

Short cruise report

METEOR cruise leg M77/4

Climate-biogeochemistry interactions in
the tropical ocean of the SE-American oxygen
minimum zone

From Callao, Peru to Colon, Panama
January 27 to February 19, 2009

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1. Participants M77/4

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2.	Ayon, Patricia	zooplankton	IMARPE
3.	Barz, Kristina	zooplankton	AWI
4.	Croot, Peter	trace elements	IFM-GEOMAR
5.	Dunker, Mirja	oxygen, nutrients	IFM-GEOMAR
6.	Funk, Andreas	ADCP	IFM-GEOMAR
7.	Grasse, Patricia	silicon, neodym	IFM-GEOMAR
8.	Grefe, Imke	biology	IFM-GEOMAR
9.	Helguero, Carlos	chemistry, observer	Ecuador
10.	Hirche, Hans-Jürgen	zooplankton	AWI
11.	Kalvelage, Tim	biology	MPI
12.	Karstensen, Johannes	CTD-processing	IFM-GEOMAR
13.	Kock, Annette	nitrous oxide	IFM-GEOMAR
14.	Komander-Hoepfner, Sigrun	CTD-watch	IFM-GEOMAR
15.	Ledesma, Jesus	oxygen	IMARPE
16.	Malien, Frank	oxygen, nutrients	IFM-GEOMAR
17.	Montes-Herrera, Enrique	nitrogen isotopes	UMASS
18.	Müller, Mario	CTD-watch, computer	IFM-GEOMAR
19.	Niehus, Gerd	CTD-watch, container	IFM-GEOMAR
20.	Nielsen, Martina	CTD-watch, customs	IFM-GEOMAR
21.	Ochsenhirt, Wolf-Thilo	meteorology	DWD
22.	Patara, Lavinia	salinometry, CTD-watch	CMCC
23.	Ryabenko, Evgenia	nitrogen isotopes	IFM-GEOMAR
24.	Scholten, Jan	GEOTRACES	IAEA-MEL
25.	Stumpf, Roland	silicon, neodym	IFM-GEOMAR
26.	Vasquez, Luis	Oceanography	IMARPE
27.	Wuttig, Kathrin	trace elements	IFM-GEOMAR
28.	Xue, Zichen	cadmium	ICL
29.	Zocher, Johanna	CTD-watch	IFM-GEOMAR

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2 Cruise objectives

The research cruise METEOR M77/4 was carried out in the context of the Sonderforschungsbereich (SFB-754, ‘Climate – Biogeochemistry Interactions in the Tropical Ocean’) which investigates changes in the oxygen minimum zones of the tropical oceans. Leg M77/4 had two main subjects. One main subject was to conduct a detailed survey of the present day distribution of the water masses and the strength of the oxygen minimum zone (OMZ) in the southeastern Pacific. This was mainly carried out to detect changes in comparison to earlier surveys. A further main subject of the work was the investigation of geochemical components in the water column. For the investigation of circulation, water mass mixing and the influence of biological productivity, samples for the analysis of neodymium, silicon and nitrogen isotopes, as well as a number of natural radionuclides were sampled. Their distribution in the water column can be seen as ‘stock-taking’ under today’s circulation and ventilation conditions and can be used in paleo-oceanographic investigations. The cruise M77/4 focused on the open ocean area where oxygen richer water is supplied to the OMZ and is closely linked to the third leg, where these investigations were made on the near-shelf areas and was complemented by additional biogeochemical measurements.

The goal of the hydrographic measurements was to derive the present day distribution of the water mass and oxygen distribution in the oxygen minimum zone (OMZ) of the southeastern Pacific and resolve the oxygen differences in comparison with older data sets in the supply paths to the OMZ. On the leg M77/4 a meridional section at 85°50’W as well as 3 zonal sections at 3°35’S, 6°S and 14°S were measured (Fig. 1). Together with the measurements of the other 3 cruise legs this will lead to a well resolved distribution of the water masses and the

oxygen status near and within the upwelling areas in the eastern equatorial Pacific at the time of the cruise.

Water sampling for chemical parameters focused on the isotopic characterization of neodymium (Nd) and silicon (Si) in water masses of Southern Ocean and central Pacific origin and their mixtures in the upwelling region of the Tropical Eastern Pacific. Based on these results, the extent of dissolved Si isotope fractionation induced by diatom productivity during active upwelling will be compared with the nitrogen (N) isotope distribution of dissolved nitrate, in order to assess the effects of mixing of water masses with a preformed Si and N isotope composition and to assess the effects of denitrification on the N isotopes. The information obtained from the unique combination of the biologically influenced Si isotopes and the quasi-conservative Nd isotopes will lead to a better understanding of water mass mixing and upwelling intensity and at the same time will improve the applicability of Nd and Si isotopes as tracers for paleo-oceanographic processes within the SFB754. Further sampling was made for excess N_2 (or N_2/Ar) and N_2O in the water column as an indicator for subsurface fixed nitrogen removal.

The overall aim of the trace metal work was to improve our understanding of the processes controlling the iron (Fe) and phosphate supply from sediments under low oxygen conditions. Fe is an essential element for many biochemical processes in phytoplankton in the ocean and is the limiting element in many parts of the global ocean and thus there are strong interactions between Fe and phytoplankton productivity. While Fe^{2+} , is the thermodynamically less favored redox state of iron under oxic conditions it is however an important intermediate species in seawater systems for the transformation of iron from one species to another.

Within the GEOTRACES program (An international study of the marine biogeochemical cycles of trace elements and their isotopes) the relationship between boundary scavenging, particle type and the distribution of dissolved and particulate ^{230}Th and ^{231}Pa in the water column was investigated.

Some biological sampling within the context of the SFB-754 was carried out. The goal was to collect biological information on the major microbial types present along the transects and to see how they vary with depth and oxygen concentration. This will be particularly interesting in order to compare the results and diversity from the Pacific Ocean with the data to be collected along similar North-South transect in the Atlantic Ocean.

High resolution studies of the vertical and horizontal distribution of zooplankton and its relation to environmental factors was studied using LOKI, a newly developed optical plankton detection system. Of special interest is the role of physical (T, S) and chemical (oxygen) gradients in structuring the plankton communities in the water column.

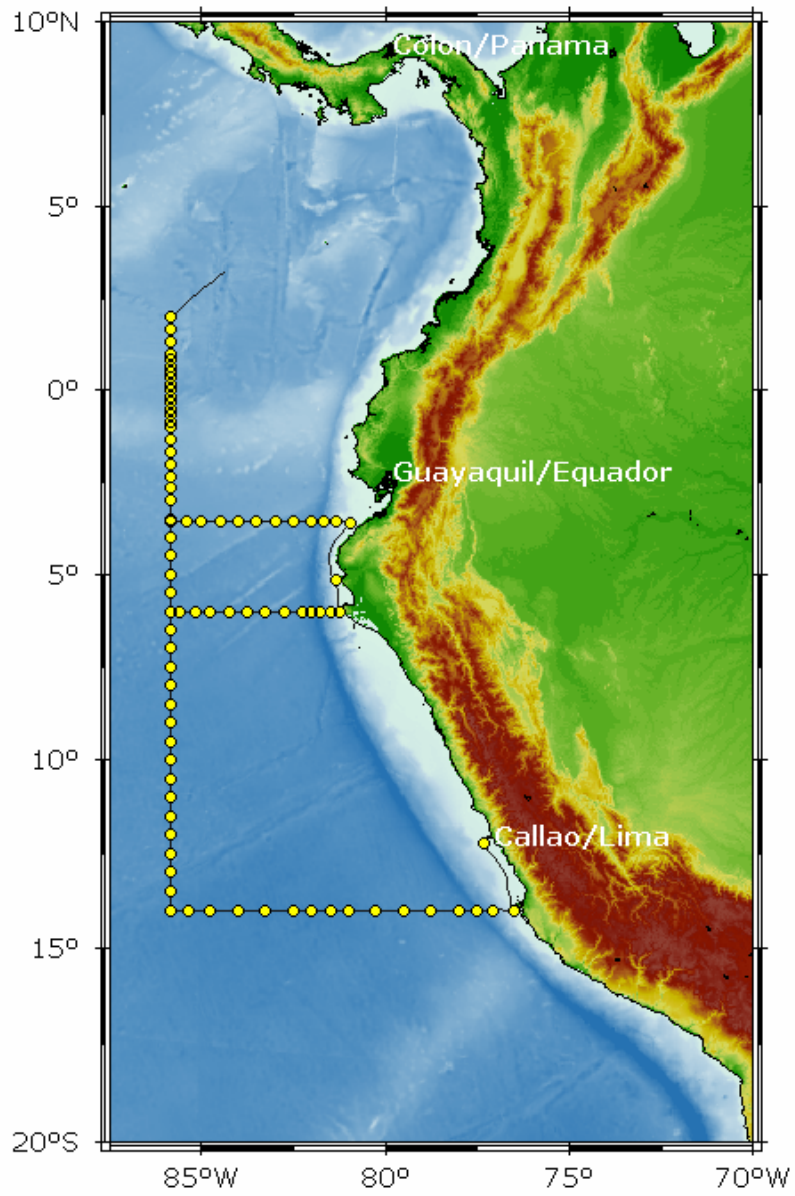


Fig. 1: Cruise track of METEOR cruise 77/4, dots indicate the locations of the CTD-stations.

3 Narrative of the Cruise

On 26 January the scientific crew except the 3 Peruvian scientists boarded RV METEOR. After lunch Peter Croot, Hans Jürgen Hirche und Lothar Stramma drove to the Instituto del Mar del Peru (IMARPE) and together with the chief scientist of the previous leg M77/3, Martin Frank, held a seminar series at IMARPE. The three Peruvian scientists tried to bring their scientific equipment on the ship, and part of the equipment was already on board, but customs officer came on board and after longer discussion the equipment had to be removed again.

On 27 January the 3 Peruvian cruise participants boarded METEOR early in the morning. At 9:30 local time METEOR left the port of Callao to drop anchor off the port of Callao and bunker. At 18:30 local time METEOR could finally start the research cruise. Little later on 01:06 UTC a first test successful CTD station was carried out at $12^{\circ}13.9'S$, $77^{\circ}19.0'W$. At 14 UTC the first station of the section at $14^{\circ}S$ (Figure 1) was done at the shelf at 200 m water depth with a GO-FLOW cast (for the trace metal work) and a CTD cast. The measurements were continued eastward including a station to 3000 m for GEOTRACES water sampling. On 29 January the section along $14^{\circ}S$ was continued. A first test with the LOKI, a newly developed optical plankton detection system, was made and the first zooplankton samples were received, however the optical plankton detection procedure still failed.

The Glider, which was deployed on leg M77/3 on 11 January, was successfully recovered on 30 January at $14^{\circ}02'S$, $82^{\circ}10'W$. A second profile with LOKI was completely successful, providing a large amount of electronic zooplankton counts during the cast. On 31 January the CTD-section along $14^{\circ}S$ was terminated with a deep CTD-station at $85^{\circ}50'W$. As most groups had large water requirements from the rosette the 24 bottles could not provide all water needed and another shallow CTD/rosette station had to be made to sample more water. In-between 2 GO-FLOW profiles and a LOKI profile were taken.

On February 1 a section northward along $85^{\circ}50'W$ was started with 30 miles station spacing. This section reoccupies a section made in 1993 and the aim was to investigate water mass and oxygen changes 16 years later. On February 2 a first pair of 2 floats with oxygen sensors was deployed at $10^{\circ}S$, $85^{\circ}50'W$. The section northward along $85^{\circ}50'W$ was continued. On February 3 a second pair of 2 floats with oxygen sensors was deployed at $8^{\circ}S$, $85^{\circ}50'W$, while we received the information that the first profiles from the two floats deployed at $10^{\circ}S$ were already transmitted. The section northward along $85^{\circ}50'W$ was continued to $6^{\circ}30'S$, where it was interrupted to first do a section along $3^{\circ}35'S$ and continue the northward section after returning when the $6^{\circ}S$ section is done. The transit to $3^{\circ}35'S$ was used to do a barbeque on the deck. In the morning of February 4 the $3^{\circ}35'S$ section was reached and the CTD profiles began working towards the east. The eastern part of the $3^{\circ}35'S$ section was done including a deep station to the bottom off the shelf break and a final station at the 200 m depth contour with the Peruvian coast in sight on 6 February. In the evening the section was finished and METEOR steamed south off the Peruvian coast.

The 6°S section began on 7 February at the 200 m depth contour. From this location the 6°S section was carried out westward with CTD/rosette, LOKI and GO-FLOW measurements. In the evening of 9 February the 6°S section was terminated at 85°50'W with a deep station. Two floats were deployed at 6°S and afterwards the interrupted 85°50'W section was continued northward, first still with 30 sm station spacing. As there is a complicated equatorial system of zonal currents and countercurrents the station spacing was reduced to 20 sm between 2°S and 2°N and even 10 sm between 1°S and 1°N. The last GO-FLOW samples were taken at 0°20'N, the last LOKI station at 1°40'N and the CTD/rosette work was terminated at 2°N in the evening of 13 February local time (14 February UTC time) with CTD profile 91 (Table 1). After terminating the station work RV METEOR made the transit towards the entrance of the Panama Canal. In the morning of 16 February METEOR reached the anchorage off Panama City. As a lot of ships were waiting at the entrance of the Panama Canal, the time for the Panama Canal Passage was shifted from 17 February to the evening of 18 February. As most of the scientific crew had to reach a flight back to Europe in the evening of 18 February, the scientific crew left METEOR at the anchorage and did not stay on board for the Panama Canal Passage. METEOR entered the Panama Canal in the evening of 18 February 2009 and reached Colon in the early morning of 19 February 2009.

Table 1 M77/4 station list

Station	P#	Date	Time	Latitude	Longitude	Depth [m]	Gear	Comment
ME774/076-1	1	28.01.09	01:05	12° 13.97' S	77° 19.03' W	127,9	CTD/RO	Teststation
ME774/077-1		28.01.09	12:55	13° 59.98' S	76° 30.60' W	199,4	GO-FLO	
ME774/077-2	2	28.01.09	13:29	13° 59.98' S	76° 30.60' W	198,9	CTD/RO	
ME774/078-1	3	28.01.09	17:35	13° 59.91' S	77° 3.49' W	3020,5	CTD/RO	
ME774/078-2	4	28.01.09	20:36	13° 59.91' S	77° 3.49' W	3025,7	CTD/RO	
ME774/079-1	5	29.01.09	00:07	13° 59.99' S	77° 30.05' W	5160,3	CTD/RO	
ME774/080-1	6	29.01.09	03:58	13° 59.95' S	77° 59.97' W	4635,6	CTD/RO	
ME774/081-1	7	29.01.09	08:43	13° 59.99' S	78° 45.05' W	4438,6	CTD/RO	
ME774/082-1		29.01.09	13:30	13° 59.95' S	79° 30.02' W	4508,7	GO-FLO	
ME774/082-2	8	29.01.09	14:00	14° 0.00' S	79° 30.01' W	4516,6	CTD/RO	
ME774/082-3		29.01.09	14:55	14° 0.00' S	79° 30.01' W	4513,5	GO-FLO	
ME774/083-1		29.01.09	19:12	13° 59.99' S	80° 15.00' W	4659	LOKI	
ME774/083-2	9	29.01.09	19:40	14° 0.00' S	80° 15.01' W	4649,6	CTD/RO	
ME774/084-1	10	30.01.09	00:35	13° 59.99' S	80° 59.93' W	4806,4	CTD/RO	
ME774/085-1	11	30.01.09	04:22	14° 0.02' S	81° 30.03' W	4972,7	CTD/RO	
ME774/086-1	12	30.01.09	08:14	14° 0.01' S	81° 59.98' W	4897	CTD/RO	
ME774/087-1		30.01.09	11:10	14° 2.22' S	82° 10.12' W	4768,2	GLIDER	
ME774/088-1		30.01.09	13:25	14° 0.00' S	82° 30.00' W	4930,2	GO-FLO	
ME774/088-2	13	30.01.09	14:00	14° 0.00' S	82° 30.00' W	4930,6	CTD/RO	
ME774/088-3		30.01.09	15:08	14° 0.00' S	82° 30.00' W	4942,2	GO-FLO	
ME774/088-4		30.01.09	16:20	14° 0.00' S	82° 30.00' W	4925,8	LOKI	
ME774/089-1	14	30.01.09	21:15	13° 59.99' S	83° 15.02' W	4857,1	CTD/RO	
ME774/090-1	15	31.01.09	02:00	13° 59.98' S	84° 0.01' W	5035	CTD/RO	
ME774/091-1		31.01.09	06:45	13° 59.97' S	84° 45.05' W	4862,4	LOKI	
ME774/091-2	16	31.01.09	07:56	13° 59.99' S	84° 45.02' W	5097,6	CTD/RO	
ME774/092-1	17	31.01.09	11:58	13° 59.96' S	85° 20.00' W	4759,1	CTD/RO	
ME774/093-1		31.01.09	17:25	13° 59.99' S	85° 50.01' W	4573,8	GO-FLO	
ME774/093-2		31.01.09	18:10	14° 0.00' S	85° 50.00' W	4592,6	LOKI	
ME774/093-3	18	31.01.09	19:18	14° 0.00' S	85° 50.00' W	4579,4	CTD/RO	
ME774/093-4		31.01.09	22:37	14° 0.00' S	85° 50.00' W	4591,4	GO-FLO	
ME774/093-5	19	31.01.09	23:37	14° 0.00' S	85° 50.00' W	4592,2	CTD/RO	
ME774/094-1	20	01.02.09	03:00	13° 30.02' S	85° 50.05' W	4679,4	CTD/RO	
ME774/095-1		01.02.09	06:45	12° 59.99' S	85° 50.01' W	4037,3	LOKI	
ME774/095-2	21	01.02.09	07:50	13° 0.00' S	85° 50.00' W	4056,3	CTD/RO	
ME774/096-1	22	01.02.09	11:43	12° 29.98' S	85° 50.01' W	4354,9	CTD/RO	
ME774/097-1	23	01.02.09	15:34	11° 59.97' S	85° 50.04' W	4389,1	CTD/RO	
ME774/098-1		01.02.09	19:23	11° 29.99' S	85° 50.01' W	4432,1	LOKI	
ME774/098-2	24	01.02.09	19:40	11° 30.00' S	85° 50.00' W	4424,8	CTD/RO	
ME774/099-1	25	01.02.09	23:40	11° 0.00' S	85° 50.02' W	4415,2	CTD/RO	
ME774/100-1	26	02.02.09	03:38	10° 30.02' S	85° 50.01' W	4321,1	CTD/RO	
ME774/101-1	27	02.02.09	08:00	10° 0.00' S	85° 50.00' W	4420,2	CTD/RO	
ME774/101-2		02.02.09	09:23	9° 59.99' S	85° 50.00' W	4411,4	FLOAT	
ME774/101-3		02.02.09	09:27	10° 0.05' S	85° 49.94' W	4401,7	FLOAT	
ME774/102-1		02.02.09	12:27	9° 30.01' S	85° 50.01' W	4373,7	GO-FLO	
ME774/102-2	28	02.02.09	13:00	9° 30.00' S	85° 50.00' W	4376,5	CTD/RO	
ME774/102-3		02.02.09	14:20	9° 30.00' S	85° 50.00' W	4366,2	GO-FLO	
ME774/103-1	29	02.02.09	18:18	9° 0.02' S	85° 50.02' W	4251	CTD/RO	
ME774/104-1	30	03.02.09	00:24	8° 30.00' S	85° 50.00' W	4231,3	CTD/RO	
ME774/105-1	31	03.02.09	04:10	8° 0.02' S	85° 49.97' W	4205,6	CTD/RO	
ME774/105-2		03.02.09	05:31	8° 0.01' S	85° 49.99' W	4206,5	FLOAT	
ME774/105-3		03.02.09	05:36	8° 0.09' S	85° 49.96' W	4202,2	FLOAT	
ME774/106-1		03.02.09	08:36	7° 29.99' S	85° 50.00' W	4136,1	LOKI	
ME774/106-2	32	03.02.09	09:34	7° 30.00' S	85° 50.00' W	4137,8	CTD/RO	

Station	P#	Date	Time	Latitude	Longitude	Depth [m]	Gear	Comment
ME774/107-1		03.02.09	13:24	7° 0.02' S	85° 50.01' W	3970,5	GO-FLO	
ME774/107-1		03.02.09	13:26	7° 0.02' S	85° 50.02' W	3975,4	GO-FLO	
ME774/107-2	33	03.02.09	14:04	7° 0.00' S	85° 50.00' W	3971,4	CTD/RO	
ME774/107-3		03.02.09	15:06	7° 0.00' S	85° 50.00' W	3972,5	GO-FLO	
ME774/108-1	34	03.02.09	18:56	6° 29.98' S	85° 50.00' W	4111	CTD/RO	
ME774/109-1	35	04.02.09	11:28	3° 35.01' S	85° 50.03' W	3260,8	CTD/RO	
ME774/109-2		04.02.09	13:56	3° 35.00' S	85° 50.00' W	3262,6	LOKI	
ME774/109-3	36	04.02.09	15:10	3° 35.00' S	85° 50.00' W	3262,8	CTD/RO	
ME774/110-1	37	04.02.09	18:13	3° 35.05' S	85° 24.98' W	3423	CTD/RO	
ME774/111-1	38	04.02.09	21:47	3° 35.00' S	85° 0.05' W	3389	CTD/RO	
ME774/112-1	39	05.02.09	01:46	3° 35.08' S	84° 30.03' W	3308,6	CTD/RO	
ME774/113-1	40	05.02.09	05:40	3° 35.00' S	83° 59.99' W	3198,7	CTD/RO	
ME774/114-1	41	05.02.09	09:40	3° 35.00' S	83° 30.00' W	3019,3	CTD/RO	
ME774/115-1		05.02.09	13:26	3° 35.08' S	83° 0.01' W	2714,9	GO-FLO	
ME774/115-2		05.02.09	13:58	3° 35.00' S	83° 0.00' W	2723,4	LOKI	
ME774/115-3	42	05.02.09	15:04	3° 35.00' S	83° 0.00' W	2722,3	CTD/RO	
ME774/115-4		05.02.09	17:15	3° 35.00' S	83° 0.00' W	2721,8	GO-FLO	
ME774/116-1	43	05.02.09	21:24	3° 35.00' S	82° 30.00' W	3599,4	CTD/RO	
ME774/117-1	44	06.02.09	01:12	3° 35.00' S	82° 0.97' W	4084,4	CTD/RO	
ME774/117-2		06.02.09	04:08	3° 35.01' S	82° 0.97' W	4061,2	LOKI	
ME774/117-3	45	06.02.09	05:20	3° 35.01' S	82° 0.97' W	4078,6	CTD/RO	
ME774/118-1		06.02.09	08:29	3° 35.00' S	81° 40.00' W	3935,3	LOKI	
ME774/118-2	46	06.02.09	09:42	3° 34.99' S	81° 40.00' W	3935,6	CTD/RO	
ME774/119-1		06.02.09	14:24	3° 35.00' S	81° 20.65' W	1181,6	GO-FLO	
ME774/119-2		06.02.09	14:58	3° 35.00' S	81° 20.64' W	1019	LOKI	
ME774/119-3	47	06.02.09	16:00	3° 35.00' S	81° 20.64' W	1047,6	CTD/RO	
ME774/119-4		06.02.09	16:56	3° 35.00' S	81° 20.64' W	1047,7	GO-FLO	
ME774/120-1		06.02.09	20:34	3° 35.53' S	80° 56.89' W	219,9	LOKI	
ME774/120-2	48	06.02.09	21:14	3° 35.53' S	80° 56.89' W	219,1	CTD/RO	
ME774/121-1	49	07.02.09	07:20	5° 10.01' S	81° 21.02' W	152	CTD/RO	
ME774/122-1		07.02.09	13:00	6° 0.01' S	81° 15.44' W	198	LOKI	
ME774/122-2	50	07.02.09	13:34	6° 0.00' S	81° 15.45' W	198,7	CTD/RO	
ME774/123-1		07.02.09	15:28	5° 59.99' S	81° 30.09' W	7,7	GO-FLO	
ME774/123-2		07.02.09	16:00	6° 0.00' S	81° 30.06' W	2419,4	LOKI	
ME774/123-3	51	07.02.09	17:13	6° 0.00' S	81° 30.03' W	2423,2	CTD/RO	
ME774/123-4		07.02.09	18:23	6° 0.00' S	81° 30.03' W	2421	GO-FLO	
ME774/124-1	52	07.02.09	21:00	6° 0.00' S	81° 45.01' W	4789,1	CTD/RO	
ME774/124-2		08.02.09	00:38	6° 0.00' S	81° 45.00' W	4765,1	LOKI	
ME774/124-3	53	08.02.09	01:42	6° 0.00' S	81° 45.00' W	4784,8	CTD/RO	
ME774/125-1		08.02.09	03:46	5° 59.97' S	82° 0.02' W	5170,9	LOKI	
ME774/125-2	54	08.02.09	04:46	6° 0.00' S	82° 0.00' W	5173,3	CTD/RO	
ME774/126-1	55	08.02.09	07:12	6° 0.00' S	82° 15.04' W	4440,1	CTD/RO	
ME774/127-1	56	08.02.09	10:58	5° 59.99' S	82° 45.00' W	4166,7	CTD/RO	
ME774/128-1		08.02.09	14:40	5° 59.99' S	83° 14.99' W	3749,2	LOKI	
ME774/128-2	57	08.02.09	15:42	6° 0.00' S	83° 15.00' W	3773,4	CTD/RO	
ME774/129-1		08.02.09	19:22	6° 0.00' S	83° 45.01' W	4075,2	LOKI	
ME774/129-2	58	08.02.09	20:28	6° 0.00' S	83° 45.00' W	4073,7	CTD/RO	
ME774/130-1		09.02.09	00:15	5° 59.97' S	84° 15.00' W	3164	LOKI	
ME774/130-2		09.02.09	00:35	6° 0.00' S	84° 15.00' W	3157,1	LOKI	
ME774/130-3	59	09.02.09	00:56	6° 0.00' S	84° 15.00' W	3156,3	CTD/RO	
ME774/131-1	60	09.02.09	05:05	5° 59.99' S	84° 45.00' W	4045,8	CTD/RO	
ME774/132-1	61	09.02.09	09:00	6° 0.00' S	85° 10.04' W	3964,2	CTD/RO	
ME774/133-1	62	09.02.09	12:56	6° 0.00' S	85° 35.06' W	3991,6	CTD/RO	
ME774/134-1	63	09.02.09	16:02	6° 0.03' S	85° 50.05' W	4102,9	CTD/RO	
ME774/134-2	64	09.02.09	20:03	6° 0.00' S	85° 50.00' W	4113,4	CTD/RO	
ME774/134-3		09.02.09	21:25	6° 0.01' S	85° 50.00' W	4106,7	FLOAT	
ME774/134-4		09.02.09	21:26	6° 0.03' S	85° 49.98' W	4126,7	FLOAT	
ME774/135-1		10.02.09	00:32	5° 30.01' S	85° 50.07' W	3883,9	LOKI	

Station	P#	Date	Time	Latitude	Longitude	Depth [m]	Gear	Comment
ME774/135-2	65	10.02.09	01:34	5° 30.00' S	85° 50.00' W	3891,4	CTD/RO	
ME774/136-1	66	10.02.09	05:36	4° 59.98' S	85° 50.01' W	3816,1	CTD/RO	
ME774/137-1		10.02.09	11:10	4° 29.97' S	85° 50.04' W	3554,7	GO-FLO	
ME774/137-2	67	10.02.09	11:44	4° 29.94' S	85° 50.06' W	3565,4	CTD/RO	
ME774/137-3		10.02.09	12:58	4° 29.99' S	85° 50.03' W	3553	GO-FLO	
ME774/138-1	68	10.02.09	17:00	4° 0.05' S	85° 49.95' W	3445,5	CTD/RO	
ME774/138-2		10.02.09	19:35	4° 0.10' S	85° 50.03' W	3441,2	FLOAT	
ME774/138-3		10.02.09	19:35	4° 0.10' S	85° 50.03' W	3441,2	FLOAT	
ME774/139-1	69	10.02.09	22:45	3° 30.03' S	85° 50.01' W	3390,5	CTD/RO	
ME774/140-1	70	11.02.09	03:00	3° 0.08' S	85° 49.98' W	3210,7	CTD/RO	
ME774/141-1	71	11.02.09	06:06	2° 39.93' S	85° 49.99' W	3148,4	CTD/RO	
ME774/142-1	72	11.02.09	09:20	2° 20.01' S	85° 49.98' W	3118,8	CTD/RO	
ME774/143-1		11.02.09	12:25	2° 0.01' S	85° 50.02' W	2734,6	LOKI	
ME774/143-2	73	11.02.09	13:28	2° 0.01' S	85° 50.01' W	2750,7	CTD/RO	
ME774/143-3		11.02.09	14:44	2° 0.16' S	85° 50.02' W	2805	FLOAT	
ME774/143-4		11.02.09	14:46	2° 0.21' S	85° 50.03' W	2844,9	FLOAT	
ME774/144-1		11.02.09	17:00	1° 39.99' S	85° 50.05' W	2523,1	GO-FLO	
ME774/144-2	74	11.02.09	17:37	1° 40.00' S	85° 50.00' W	2518	CTD/RO	
ME774/144-3		11.02.09	19:40	1° 40.00' S	85° 50.00' W	2518,6	GO-FLO	
ME774/145-1		11.02.09	22:49	1° 20.03' S	85° 50.03' W	2449,4	LOKI	
ME774/145-2	75	11.02.09	23:51	1° 20.06' S	85° 50.07' W	2449,9	CTD/RO	
ME774/146-1	76	12.02.09	03:00	0° 59.96' S	85° 50.04' W	2240,9	CTD/RO	
ME774/147-1	77	12.02.09	05:58	0° 49.95' S	85° 50.06' W	2403,6	CTD/RO	
ME774/148-1	78	12.02.09	07:56	0° 40.04' S	85° 50.07' W	2560,7	CTD/RO	
ME774/149-1		12.02.09	10:12	0° 30.01' S	85° 50.01' W	2774	LOKI	
ME774/149-2	79	12.02.09	11:15	0° 30.01' S	85° 50.01' W	2768,7	CTD/RO	
ME774/150-1	80	12.02.09	13:34	0° 20.09' S	85° 50.02' W	3013,8	CTD/RO	
ME774/151-1		12.02.09	15:50	0° 10.00' S	85° 50.13' W	2724,2	GO-FLO	
ME774/151-2	81	12.02.09	16:44	0° 10.00' S	85° 50.05' W	2718,3	CTD/RO	
ME774/152-1		12.02.09	19:00	0° 0.03' S	85° 50.00' W	2905,7	GO-FLO	
ME774/152-2		12.02.09	19:37	0° 0.02' S	85° 50.00' W	2906,5	LOKI	
ME774/152-3	82	12.02.09	20:40	0° 0.02' S	85° 50.01' W	2907,8	CTD/RO	
ME774/152-4		12.02.09	22:58	0° 0.02' S	85° 50.00' W	2908,8	GO-FLO	
ME774/153-1	83	13.02.09	00:50	0° 9.98' N	85° 50.06' W	2892,6	CTD/RO	
ME774/153-2		13.02.09	02:02	0° 9.99' N	85° 50.04' W	2883	GO-FLO	
ME774/154-1		13.02.09	03:46	0° 20.04' N	85° 50.06' W	3033,2	GO-FLO	
ME774/154-2	84	13.02.09	04:30	0° 20.01' N	85° 50.00' W	3024,2	CTD/RO	
ME774/155-1	85	13.02.09	06:40	0° 30.03' N	85° 50.01' W	2812,5	CTD/RO	
ME774/156-1	86	13.02.09	08:55	0° 40.06' N	85° 49.99' W	2744,2	CTD/RO	
ME774/157-1		13.02.09	11:14	0° 50.06' N	85° 49.94' W	2704,6	LOKI	
ME774/157-2	87	13.02.09	12:17	0° 50.00' N	85° 50.00' W	2685,4	CTD/RO	
ME774/158-1	88	13.02.09	14:28	1° 0.09' N	85° 50.02' W	2769,8	CTD/RO	
ME774/159-1	89	13.02.09	17:30	1° 20.06' N	85° 49.98' W	2943	CTD/RO	
ME774/160-1		13.02.09	20:36	1° 39.98' N	85° 49.96' W	2612,4	LOKI	
ME774/160-2	90	13.02.09	21:37	1° 39.99' N	85° 49.99' W	2607	CTD/RO	
ME774/161-1	91	14.02.09	01:26	2° 0.01' N	85° 50.06' W	2584	CTD/RO	