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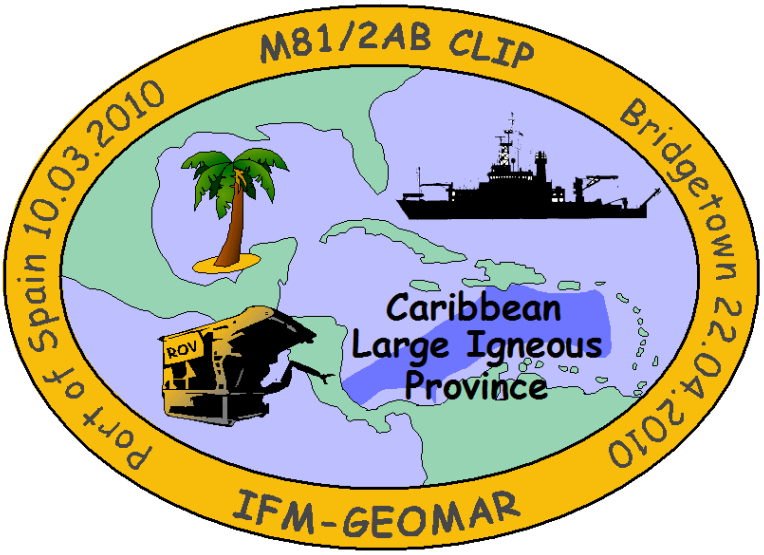
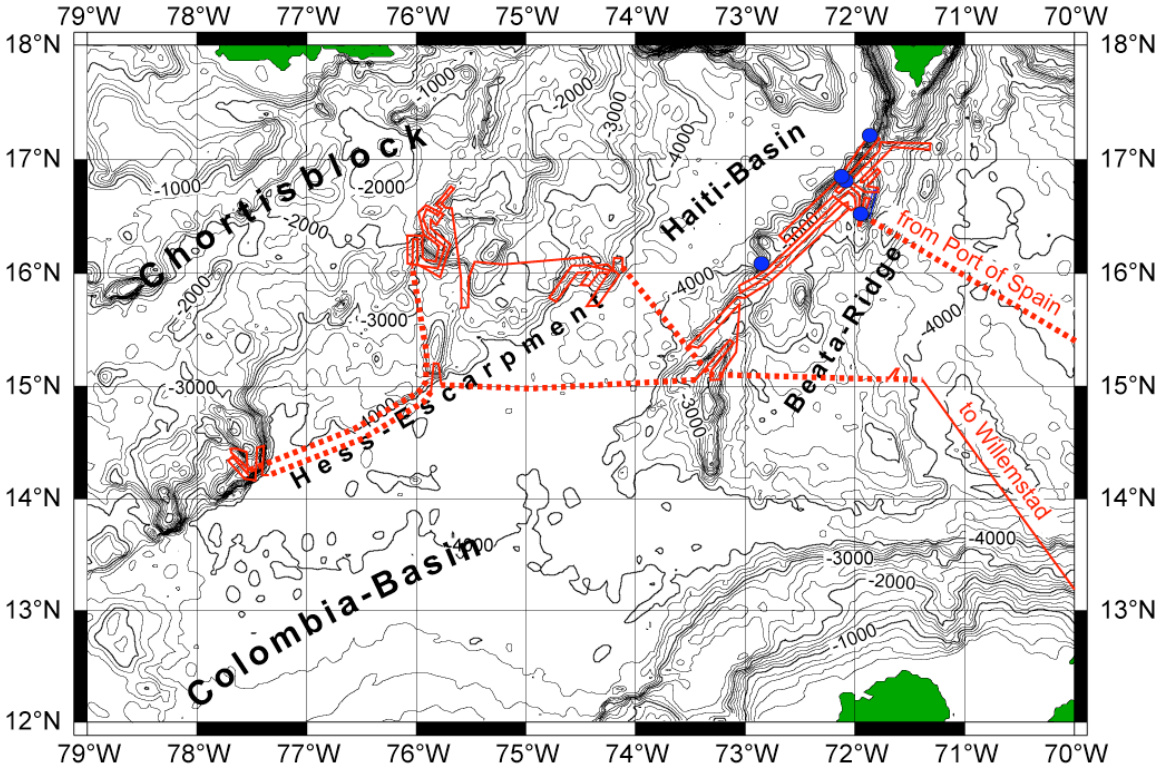
Short Cruise Report
RV Meteor Cruise M81/2A

Port of Spain – Willemstad
March 11 – 29, 2010
Chief Scientist: Kaj Hoernle
Captain: Thomas Wunderlich



Station Map



Ship track of RV Meteor cruise M81/2A (thin red line) with locations of ROV dive profiles on the Beata Ridge (blue dots). Magnetic, Simrad EM120 and Parasound surveys were carried out on all ship tracks within the EEZ of the Dominican Republic, Haiti and Jamaica. Major magnetic profiles are marked by the dashed red line.

1. Objectives

Members of the IFM-GEOMAR Leibniz-Institut für Meereswissenschaften, Institut für Geographie und Geologie der Ernst-Moritz-Arndt Universität Greifswald and the Bundesanstalt für Geowissenschaften und Rohstoffe jointly carried out RV Meteor cruise M81/2A. Members of Oregon State University (USA) and Cardiff University (England) also participated in the cruise.

The main goals of the cruise were to combine geological and geophysical research methods in order to gain new insights into the origin, evolution and composition of the Caribbean Large Igneous Province (CLIP), a giant submarine plateau of lava, and the geodynamic evolution of the Central Caribbean. Cruise M81/2A is part of an international strategy to improve our understanding of submarine flood basalt provinces. We used a remotely operated vehicle (ROV Kiel 6000) to sample lava sequences along fault scarps on the Beata Rise in the northern part of the Central Caribbean south of Hispaniola. Magnetic, multi-beam echo-sounding (SIMRAD EM120) and sub-bottom profiling (Parasound) profiles were carried out over much of the Beata Rise, the northeastern part of the Hess

Escarpment, the Haiti Basin, northern part of the Colombia Basin and the western part of the Venezuela Basin.

2. Narrative

RV Meteor sailed from Port of Spain, Trinidad and Tobago on March 11 at 10:30. After fueling from a tanker, the voyage to the Beata Rise, a submarine ridge located south of the Hispaniola began. After a two-day transit during which preparations for the cruise continued, we reached the exclusive economic zone (EEZ) of the Dominican Republic on Saturday evening of March 13, where we began magnetic, multi-beam echo-sounding and Parasound surveys. On the morning of Sunday March 14, we reached the Beata Rise. Echo-sounding data collected on the Beata Rise was used to produce a high-resolution bathymetric map of the seafloor in order to determine a track for the first ROV dive.

From Monday March 15 through Friday March 19, five dives with the Kiel 6000 ROV were carried out on the western slopes of the Beata Rise. The ROV dives took place during the day with time on the seafloor averaging about 8 hours per dive. Magnetic and multi-beam (SIMRAD EM120) and sediment (Parasound) echo-sounding profiles were conducted between dives. The extensive multi-beam mapping of the seafloor was used to select the steepest areas away from seafloor canyons, which proved to have the most continuous sequences of outcropping rocks for stratigraphic sampling. In situ sampling of volcanic, plutonic and sedimentary sequences was carried out on the first, third, fourth and fifth dives. Although no hard rock sequences were found on the second dive, we did find many young faults cutting the soft sediments. Mud mounds located on the fault traces were sampled at several locations.

On March 16 magnetic, SIMARD EM120 and Parasound surveys continued on the Beata Rise, while maintenance was carried out on the ROV. On Sunday March 17, magnetic and mapping of the Haiti Basin and the central Hess Escarpment was carried out, crossing through the EEZ of Haiti and into the EEZ of Jamaica. On Monday March 18, due to bad weather and high swell and a technical problem with the bow thruster that could not be resolved at sea, all future ROV dives were cancelled. In order to unload the ROV so that dredging could take place via the rear A-frame, it was decided to terminate Leg M81/2A as early as possible in order to gain more time for dredging during Leg M81/2B to compensate for the lost ROV dives.

From Monday March 18 through Friday March 26, magnetic and SIMARD EM120 surveys continued along the central Hess Escarpment and on seamounts on the Hess Escarpment and further north within the Jamaican EEZ, providing valuable data for selecting dredge sites for M81/2B. During the later half of Friday March 26, we again crossed the Haiti Graben in the Haitian EEZ. Late Friday night, the Beata Ridge was reached again in the EEZ of the Dominican Republic. On Saturday March 27, the SIMRAD EM120 system was calibrated in preparation for Leg M81/2B. On Sunday morning March 28, we ended our magnetic and SIMRAD EM120 surveys shortly before leaving the EEZ of the Dominican Republic and began our transit to Willemstad, Curacao.

On Monday morning March 28, we reached Willemstad, successfully ending Leg M81/2A despite the technical difficulties. Complementing 3,824 nm of SIMRAD EM120 and Parasound profiling (including 3,731 nm of magnetic profiling), a total of 5 RO profiles were carried out on M81/2B. No equipment were lost or seriously damaged.

3. Acknowledgements

We would like to thank Captain Thomas Wunderlich, his officers and crew of the RV Meteor for their excellent support, hard work, professionalism during the cruise and for the friendly atmosphere on board, which directly contributed to the success of this expedition.

We gratefully acknowledge the support of the German Science Foundation (DFG) for funding this project within their core program METEOR/MERIAN and their continued support of marine research. We would also like to thank the research institutes and universities involved in this project for additional support.

4. M81/2A Cruise Participants

Hoernle, Kaj	Chief Scientist	IFM-GEOMAR
Werner, Reinhard	Curise Organisation	IFM-GEOMAR
Hauff, Folkmar	Shift Leader	IFM-GEOMAR
Maicher, Doris	Shift Leader	IFM-GEOMAR
Hastie, Alan	Petrology	Univ. Cardiff
Conrad, Sarah	Petrology	IFM-GEOMAR
Seidel, Elisabeth	Petrology	IFM-GEOMAR
Krueger, Uwe	Petrology	IFM-GEOMAR
Meschede, Martin	Head of Structural Geology Group	Univ. Greifswald
Hueneke, Heiko	Structural Geology	Univ. Greifswald
Bratsch, Carolin	Structural Geology	Univ. Greifswald
Sperl, Daniel	Structural Geology	Univ. Greifswald
Barckhausen, Udo	Head of Magnetics	BGR
Zeibig, Michael	Magnetics	BGR
Pieper, Martin	Head of ROV Team	IFM-GEOMAR
Suck, Inken	ROV Team	IFM-GEOMAR
Huusmann, Hannes	ROV Team	IFM-GEOMAR
Meier, Arne	ROV Team	IFM-GEOMAR
Petersen, Asmus	ROV Team	IFM-GEOMAR
Cuno, Patrick	ROV Team	IFM-GEOMAR
Foster, Andrew	ROV Team	Schilling
Borchert, Wolfgang	Bathymetrie	Borchert HH
Loewen, Matthew	Guest	Oregon St. Univ.
Lancivette, Wilner	Observer Haiti	SEMANAH
Rentsch, Harald	Meteorology	DWD
Truscheit, Thorsten	Meteorology	DWD

5. Institutions

IFM-GEOMAR	Leibniz-Institut für Meereswissenschaften, Kiel, Germany
Univ. Cardiff	School of Earth and Ocean Sciences, Cardiff University, Cardiff, U.K.
Univ. Greifswald	Institut für Geographie und Geologie, Ernst-Moritz-Arndt Universität Greifswald, Greifswald, Germany
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover, Germany
Schilling	Schilling Robotics, Aberdeen, U.K.
Borchert HH	Borchert-Hamburg GBR, Hamburg, Germany
Oregon State Univ.	College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, U.S.A.
SEMANAH	Service Maritime et de Navigation d'Haïti, Marine Environment Protection Direction, Haiti
DWD	Deutscher Wetterdienst, Hamburg, Germany

6. ROV Profiles

Type	Stat.	Location	total samples	Rock summary	on bottom		off bottom		depth (m)	
					lat °N	long °E	lat °N	long °E	max	min
ROV	M81-217	Northern Beata Ridge, N-S ridge	13	lava, gabbroic rocks	16,548	71,949	16,549	71,939	1411	839
ROV	M81-220	Northern Beata Ridge, base	4	sedimentary rocks	17,248	71,867	17,238	71,845	4146	2987
ROV	M81-223	Northern Beata Ridge, lower Base	13	lava, gabbroic rocks, volcaniclastics	16,861	72,103	16,845	72,087	3442	2393
ROV	M81-226	Northern Beata Ridge, upper base	4	volcaniclastics (?), sedimentary rocks	16,844	72,086	16,834	72,078	2472	2875
ROV	M81-229	Central Beata Ridge, base	21	lava, gabbroic rocks, volcaniclastics	16,106	72,854	16,069	72,840	4201	2533

7. M81/2A Station List

Station	Date	Time UTC	Lat.	Lon.	Depth [m]	Gear	Action
ME812/214-1	14.03.2010	0:51	15° 19.90' N	69° 51.55' W	3751	Magnetic profile	Magnetometer in water
ME812/214-1	14.03.2010	1:01	15° 20.45' N	69° 52.53' W	3753,7	Magnetic profile	Magnetometer in water
ME812/214-1	14.03.2010	1:15	15° 21.36' N	69° 54.15' W	3723,4	Magnetic profile	begin of profile
ME812/214-1	14.03.2010	14:12	16° 24.89' N	71° 47.48' W	2987,8	Magnetic profile	end of profile
ME812/214-1	14.03.2010	14:37	16° 25.79' N	71° 49.09' W	2969,4	Magnetic profile	Magnetometer on deck
ME812/214-1	14.03.2010	14:43	16° 26.01' N	71° 49.48' W	3002,1	Magnetic profile	on deck
ME812/215-1	14.03.2010	15:12	16° 28.67' N	71° 53.27' W	2526,9	Multibeam-Parasound-Profile	Begin Profile
ME812/215-1	14.03.2010	16:35	16° 43.17' N	71° 49.26' W	1994,5	Multibeam-Parasound-Profile	alter course
ME812/215-1	14.03.2010	16:50	16° 44.14' N	71° 50.80' W	1642,8	Multibeam-Parasound-Profile	alter course
ME812/216-1	14.03.2010	17:28	16° 39.18' N	71° 52.92' W	1075,5	Magnetic profile	Magnetometer in water
ME812/216-1	14.03.2010	17:40	16° 37.68' N	71° 53.34' W	1356,8	Magnetic profile	begin of profile

Station	Date	Time UTC	Lat.	Lon.	Depth [m]	Gear	Action
ME812/216-1	14.03.2010	17:46	16° 36.73' N	71° 53.60' W	1227,5	Magnetic profile	end of profile
ME812/216-1	14.03.2010	18:15	16° 34.07' N	71° 54.34' W	1267,8	Magnetic profile	Magnetometer on deck
ME812/216-1	14.03.2010	18:17	16° 33.90' N	71° 54.39' W	1290,9	Magnetic profile	Magnetometer in water
ME812/216-1	14.03.2010	18:45	16° 29.70' N	71° 55.55' W	1274,6	Magnetic profile	begin of profile
ME812/216-1	15.03.2010	10:46	16° 33.42' N	71° 58.93' W	2333	Magnetic profile	end of profile
ME812/215-1	15.03.2010	11:00	16° 33.09' N	71° 57.60' W	1789,6	Multibeam-Parasound-Profile	end of profile
ME812/216-1	15.03.2010	11:03	16° 33.04' N	71° 57.36' W	1690,8	Magnetic profile	Magnetometer on deck
ME812/217-1	15.03.2010	12:15	16° 33.04' N	71° 57.04' W	1512,4	Remote operated vehicle	surface
ME812/217-1	15.03.2010	12:17	16° 33.07' N	71° 57.00' W	1521,8	Remote operated vehicle	umbilical float in water
ME812/217-1	15.03.2010	12:23	16° 33.15' N	71° 56.90' W	1471,6	Remote operated vehicle	umbilical float in water
ME812/217-1	15.03.2010	12:25	16° 33.17' N	71° 56.87' W	1473,2	Remote operated vehicle	diving
ME812/217-1	15.03.2010	13:55	16° 32.98' N	71° 56.78' W	1303,5	Remote operated vehicle	seafloor sighted
ME812/217-1	15.03.2010	21:44	16° 32.95' N	71° 56.28' W	839,9	Remote operated vehicle	coming back to the surface
ME812/217-1	15.03.2010	22:13	16° 32.97' N	71° 56.26' W	822,2	Remote operated vehicle	surfaced
ME812/217-1	15.03.2010	22:16	16° 33.00' N	71° 56.24' W	832,7	Remote operated vehicle	umbilical float on deck
ME812/217-1	15.03.2010	22:20	16° 33.04' N	71° 56.21' W	849,4	Remote operated vehicle	on deck
ME812/218-1	15.03.2010	22:36	16° 33.44' N	71° 56.31' W	1265,3	Multibeam-Parasound-Profile	Begin Profile
ME812/219-1	15.03.2010	22:36	16° 33.44' N	71° 56.31' W	1265,3	Magnetic profile	Magnetometer in water
ME812/219-1	15.03.2010	23:00	16° 34.66' N	71° 58.19' W	2305,6	Magnetic profile	begin of profile
ME812/219-1	16.03.2010	10:48	17° 14.04' N	71° 54.86' W	4277,4	Magnetic profile	end of profile
ME812/218-1	16.03.2010	11:14	17° 14.73' N	71° 52.58' W	4265,8	Multibeam-Parasound-Profile	end of profile
ME812/219-1	16.03.2010	11:20	17° 14.87' N	71° 52.08' W	4244	Magnetic profile	Magnetometer on deck
ME812/220-1	16.03.2010	12:12	17° 14.94' N	71° 52.08' W	4262,6	Remote operated vehicle	surface
ME812/220-1	16.03.2010	12:17	17° 14.92' N	71° 52.05' W	4203,2	Remote operated vehicle	umbilical float in water
ME812/220-1	16.03.2010	12:21	17° 14.90' N	71° 52.01' W	4205	Remote operated vehicle	umbilical float in water
ME812/220-1	16.03.2010	12:26	17° 14.89' N	71° 51.98' W	4162,7	Remote operated vehicle	diving
ME812/220-1	16.03.2010	14:25	17° 14.88' N	71° 51.96' W	4146,7	Remote operated vehicle	seafloor sighted
ME812/220-1	16.03.2010	20:50	17° 14.24' N	71° 50.62' W	2987,4	Remote operated vehicle	coming back to the surface
ME812/220-1	16.03.2010	22:02	17° 14.23' N	71° 50.62' W	7,7	Remote operated vehicle	umbilical float on deck
ME812/220-1	16.03.2010	22:05	17° 14.22' N	71° 50.59' W	2843,6	Remote operated vehicle	surfaced
ME812/220-1	16.03.2010	22:12	17° 14.16' N	71° 50.49' W	3318,2	Remote operated vehicle	on deck
ME812/221-1	16.03.2010	22:24	17° 13.83' N	71° 49.86' W	3091,8	Multibeam-Parasound-Profile	Begin Profile
ME812/222-1	16.03.2010	22:24	17° 13.83' N	71° 49.86' W	3091,8	Magnetic profile	Magnetometer in water
ME812/222-1	16.03.2010	22:42	17° 13.55' N	71° 47.90' W	2359	Magnetic profile	begin of profile
ME812/222-1	17.03.2010	10:30	16° 50.35' N	72° 1.18' W	1850,2	Magnetic profile	end of profile
ME812/222-1	17.03.2010	11:07	16° 51.18' N	72° 4.29' W	2407,1	Magnetic profile	Magnetometer on deck
ME812/221-1	17.03.2010	11:20	16° 51.50' N	72° 6.20' W	3396,7	Multibeam-Parasound-Profile	end of profile
ME812/223-1	17.03.2010	12:12	16° 51.75' N	72° 6.35' W	3624,8	Remote operated vehicle	surface
ME812/223-1	17.03.2010	12:14	16° 51.75' N	72° 6.33' W	3617,1	Remote operated vehicle	umbilical float in water
ME812/223-1	17.03.2010	12:20	16° 51.74' N	72° 6.26' W	3632,9	Remote operated vehicle	umbilical float in water
ME812/223-1	17.03.2010	12:22	16° 51.73' N	72° 6.24' W	3561,8	Remote operated vehicle	diving
ME812/223-1	17.03.2010	14:03	16° 51.61' N	72° 6.12' W	3442,5	Remote operated vehicle	seafloor sighted
ME812/223-1	17.03.2010	22:20	16° 50.67' N	72° 5.15' W	2393,8	Remote operated vehicle	coming back to the surface
ME812/223-1	17.03.2010	23:13	16° 50.65' N	72° 5.13' W	2366,6	Remote operated vehicle	umbilical float on deck
ME812/223-1	17.03.2010	23:16	16° 50.66' N	72° 5.13' W	2382,6	Remote operated vehicle	surfaced
ME812/223-1	17.03.2010	23:21	16° 50.68' N	72° 5.13' W	2393	Remote operated vehicle	on deck
ME812/224-1	17.03.2010	23:28	16° 50.64' N	72° 5.05' W	2363,4	Multibeam-Parasound-Profile	Begin Profile

Station	Date	Time UTC	Lat.	Lon.	Depth [m]	Gear	Action
ME812/225-1	17.03.2010	23:34	16° 50.41' N	72° 5.04' W	2228,9	Magnetic profile	surface
ME812/225-1	17.03.2010	23:56	16° 48.22' N	72° 5.72' W	1979,8	Magnetic profile	begin of profile
ME812/225-1	18.03.2010	11:00	16° 26.81' N	72° 22.68' W	2955,4	Magnetic profile	end of profile
ME812/225-1	18.03.2010	11:42	16° 28.98' N	72° 19.77' W	2504,9	Magnetic profile	Magnetometer on deck
ME812/224-1	18.03.2010	14:18	16° 50.30' N	72° 5.16' W	2249,4	Multibeam-Parasound-Profile	end of profile
ME812/226-1	18.03.2010	14:53	16° 50.72' N	72° 5.28' W	2472,8	Remote operated vehicle	surface
ME812/226-1	18.03.2010	14:55	16° 50.72' N	72° 5.25' W	2468,1	Remote operated vehicle	umbilical float in water
ME812/226-1	18.03.2010	15:00	16° 50.73' N	72° 5.18' W	2424	Remote operated vehicle	umbilical float in water
ME812/226-1	18.03.2010	15:02	16° 50.73' N	72° 5.15' W	2416,7	Remote operated vehicle	diving
ME812/226-1	18.03.2010	15:59	16° 50.61' N	72° 5.10' W	2332,3	Remote operated vehicle	seafloor sighted
ME812/226-1	18.03.2010	21:54	16° 50.03' N	72° 4.71' W	1875	Remote operated vehicle	coming back to the surface
ME812/226-1	18.03.2010	22:32	16° 50.02' N	72° 4.70' W	1871,2	Remote operated vehicle	umbilical float on deck
ME812/226-1	18.03.2010	22:35	16° 50.02' N	72° 4.70' W	1883,1	Remote operated vehicle	surfaced
ME812/226-1	18.03.2010	22:40	16° 50.01' N	72° 4.68' W	1877,8	Remote operated vehicle	on deck
ME812/227-1	18.03.2010	22:46	16° 49.89' N	72° 4.60' W	1828,9	Multibeam-Parasound-Profile	Begin Profile
ME812/228-1	18.03.2010	22:50	16° 49.64' N	72° 4.58' W	1830	Magnetic profile	Magnetometer in water
ME812/228-1	18.03.2010	23:26	16° 44.97' N	72° 4.34' W	2216,7	Magnetic profile	begin of profile
ME812/228-1	19.03.2010	9:50	16° 3.97' N	72° 52.40' W	3278,9	Magnetic profile	end of profile
ME812/227-1	19.03.2010	10:24	16° 6.52' N	72° 51.37' W	4213	Multibeam-Parasound-Profile	end of profile
ME812/228-1	19.03.2010	10:24	16° 6.52' N	72° 51.37' W	4213	Magnetic profile	Magnetometer on deck
ME812/229-1	19.03.2010	12:04	16° 6.37' N	72° 51.34' W	4199,7	Remote operated vehicle	surface
ME812/229-1	19.03.2010	12:05	16° 6.37' N	72° 51.34' W	4203,1	Remote operated vehicle	umbilical float in water
ME812/229-1	19.03.2010	12:09	16° 6.37' N	72° 51.34' W	4210,5	Remote operated vehicle	umbilical float in water
ME812/229-1	19.03.2010	12:12	16° 6.38' N	72° 51.34' W	4206,2	Remote operated vehicle	diving
ME812/229-1	19.03.2010	13:56	16° 6.29' N	72° 51.21' W	4201,7	Remote operated vehicle	seafloor sighted
ME812/229-1	20.03.2010	1:24	16° 4.12' N	72° 50.42' W	2533,3	Remote operated vehicle	coming back to the surface
ME812/229-1	20.03.2010	2:25	16° 4.12' N	72° 50.40' W	2520,2	Remote operated vehicle	umbilical float on deck
ME812/229-1	20.03.2010	2:27	16° 4.13' N	72° 50.40' W	2538,9	Remote operated vehicle	surfaced
ME812/229-1	20.03.2010	2:29	16° 4.15' N	72° 50.39' W	2525,8	Remote operated vehicle	umbilical float on deck
ME812/229-1	20.03.2010	2:33	16° 4.19' N	72° 50.38' W	2553,7	Remote operated vehicle	on deck
ME812/230-1	20.03.2010	2:49	16° 3.82' N	72° 50.45' W	2378,3	Multibeam-Parasound-Profile	Begin Profile
ME812/231-1	20.03.2010	2:50	16° 3.78' N	72° 50.53' W	2415,5	Magnetic profile	Magnetometer in water
ME812/231-1	20.03.2010	3:12	16° 2.51' N	72° 53.30' W	2753,8	Magnetic profile	begin of profile
ME812/231-1	27.03.2010	16:56	15° 7.19' N	71° 30.32' W	4024,2	Magnetic profile	Magnetometer on deck
ME812/231-1	27.03.2010	17:00	15° 7.18' N	71° 29.98' W	4038,6	Magnetic profile	Magnetometer on deck
ME812/230-1	27.03.2010	19:42	15° 0.22' N	71° 17.84' W	4093,8	Multibeam-Parasound-Profile	end of profile