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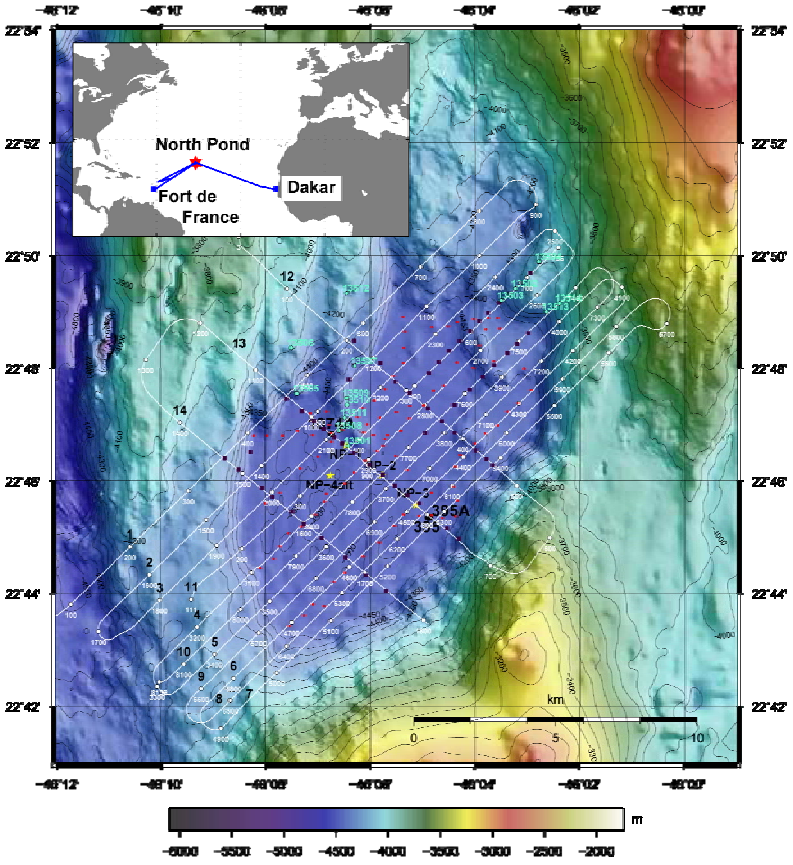
Short Cruise Report
RV Maria S. Merian Cruise MSM11/1

Fort de France - Dakar
16. February – 12. May 2009
Chief Scientist: Heinrich Villinger
Captain: Klaus Bergmann



Ship track of RV Maria S. MERIAN cruise MSM11/1(see inset) and location of stations and seismic lines in North Pond

Objectives

North Pond, an isolated sediment pond located on the Western flank of the mid-Atlantic Ridge, offers the opportunity to study microbial communities and their activities in deeply-buried sediments and the underlying basement. One important argument for choosing North Pond is that the geochemistry, hydrology, and geologic setting of North Pond have been previously studied by a series of DSDP and ODP drill holes and seafloor observatories. However the existing site survey data are not sufficient for the approved North Pond IODP drilling expedition, scheduled to take place not before FY 2010. The goal of the proposed investigations on MSM 11/1 is therefore to map North Pond in a detailed way in order to be able to position planned IODP holes precisely. These surveys compromise a detailed seismic mapping of the sediment-basement interface of North Pond, additional heat flow data and geochemical and microbial sampling of the sediments. In addition dredging of the upper crust, surrounding North Pond, will help to better define the petrological setting of North Pond. The MERIAN cruise together with the planned IODP drilling project will provide a unique comprehensive geophysical, (bio)geochemical and microbial data set for the study of deep biosphere.

Narrative

On Tuesday, February 17th, 2009, at 11 o'clock in the morning, the R/V M.S. MERIAN left the harbor of Fort de France and headed for the working area at North Pond on the Mid-Atlantic Ridge at 22° N/46°W. Our departure was delayed for over a day due to a general strike in Martinique that prevented our refueling for the trip. Thanks to the negotiating skills of Captain Bergmann and our agent in Fort de France we were able to obtain fuel and finally cast-off lines.

During the four-day transit, the various research groups had time to set-up laboratories and test all their equipment. Over the course of two scientific meetings, the research groups informed one another of their various research programs, and they discussed optimal sampling strategies and time plans for the upcoming days on-site. We reached North Pond at around 15:00 on February 21. We began immediately with a gravity core deployment which was successful with a 8.44m long core.

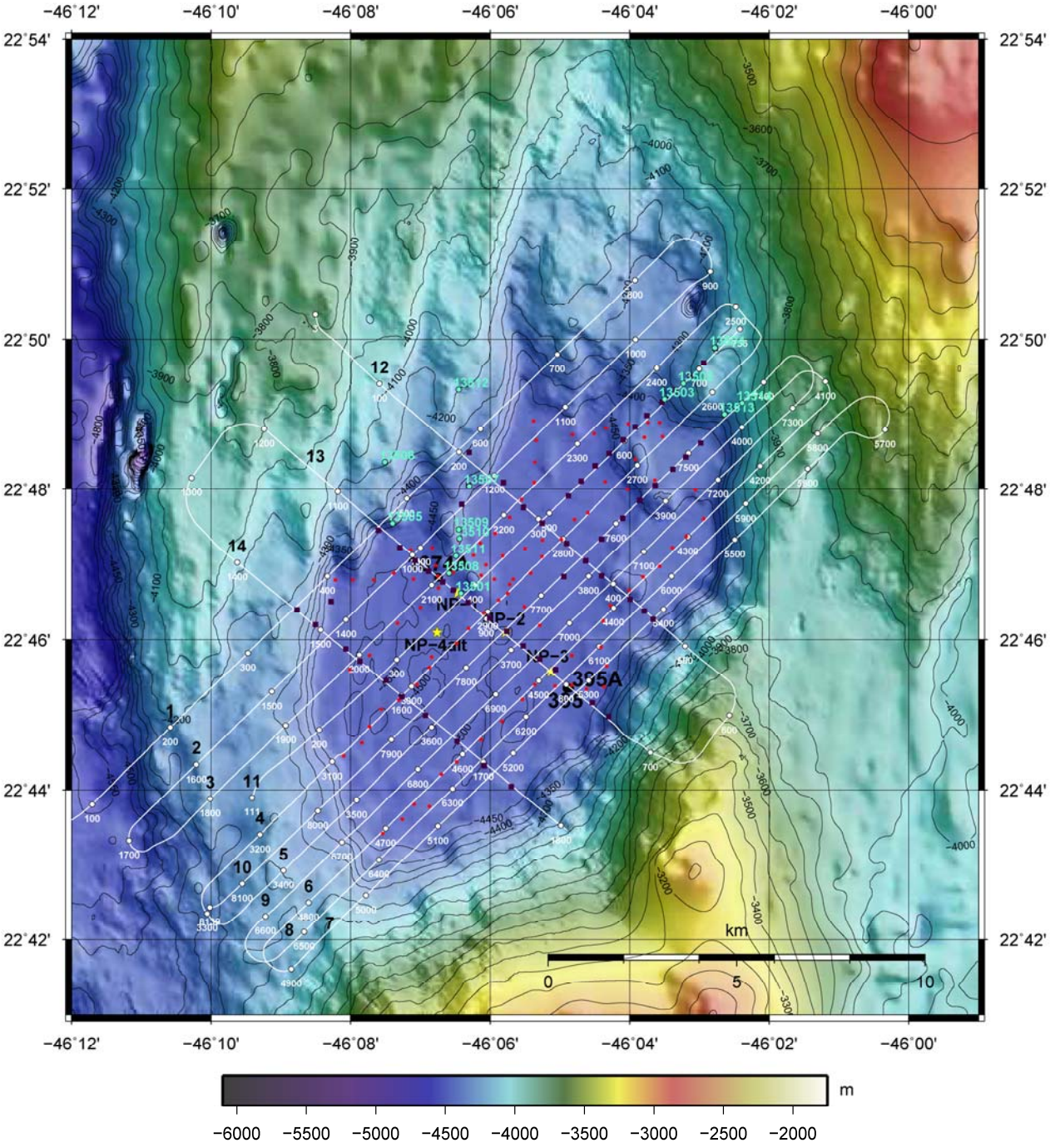
Immediately afterwards we started a 40 hour long seismic survey along closely spaced lines, in order to map the topography of the sediment basin in detail. In addition bathymetric mapping with SIMRAD and sediment echo-sounding took place. Unfortunately, during our seismic survey, one of the crew members suffered such a serious injury that Captain Bergmann had to immediately decide to halt research operations, so as to transport the patient as quickly as possible to Martinique or Guadeloupe. We reached the location off Guadeloupe for helicopter pickup of the patient in the morning of February 25. The pickup went very well and the patient was in the hospital on Guadeloupe one hour later. After that we left immediately for our working area again where we arrived in the late morning of February 28. As we had lost about 7 days due to the accident, we asked the Senatskommission für Ozeanographie for a prolongation of cruise which was granted as the chief scientist of MSM11/2 gave us two days of his working days. The planned arrival in Dakar was therefore March 12 at 8:00. This left us 6.3 working days out of the planned 13 days.

After arrival at North Pond again we completed the interrupted seismic survey. The following days were filled with a succession of gravity coring during the day and heat flow surveys during night. Our attempt to take a multi-corer failed for yet unknown reasons. Due to the dramatically reduced number of working days, we decided not to try again. In order to sample bottom water, we deployed the CTD/rosette in the middle of North Pond. Our work ended with a short bathymetric survey around North Pond to close gaps in the existing coverage.
We started our 6½ day long journey to Dakar on March 6 at 19:00 where we arrived on March 12 at 8:00.

Acknowledgements

We like to thank Captain Klaus Bergmann, his mates and the crew of RV Maria S. MERIAN for their tremendous support of our scientific program and for hosting us so friendly on board. We are especially thankful for the prolongation of the cruise, granted by the Senatskommission für Ozeanographie and many thanks to the chief scientist and science party of MSM11/2 for the generous ‘gift’ of two additional working days.

The ship time of RV Maria S. MERIAN was provided by the Deutsche Forschungsgemeinschaft within the core program of METEOR / MERIAN. Financial support for the different projects of our North American colleagues was provided by the National Science Foundation. We gratefully acknowledge all this support.



Bathymetry and location of all seismic profiles (white lines), heat flow measurements and gravity cores in North Pond. Existing heat flow measurements: filled red circles; new heat flow measurements: blue filled squares; gravity cores: light blue circles.

Cruise participants

Name	Title	Expertise	Affiliation
Villinger, Heinrich	Prof. Dr.	Chief Scientist	UHB
Bach, Wolfgang	Prof. Dr.	petrology	UHB
Biddle, Jennifer	Dr.	geomicrobiology	UNC
Blazejak, Anna	Dr.	geomicrobiology	BGR
Edwards, Katrina	Prof. Dr.	geomicrobiology	USC
Ferdelman, Timothy	Dr.	biogeochemistry	MPI
Heesemann, Bernd	Dipl. Ing.	electronics	UHB
Heuer, Verena	Dr.	biogeochemistry	MARUM
Kaul, Norbert	Dr.	geophysics	UHB
Kellermann, Matthias	Dipl. Geowiss.	biogeochemistry	MARUM
Klein, Frieder	Dipl. Geowiss.	petrology	UHB
Knab, Nina	Dr.	biogeochemistry	USC
McManus, James	Prof. Dr.	biogeochemistry	OSU
Muratli, Jesse	Student	biogeochemistry	OSU
Picard, Aude	Dr.	biogeochemistry	MPI
Polster, André	Dipl. Geophys.	geophysics	UHB
Schippers, Axel	PD Dr.	geomicrobiology	BGR
Schmidt-Schierhorn, F.	Student	geophysics	UHB
Schwab, Arne	Student	geophysics	UHB
Stephan, Sebastian	Student	geophysics	UHB
Teske, Andreas	Prof. Dr.	geomicrobiology	UNC
Ziebis, Wiebke	Prof. Dr.	biogeochemistry	USC

Addresses of participants

UHB	Department of Geoscience University of Bremen P.O.Box 330 440 D-28334 Bremen	MPI	Max-Planck-Institute for Marine Microbiology
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe Stilleweg 2 D-30655 Hannover	USC	University of Southern California 3616 Trousdale Parkway, AHF107 Los Angeles, CA 90089 USA
MARUM	Zentrum für Marine Umweltwissenschaften University of Bremen P.O.Box 330 440 D-28334 Bremen	OSU	Oregon State University
UNC	University of North Carolina Dept. of Marine Science 340 Chapman Hall, CB3300 Chapel Hill, NC 27599 USA		

Stationsliste

List of Parasound profiles

Seismic Profile	Date	Start	Position		Sounding	End	Position		Sounding	Length of Profile
	Start	UTC	Latitude	Longitude	ID	UTC	Latitude	Longitude	no	(km)
NP_SCS_01	2009-02-21	20:35	22°44.159'N	46°11.320'W	21690385	22:32	22°51.165'N	46°03.504'W	21692019	18.52
NP_SCS_02	2009-02-21	22:48	22°50.663'N	46°03.192'W	21692020	00:50	22°43.641'N	46°10.985'W	21693182	18.52
NP_SCS_03	2009-02-22	01:07	22°43.515'N	46°10.421'W	21693192	03:08	22°50.464'N	46°02.600'W	21694218	18.52
NP_SCS_04	2009-02-22	03:09	22°50.439'N	46°02.467'W	21694231	05:17	22°42.787'N	46°09.998'W	21695295	18.52
NP_SCS_05	2009-02-22	05:32	22°42.490'N	46°09.449'W	21695421	07:29	22°49.364'N	46°01.775'W	21696391	18.52
NP_SCS_06	2009-02-22	07:43	22°48.900'N	46°01.491'W	21696518	09:43	22°41.931'N	46°09.230'W	21697476	18.52
NP_SCS_07	2009-02-22	09:53	22°41.807'N	46°08.631'W	21697485	11:54	22°48.693'N	46°00.988'W	21694893	18.52
NP_SCS_08	2009-02-22	12:18	22°48.788'N	46°01.233'W	21698703	14:20	22°41.867'N	46°08.944'W	21699699	18.52
NP_SCS_09	2009-02-22	14:31	22°42.209'N	46°09.339'W	21699790	16:32	22°49.200'N	46°01.534'W	21700803	18.52
NP_SCS_10	2009-02-22	16:45	22°49.524'N	46°01.994'W	21700859	18:46	22°42.598'N	46°09.742'W	21701893	18.52
NP_SCS_11a	2009-02-22	19:02	22°43.145'N	46°10.245'W	21702035	19:28	22°44.660'N	46°08.539'W	21702254	n/a
NP_SCS_11	2009-02-28	12:46	22°42.764'N	46°10.662'W	21702568	15:02	22°50.119'N	46°02.443'W	21703640	18.52
NP_SCS_12	2009-03-01	15:30	22°49.691'N	46°07.905'W	21710191	16:50	22°45.577'N	46°02.750'W	21710879	11.67
NP_SCS_13	2009-03-01	17:16	22°44.512'N	46°03.739'W	21711103	18:36	22°48.628'N	46°09.022'W	21711776	11.85
NP_SCS_14	2009-03-01	19:07	22°47.300'N	46°09.953'W	21712047	20:20	22°43.467'N	46°04.913'W	21712654	11.11

List of seismic profiles

Profile	Date	Start	Position		Shotpoint no	End	Position		Shotpoint no	Length of Profile (km)
		UTC	Latitude	Longitude		UTC	Latitude	Longitude		
NP_SCS_01	2009-02-21	20:39	22°43.710'N	46°11.744'W	-0090	22:33	22°51.150'N	46°03.513'W	834	18.52
NP_SCS_02	2009-02-21	22:48	22°50.655'N	46°03.204'W	0925	00:51	22°43.706'N	46°10.929'W	1668	18.52
NP_SCS_03	2009-02-22	01:06	22°43.421'N	46°10.486'W	1755	03:07	22°50.426'N	46°02.695'W	2483	18.52
NP_SCS_04	2009-02-22	03:19	22°49.735'N	46°02.346'W	2552	05:18	22°42.710'N	46°10.074'W	3172	18.52
NP_SCS_05	2009-02-22	05:32	22°42.476'N	46°09.453'W	3352	07:29	22°49.387'N	46°01.740'W	4058	18.52
NP_SCS_06	2009-02-22	07:42	22°48.960'N	46°01.412'W	4136	09:41	22°41.998'N	46°09.174'W	4852	18.52
NP_SCS_07	2009-02-22	09:51	22°41.885'N	46°08.547'W	4909	11:53	22°48.671'N	46°00.990'W	5640	18.52
NP_SCS_08	2009-02-22	12:18	22°48.802'N	46°01.246'W	5790	14:21	22°41.834'N	46°08.993'W	6528	18.52
NP_SCS_09	2009-02-22	14:31	22°42.221'N	46°09.326'W	6590	16:32	22°49.203'N	46°01.530'W	7312	18.52
NP_SCS_10	2009-02-22	16:45	22°49.551'N	46°01.711'W	7390	18:46	22°42.570'N	46°09.773'W	8115	18.52
NP_SCS_11a	2009-02-22	19:02	22°43.170'N	46°10.217'W	8215	19:05	22°43.325'N	46°10.015'W	8226	
NP_SCS_11b	2009-02-22	19:09	22°43.595'N	46°09.712'W	0001	19:27	22°44.626'N	46°08.572'W	200	
NP_SCS_11	2009-02-28	13:15	22°43.988'N	46°09.375'W	0111	15:02	22°50.136'N	46°02.418'W	756	18.52
NP_SCS_12	2009-03-01	15:30	22°49.719'N	46°07.936'W	0066	16:50	22°45.567'N	46°02.737'W	0545	11.67
NP_SCS_13	2009-03-01	17:15	22°44.480'N	46°03.679'W	0700	18:36	22°48.642'N	46°09.036'W	1180	11.85
NP_SCS_14	2009-03-01	19:08	22°47.290'N	46°09.946'W	1372	20:20	22°43.484'N	46°04.920'W	1806	11.11

List of heat flow penetrations

Penetration	Depth (m)	Date	PenTime (UTC)	HeatTime (UTC)	OutTime (UTC)	Latitude DD	Latitude MM	Longitude DD	Longitude MM	Heatpuls	Seismic profile no	Shotpoint no	Distance to Shotpoint (km)
Station 1													
H0901P01	4480	28.02.2009	20:18:00	20:26:00	20:37:10	22	47.926	-46	4.867	yes	SCS_11	527	0.019
H0901P02	4478	28.02.2009	21:31:00	none	21:39:40	22	48.159	-46	4.644	no	SCS_11	549	0.034
H0901P03	4479	28.02.2009	22:24:40	22:33:00	22:44:50	22	48.358	-46	4.448	yes	SCS_11	568	0.069
H0901P04	4468	28.02.2009	23:26:20	none	23:33:10	22	48.508	-46	4.247	no	SCS_11	585	0.028
H0901P05	4411	01.03.2009	00:19:10	00:29:10	00:38:20	22	48.717	-46	4.038	yes	SCS_11	606	0.051
H0901P06	4406	01.03.2009	01:14:30	none	01:22:50	22	48.878	-46	3.868	no	SCS_11	622	0.064
H0901P07	4401	01.03.2009	01:56:10	02:05:30	02:13:30	22	49.047	-46	3.688	yes	SCS_11	639	0.079
H0901P08	4348	01.03.2009	02:52:30	none	02:59:50	22	49.207	-46	3.488	no	SCS_11	657	0.052
H0901P09	4259	01.03.2009	03:36:00	03:45:20	03:56:30	22	49.387	-46	3.292	yes	SCS_11	675	0.055
H0901P10	4184	01.03.2009	04:33:00	none	04:43:20	22	49.575	-46	3.292	no	SCS_11	685	0.295
H0901P11	4108	01.03.2009	05:18:39	20:27:10	05:38:00	22	49.747	-46	2.889	no	SCS_11	712	0.050
H0901P12	4014	01.03.2009	06:18:35	none	06:26:10	22	49.917	-46	2.707	yes	SCS_11	730	0.053
Station 2													
H0902P01	4476	01.03.2009	22:25:50	22:34:10	22:42:10	22	44.971	-46	4.311	yes	SCS_13	752	0.044
H0902P02	4473	01.03.2009	23:29:50	none	23:37:20	22	45.162	-46	4.542	no	SCS_13	771	0.055
H0902P03	4482	02.03.2009	00:55:40	01:03:40	01:11:10	22	45.603	-46	5.080	yes	SCS_13	817	0.098
H0902P04	4483	02.03.2009	01:48:10	none	01:56:10	22	45.746	-46	5.292	no	SCS_13	834	0.070
H0902P05	4484	02.03.2009	02:42:10	02:50:10	02:59:20	22	45.920	-46	5.528	yes	SCS_13	855	0.061
H0902P06	4483	02.03.2009	03:42:20	none	03:50:40	22	46.106	-46	5.764	no	SCS_13	876	0.070
H0902P07	4482	02.03.2009	04:32:10	04:40:40	04:49:20	22	46.292	-46	6.016	yes	SCS_13	899	0.061
H0902P08	4479	02.03.2009	05:36:30	none	05:44:30	22	46.505	-46	6.320	no	SCS_13	925	0.009
H0902P09	4480	02.03.2009	06:25:30	06:34:30	06:43:10	22	46.668	-46	6.543	yes	SCS_13	945	0.015
H0902P10	4475	02.03.2009	07:17:30	none	07:24:20	22	46.776	-46	6.683	no	SCS_13	958	0.011
H0902P11	4483	02.03.2009	08:04:39	08:12:10	08:19:00	22	46.931	-46	6.900	yes	SCS_13	978	0.034
H0902P12	4480	02.03.2009	08:58:35	none	09:04:10	22	47.061	-46	7.087	no	SCS_13	994	0.071
H0902P13	4477	02.03.2009	09:49:35	none	09:56:10	22	47.235	-46	7.319	no	SCS_13	1016	0.086

H0902P14	4408	02.03.2009	10:50:40	11:00:40	11:08:00	22	47.459	-46	7.612	yes	SCS_13	1044	0.088
Station 3													
H0903P01	4449	02.03.2009	23:50:30	22:58:10	00:07:10	22	46.274	-46	3.665	yes	SCS_12	456	0.031
H0903P02	4437	03.03.2009	00:41:00	none	00:49:00	22	46.385	-46	3.790	no	SCS_12	443	0.015
H0903P03	4416	03.03.2009	01:22:10	01:30:20	01:38:10	22	46.840	-46	3.994	yes	SCS_12	409	0.393
H0903P04	4476	03.03.2009	02:37:30	none	02:44:10	22	46.856	-46	4.401	no	SCS_12	386	0.028
H0903P05	4481	03.03.2009	03:22:40	03:30:40	03:39:30	22	47.056	-46	4.631	yes	SCS_12	363	0.012
H0903P06	4482	03.03.2009	04:22:40	none	04:29:30	22	47.285	-46	4.905	no	SCS_12	338	0.018
H0903P07	4481	03.03.2009	05:22:30	05:30:30	05:40:30	22	47.552	-46	5.255	yes	SCS_12	305	0.017
H0903P08	4476	03.03.2009	06:27:20	none	06:33:40	22	47.761	-46	5.524	no	SCS_12	281	0.024
H0903P09	4469	03.03.2009	07:45:30	none	07:52:10	22	48.091	-46	5.811	no	SCS_12	250	0.132
H0903P10	4420	03.03.2009	09:08:30	09:16:00	09:23:20	22	48.492	-46	6.383	yes	SCS_12	203	0.065
H0903P11	4392	03.03.2009	10:33:39	08:12:10	10:41:00	22	48.053	-46	6.309	no	SCS_12	1224	0.270
H0903P12	4381	03.03.2009	11:21:35	none	11:29:10	22	47.800	-46	6.409	no	SCS_12	1241	0.055
H0903P13	4371	03.03.2009	12:07:35	none	12:17:10	22	47.477	-46	6.443	no	SCS_12	1258	0.337
Station 4													
H0904P01	4478	03.03.2009	21:03:20	21:10:20	21:19:30	22	44.045	-46	5.697	yes	SCS_14	1736	0.028
H0904P02	4482	03.03.2009	22:23:30	none	22:30:30	22	44.321	-46	6.085	no	SCS_14	1703	0.055
H0904P03	4489	03.03.2009	23:34:40	23:41:40	23:49:50	22	44.642	-46	6.474	yes	SCS_14	1669	0.031
H0904P04	4485	04.03.2009	00:52:30	none	00:59:30	22	44.989	-46	6.930	no	SCS_14	1629	0.032
H0904P05	4483	04.03.2009	01:45:00	01:52:00	02:00:30	22	45.238	-46	7.266	yes	SCS_14	1601	0.016
H0904P06	4489	04.03.2009	02:46:00	none	02:53:00	22	45.456	-46	7.495	no	SCS_14	1579	0.049
H0904P07	4489	04.03.2009	03:44:40	03:51:40	04:01:30	22	45.712	-46	7.868	yes	SCS_14	1548	0.008
H0904P08	4484	04.03.2009	04:32:30	none	04:38:20	22	45.878	-46	8.071	no	SCS_14	1530	0.028
H0904P09	4363	04.03.2009	05:37:30	05:46:30	05:57:00	22	46.200	-46	8.506	yes	SCS_14	1493	0.018
H0904P10	4206	04.03.2009	06:39:20	none	06:48:30	22	46.399	-46	8.769	no	SCS_14	1471	0.020
H0904P11	4476	04.03.2009	07:58:39	none	08:08:00	22	46.511	-46	8.281	no	SCS_14	1398	0.565
Station 5													
H0905P01	4481	04.03.2009	22:14:00	22:22:00	22:31:40	22	46.846	-46	4.944	yes	SCS_10	7672	0.047
H0905P02	4481	04.03.2009	22:39:40	22:48:00	22:56:30	22	46.846	-46	4.944	yes	SCS_10	7672	0.047
H0905P03	4480	05.03.2009	00:20:30	none	00:28:30	22	47.344	-46	4.405	no	SCS_10	7621	0.019

H0905P04	4481	05.03.2009	00:36:20	none	00:44:20	22	47.344	-46	4.398	no	SCS_10	7620	0.028
H0905P05	4484	05.03.2009	01:39:20	01:47:10	01:56:20	22	47.617	-46	4.101	yes	SCS_10	7592	0.018
H0905P06	4473	05.03.2009	02:44:40	none	02:51:00	22	47.849	-46	3.856	no	SCS_10	7568	0.004
H0905P07	4401	05.03.2009	03:40:00	03:48:00	03:58:50	22	48.049	-46	3.634	yes	SCS_10	7547	0.004
H0905P08	4411	05.03.2009	04:42:40	none	04:50:00	22	48.266	-46	3.381	no	SCS_10	7523	0.009
H0905P09	4410	05.03.2009	05:29:10	05:38:40	05:46:20	22	48.428	-46	3.196	yes	SCS_10	7505	0.023
H0905P10	4411	05.03.2009	05:52:00	06:02:00	06:11:20	22	48.428	-46	3.195	yes	SCS_10	7505	0.024
H0905P11	4407	05.03.2009	06:42:10	none	06:49:50	22	48.616	-46	2.982	no	SCS_10	7483	0.028

Sediment coring locations

Sediment coring locations -- cruise MSM11/1 -- North Pond

Site	Tool	Type	Ship Station	Lat °	Lat '	Long °	Long '	Water depth (m)
GeoB 13501	-1	GC (12 m)	317	22	46.62	46	6.42	4480
GeoB 13502	-1	GC (12 m)	330	22	49.41	46	3.23	4250
GeoB 13503	-1	GC (12 m)	343	22	49.20	46	3.50	4365
GeoB 13504	-1	GC (6 m)	344	22	49.89	46	2.78	4096
GeoB 13505	-1	GC (12 m)	362	22	47.55	46	7.40	4402
GeoB 13506	-1	GC (6 m)	363	22	48.36	46	7.51	4143
GeoB 13507	-1	GC (12 m)	378	22	48.04	46	6.30	4395
GeoB 13508	-1	GC (6 m)	390	22	46.89	46	6.59	4475
GeoB 13509	-1	GC (3 m)	391	22	47.47	46	6.45	4438
GeoB 13510	-1	GC (6 m)	392	22	47.35	46	6.44	4448
GeoB 13511	-1	GC (6 m)	393	22	47.12	46	6.49	4445
GeoB 13512	-1	GC (6 m)	402	22	49.33	46	6.45	4200
GeoB 13513	-1	GC (6 m)	403	22	49.00	46	2.64	4262
GeoB 13514	-1	GC (6 m)	404	22	49.15	46	2.39	4040
GeoB 13501	-2	MUC	364	22	46.62	46	6.42	4480
GeoB 13501	-3	Rosette	379	22	46.62	46	6.42	4480

Station details of sediment coring stations

Core	Core length (cm)	Description	Day	Time* of tool deployment	Time* of tool on seafloor	Time* of tool on deck	Time* of core in cool room
GeoB 13501-1	844	Ooze, sand, Mn	21.02.2009	16:51	17:56	18:57	20:30
GeoB 13502-1	847	Ooze, sparse Mn	28.02.2009	15:49	17:00	18:00	18:37
GeoB 13503-1	689	Ooze	01.03.2009	08:31	09:29	10:36	11:05
GeoB 13504-1	72	Ooze, clay, basement?	02.03.2009	11:36	12:29	13:34	not recorded
GeoB 13505-1	76	Ooze, clay	02.03.2009	13:07	14:09	15:09	not recorded
GeoB 13506-1	574	Ooze, Mn	02.03.2009	16:13	17:09	18:05	18:30
GeoB 13507-1	865	Ooze, sand, Mn	03.03.2009	13:49	14:46	15:48	16:30
GeoB 13508-1	344	Ooze, sand	04.03.2009	09:44	10:43	11:52	12:30
GeoB 13509-1	267	Ooze, sparse Mn	04.03.2009	13:19	14:19	15:21	15:40
GeoB 13510-1	515	Ooze, sparse sand, sparse Mn	04.03.2009	15:49	16:46	17:45	18:05
GeoB 13511-1	468	Ooze, sparse sand, sparse Mn	04.03.2009	18:10	19:18	20:26	20:45
GeoB 13512-1	516	Ooze, sparse Mn	05.03.2009	08:55	10:02	11:08	11:30
GeoB 13513-1	504	Ooze, sparse Mn	05.03.2009	11:59	13:00	14:03	14:30
GeoB 13514-1	237	Ooze, mod. Forams	05.03.2009	14:24	15:22	16:16	16:35
GeoB 13501-2	no recovery		02.03.2009	18:52	20:21	21:51	
GeoB 13501-3	24 bottles	All bottles fired at 4400 m	03.03.2009	16:29	17:54	19:06	
				* UTC			