	-	Yamagata-u., Hokkaido-u.	Jordan, Kuramoto	
6	-	Kanazawa-u.	Nakanishi	
7	-	ORI	Nozaki	
8	-	Kinki-u.	Nakaguchi	
PA4MC				
1	32.8	ORI	Nozaki	
2	32.8	ORI	Kimoto, Tadai	visual description
3	32.3	Tokai-u.	Kato	
4	33	NIRS	Yamada	
5	35	Yamagata-u., Hokkaido-u.	Jordan, Hayashi	
6	-	Kanazawa-u.	Nakanishi	
7	28	Hokkaido-u.	Narita	
8	31	Hokkaido-tokai-u.	Minami	
PA5MC				
1	24.2	Hokkaido-u.	Narita	
2	24	Tokai-u.	Kato	
3	23	NIRS	Yamada	
4	20	ORI	Nozaki	
5	25.5	Kanazawa-u.	Nakanishi	
6	26	ORI	Kimoto, Tadai	visual description
7	21	Kinki-u., Hokkaido-tokai-u.	Hattori, Minami	
8	24.5	Yamagata-u., Hokkaido-u.	Jordan, Hayashi	
PA7MC				
1	37.5	ORi, Kyushu-u.	Nozaki, Kakiuchi	
2	32.5	Hokkaido-tokai-u.	Minami	
3	40	Yamagata-u., Hokkaido-u.	Jordan, Hayashi	
4	37.5	Tokai-u.	Kato	
5	41.2	ORI	Kimoto, Tadai	visual description
6	38	Hokkaido-u.	Narita	
7	33	Kanazawa-u.	Nakanishi	
8	33	NIRS	Yamada	
PA8MC				
1	20.5	ORI, Hokkaido-u.	Kimoto, Murayama	visual description
2	21	Hokkaido-u.	Narita	
3	21.5	Tokai-u.	Kato	
4	20.2	Hokkaido-u.	Murayama, Hayashi	
5	21.5	Yamagata-u.	Jordan	
6	20.4	ORI	Kimoto	
7	20.2	ORI	Tadai	
8	18.8	ORI	Nozaki	

Core (core no.)	core length	distribution	organizer	remarks
PA9MC				
1	32	Hokkaido-u.	Narita	
2	29	NIRS	Yamada	
3	32	Tokai-u.	Kato	
4	31.5	Yamagata-u.& Hokkaido-u.	Jordan, Hayashi	
5	36	Kanazawa-u.	Nakanishi	
6	33	Kinki-u.&Hokkaido Tokai-u.	Hattori, Minami	
7	34.5	ORI	Kimoto, Tadai	visual description
8	22.2	ORI & Kyushu-u.	Nozaki, Kakiuchi	
PA10MC				
1	40	ORI	Kimoto, Tadai	visual description
2	36	Kinki-u, Hokkaido-tokai-u.	Hattori, Minami	
3	36	Tokai-u.	Kato	
4	36	NIRS	Yamada	
5	36	ORI, Kyushu-u.	Nozaki, Kakiuchi	
6	39	Kanazawa-u.	Nakanishi	
7	40	Hokkaido -u.	Narita	
8	39.5	Yamagata-u., Hokkaido-u.	Jordan, Hayashi	
PA11MC				
1	31	Hokkaido-tokai-u.	Minami	
2	26	Kinki-u., ORI	Kimura, Nozaki	
3	27.5	Kyushu-u.	Kakiuchi	
4	33.8	Yamagata-u., Hokkaido-u.	Jordan, Hayashi	
5	25	Hokkaido-u., Tokai-u.	Narita, Kato	
6	29.5	Kanazawa-u.	Haque	
7	32	ORI	Kimoto, Tadai	visual description
8	27.5	NIRS	Yamada	