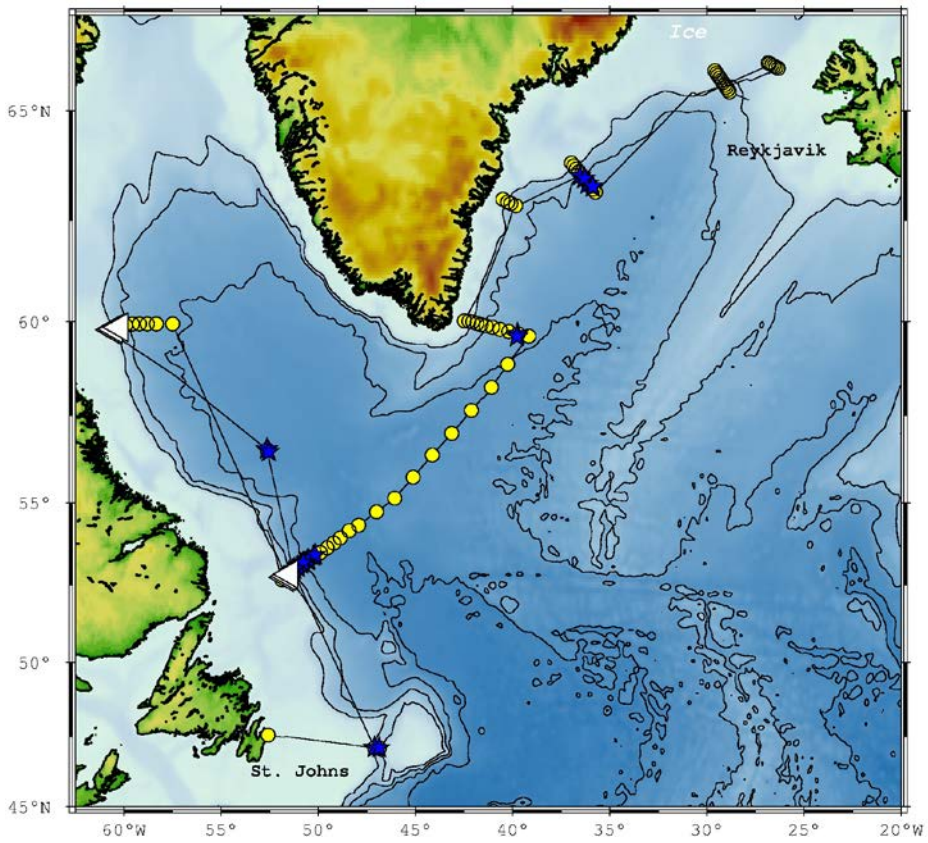
Johannes Karstensen
Helmholtz Centre for Ocean Research Kiel
GEOMAR
Düsternbrooker Weg 20
D-24105 Kiel
Tel.: +49 431 600 4156
Fax.: +49 431 600 4102
email: jkarstensen@geomar.de

Short Cruise Report
RV Maria S. Merian Cruise MSM 21/1A

St. Johns – Reykjavik
13. May – 06. June 2012
Chief scientist: Johannes Karstensen
Captain: Ralf Schmidt

RV Maria S. Merian 21/1a cruise track from St. Johns to Reykjavik. Yellow dots indicate CTD/lADCP casts, blue stars indicate mooring operations, white triangle bottom pressure sensor deployments



Objective

The Maria S. Merian expedition MSM21/1a was carried out jointly by the Institut für Meereskunde

at the KlimaCampus of the University of Hamburg and the Helmholtz Centre for Ocean Research Kiel, GEOMAR. The cruise main objectives were related to investigations on water mass transformation processes and transports in the northern North Atlantic and included:

- Recovery of a pilot-mooring array (FP1, FP2) to study the export of deep waters from the Labrador Sea through Flemish Pass
- Redeployment of five moorings (K8, K9, K10, DSOW1, DSOW2) at the southern exist of the Labrador Sea (53°N array) and enhancement of the array by one mooring (K7)
- Deployment of six bottom pressure sensors (P1 to P6) at two areas in the Labrador Sea shelf edge at three different depth (500, 100, 1500m)
- Redeployment of a mooring in the Central Irminger Sea (CIS)
- Recovery of four (G1, F2, UK1, UK2) and redeployment of two (UK1, UK2) moorings in the Denmark Strait overflow off Angmagssalik.
- Acquisition of synoptic hydrography/currents/oxygen data at key sections in the subpolar North Atlantic

The scientific aspects of this work are supported through the BMBF project “North Atlantic” and the EU FP7 project THOR. In addition to staff members from the above mentioned institutions, one technician from the U.K. Lowestoft Laboratory of CEFAS, U.K., four master students from the Universities of Kiel and Hamburg, and a bird observer from Environment Canada participated in the cruise and supported the field work conducted.

Narrative

Maria S. Merian set sail on Sunday, 13. May at 18:06 local time St. Johns, Newfoundland, Canada. A first CTD/O2/lADCP profile was taken just 10nm off the harbour at the Canadian time series station “Station 27” at 47° 32.80'N/052° 35.20W, water depth 176m. The CTD with rosette water sampler from the GEOMAR (SBE#4) was used with double T, C and O2 sensor. Moreover a Wetlabs Fluorometer/Turbidity sensor was used. The collection of DVS and sADCP data was started as well.

We headed eastward to recover two moorings at Flemish Pass (FP1&FP2) that were installed last year. Unfortunately the FP2 mooring did not respond although we used 3 different deck units, and hydrophones lowered over starboard side as well as the one installed in the moon pool of MSM. Because of heavy fog we decided to not risk a release without communication. In about 2 month time the region will be visited again by MSM with the University of Bremen and they will do another recovery attempt. In contrast, FP1 responded to the acoustic deck unit and we tracked the mooring and recovered all equipment safely.

After acquisition of two CTDs (#2, #3) at FP1 & FP2 (one was a MicroCat calibration for sensors that will be deployed at site K7) we left the Flemish Pass working area and headed north-westward to recover the K8 mooring of the 53°N array. During the transit the preparation work for the mooring recovery was done and analysis routines were tested. The CIS mooring telemetry system was set up at the deck and test messages transfered. We also started to send our CTD profile data to the Coriolis data centre for use in operational ocean & weather forecast models.

K8 was reached on Wednesday the 16. May around noon and released at 11:15 and recovered. Sea state was calm but some icebergs surrounded us and it was partially foggy. We continued to

DSOW1 (recovered 17:30) and K9 (recovered 22:00). In parallel the Iridium based telemetry system for CIS 12 was further tested. The CTD program was started (CTD#04 at K9) but we encountered problems with the temperature sensor#1. The sensor was replaced but this did not help. However, sensor T2 was operating well during the whole time. On the 17. May we recovered K10 (08:30) and DSOW2 (14:00) and a first instrument (MicroCat, Mini-T Logger) calibration cast was done. The deployment of K7 was prepared, in particular the IceCat system was assembled and the ADCP was programmed and installed in the buoyancy sphere. At 22:00 the deployment was started and at 00:30 the anchor was slipped. CTD work continued (#09 to #11) but we had some minor problems with the winch. At 10:00 we deployed DSOW1 and at 16:00 DSOW2. In between a CTD cast for MicroCat calibration and releaser test was done and at 19:00 K10 was re-deployed. The CTD program continued until 10:00 on the 19 May when K9 was deployed. K8 deployment followed at 15:00. For both deployments icebergs where sighted in our vicinity and care has been taken to not towing the mooring into an ice field.

A transit to the central Labrador Sea mooring K1 followed and allowed us to prepare the instrumentation for later deployment. Based on Canadian Coast guard ice-charts we started to discuss the best strategy for the deployment of the bottom pressure sensors at around 60°N. On Monday 21. May we reached K1 and started to recover the mooring at 07:00 after a first CTD (#17) was completed. In the afternoon at 14:00 we deployed K1 again.

The transit to the region were we wanted to deploy the bottom pressure sensor array at about 60°N began. The anticipated location was not ice free as it appeared from the charts and we continued to go further north and finally found an ice free region with water depth of about 500m and less. A CTD section perpendicular to the topography was started and the pressure sensors were deployed at 500m (POL sensor), 1000m (Kiel OBS type sensor), and 1500m (Kiel OBS type sensor) depth. The depth was sounded with the 120kHz beam echo-sounder that was corrected with a local sound speed profile. Sound speed is in the region a mainly a function of pressure only.

After finishing the CTD section we started transit back the 53°N section for the deployment of the P4 to P6 bottom pressure sensors. Meanwhile three seminar talks about the role of the Labrador Sea in the global thermohaline circulation were presented. On Friday the 25. May in the afternoon the CTD section across the 53°N array and towards the central Irminger Sea mooring began. On our way northeast, the P4 to P6 bottom pressure sensors where deployed at appropriate positions (500, 1000, 1500m water depth).

Because of favourable weather conditions we made good progress. Some problems with the salinometer were solved (persistent bubble in one cell). Some of the CTD stations were used for calibrating the recovered and to be deployed instrumentation. Further preparations for the deployment of the CIS mooring where done. The weather forecast showed that an intense low pressure will develop south of our working area and strong wind and high seas were expected. Therefore we planned to recover and deploy the CIS mooring on one day, on the 30. May. The operations went on smoothly, except that we had to search for a suitable depth to launch the mooring. The fall-back of the mooring was estimated to be 500m (about 20%) based on the last deployment. By around 21:00 the CIS mooring was re-deployed. We followed the head buoy and shortly after deployment the data telemetry system indicated that the buoy was within a few meters of the anticipated target depth.

We continued CTD cast to towards the coast while the weather was getting rougher indicating us that indeed the low pressure system developed and that it was a good idea that we processed the CIS re-deployment so quickly. After finishing the CTD section (CTD#53-CTD#62) we turned

northward towards the Angmagssalik mooring array. On our way north we stopped midway at a location where a bottom lander was deployed in 2007 that has not been recovered so far. First we were optimistic about the local ice condition but we had to learn that about 10nm offshore from the nominal lander position, the ice cover was very dense and no transit was possible. A short CTD section (CTD#63-CTD#66) at this very narrow shelf area was made to sample the denser part of the overflow waters.

On 02. June we started with the recovery of the Angmagssalik mooring array. All four moorings (F2new, G1-11, UK1-11, UK2-11) were recovered on the 02. June. Starting with CTD work along the array UK1-12 and UK2-12 were both re-deployed on the 3. June 2012. We finalized the CTD section (CTD#67-CTD#77) in the evening of the 3. June.

The remaining time was used for CTD surveys. First we transit to Denmark Strait to do a CTD section over the strait. At the beginning the most northern station was set as way-point but during the 4. June it became apparent that again the ice cover was much more dense than expected and we decided to start the section from the south and find our way as far north as possible. Unfortunately the ice cover stopped our efforts before even reaching the deepest sill depth, and hence the overflow was only touched. We sailed south and started an alternative section to monitor the outflow about 50nm south of the sill. We started the section ('E') in the middle towards the north until we encounter ice. A first ice field was crossed until a tongue of free waters was reached. As closer we could come to the shore as better because the overflow may be separated here in two, one at shallow depth (Spill jet) and one classical deep overflow and this we wanted to survey. CTD work in the ice worked very well and again we were happy to be on the MSM, a research vessel with ice class. The last CTD (#93) was finished around 21:30LT and we started our transit to Reykjavik. The scientific program ended by 03:00 switching of the sADCP. Underway data recording stopped 6. June 2012, 12:00LT. Maria S. Merian was moored around 13:30 in Reykjavik pier western part of city.

Acknowledgements

We thank Captain Ralf Schmidt, his officers and the crew of RV Maria S. Merian for their support of our observational program and the hospitality on board. It became apparent during the cruise that having a research vessel that is capable in operating in region with partial ice cover is enormous important for our work and we are particularly thankful for having access to the Merian. The ship time was provided by the Deutsche Forschungsgemeinschaft within the METEOR/MERIAN core program. Financial support for the different work carried out during the expedition was provided by the EU-project THOR and by the German Ministry of Education and Research through the “Nordatlantik Programm”. We also benefited from financial contributions by the research institutions involved.

Cruise participants science:

	Name	Function	Institut
1	Johannes Karstensen	Chief scientist	GEOMAR
2	Michael Brüdgam	CTD watch/ underway data	IfM-ZMAW
3	Rafael Abel	CTD watch / mooring data	GEOMAR
4	Steven Duffy	Bird watch	EC
5	Manuela Köllner	CTD watch / Salinometer/ O2 titration	IfM-ZMAW
6	Wiebke Martens	CTD & instrument technician	GEOMAR
7	Nadine Mengis	CTD watch leader/ CTD processing	GEOMAR
8	Neil Needham	Mooring technician	CEFAS
9	Gerd Niehus	Mooring technician	GEOMAR
10	Nuno de Abreu Nunes	CTD watch leader/ ADCP processing	IfM-ZMAW
11	Uwe Papenburg	Mooring technician	GEOMAR
12	Florian Schuette	CTD watch / Salinometer/ O2 titration	GEOMAR
13	Sandra Tippenhauer	CTD watch / lADCP processing	GEOMAR
14	Eirini Varotsou	CTD watch	IfM-ZMAW

GEOMAR: Helmholtz Centre for Ocean Research Kiel, Kiel, Germany
IfM-ZMAW: Institut für Meereskunde, KlimaCampus, University of Hamburg, Hamburg, Germany
CEFAS: Centre for Environment, Fishery and Aquaculture Science, Lowestoft, U.K.
EC: Environment Canada, Halifax, Nova Scotia, Canada

Station list

Gear coding
ROS: Rosette sampler
CTD: Conductivity/Temperature/Depth sonde
LADCP: lowered Acoustic Doppler Current Profiler
MOOR: Mooring operation
BPS: Bottom Pressure Sensor

Station No.		Date	Gear	Time	Latitude	Longitude	Water	Remarks
Event label	CTD#	2012		UTC	[°N]	[°W]	depth	
MSM 21-1a/195	1	13.05	ROS/CTD/LADCP	21:32	47° 32.79	52° 35.08	186.8	"Station 27"
MSM 21-1a/196		14.05	MOR	17:45	47° 06.30	47° 06.16	1029.3	Recovery of mooring FP2-01 failed
MSM 21-1a/197		14.05	MOR	19:51	47° 05.97	46° 51.56	1194.5	Recovery of mooring FP1-01
MSM 21-1a/197	2	14.05	ROS/CTD/LADCP	21:21	47° 05.64	46° 51.83	1187.6	
MSM 21-1a/196	3	14.05	ROS/CTD/LADCP	23:44	47° 05.99	47° 06.18	1028.7	
MSM 21-1a/198		16.05	MOR	12:16	52° 57.82	51° 18.85	2264.0	Recovery of mooring K8
MSM 21-1a/199		16.05	MOR	17:28	53° 03.29	51° 04.83	2616.2	Recovery of mooring DSOW1
MSM 21-1a/200		16.05	MOR	19:49	53° 08.74	50° 52.78	2907.3	Recovery of mooring K9
MSM 21-1a/200	4	16.05	ROS/CTD/LADCP	23:53	53° 09.93	50° 51.55	2977.9	
MSM 21-1a/201	5	17.05	ROS/CTD/LADCP	03:23	53° 15.66	50° 33.58	3184.7	
MSM 21-1a/202	6	17.05	ROS/CTD/LADCP	07:49	53° 22.81	50° 15.20	3388.0	
MSM 21-1a/202		17.05	MOR	09:23	53° 23.34	50° 15.32	3388.0	Recovery of mooring K10
MSM 21-1a/203		17.05	MOR	14:51	53° 15.86	50° 33.29	3200.0	Recovery of mooring DSOW2
MSM 21-1a/204	7	17.05	ROS/CTD/LADCP	19:39	53° 01.86	51° 06.98	2551.3	
MSM 21-1a/205		17.05	MOR	23:15	52° 54.62	51° 30.55	1777.6	Deployment of mooring K7
MSM 21-1a/205	8	18.05	ROS/CTD/LADCP	02:01	52° 50.76	51° 29.09	1480.0	Stopped cast because of sensor problems
MSM 21-1a/205	9	18.05	ROS/CTD/LADCP	03:38	52° 50.76	51° 29.08	1480.0	During upcast ship had to move because of an iceberg
MSM 21-1a/206	10	18.05	ROS/CTD/LADCP	05:42	52° 45.90	51° 37.95	816.2	

Station No.		Date	Gear	Time	Latitude	Longitude	Water	Remarks
Event label	CTD#	2012		UTC	[°N]	[°W]	depth	
MSM 21-1a/207	11	18.05	ROS/CTD/LADCP	10:03	53° 02.80	51° 04.80	2634.9	Stopped cast because of problems with the communication with the CTD
MSM 21-1a/207		18.05	MOR	11:05	53° 04.03	51° 03.17	2714.4	Deployment of mooring DSOW1
MSM 21-1a/208		18.05	MOR	14:16	53° 16.73	50° 30.65	3206.1	Deployment of mooring DSOW2
MSM 21-1a/209	12	18.05	ROS/CTD/LADCP	17:15	53° 19.60	50° 22.16	3338.4	
MSM 21-1a/210		18.05	MOR	20:23	53° 26.55	50° 09.97	3852.7	Deployment of mooring K10
MSM 21-1a/210	13	19.05	ROS/CTD/LADCP	00:24	53° 22.44	50° 15.86	3382.0	
MSM 21-1a/211	14	19.05	ROS/CTD/LADCP	04:59	53° 12.20	50° 42.00	3148.3	
MSM 21-1a/212	15	19.05	ROS/CTD	08:20	53° 08.26	50° 52.27	2779.6	No LADCP due to starting problems
MSM 21-1a/212		19.05	MOR	10:55	53° 11.81	50° 46.34	3099.2	Deployment of mooring K9
MSM 21-1a/213		19.05	MOR	16:07	52° 59.62	51° 13.34	2377.0	Deployment of mooring K8
MSM 21-1a/213	16	19.05	ROS/CTD/LADCP	19:12	52° 56.92	51° 19.36	2214.9	
MSM 21-1a/214	17	21.05	ROS/CTD/LADCP	04:22	56° 31.95	52° 38.15	3525.5	Ship had to move during the cast due to problems with the winch
MSM 21-1a/214		21.05	MOR	08:07	56° 32.64	52° 38.46	3522.5	Recovery of mooring K1
MSM 21-1a/215		21.05	MOR	14:42	56° 28.71	52° 32.54	3544	Deployment of mooring K1
MSM 21-1a/216	18	22.05	ROS/CTD/LADCP	23:35	59° 45.75	60° 42.47	300.7	
MSM 21-1a/217	19	23.05	ROS/CTD/LADCP	00:30	59° 47.37	60° 37.28	499.2	
MSM 21-1a/217		23.05	BPS	00:46	59° 47.37	60° 37.28	500.2	Deployment of Bottom pressure sensor 1
MSM 21-1a/218	20	23.05	ROS/CTD/LADCP	01:37	59° 48.55	60° 30.77	999.8	
MSM 21-1a/218		23.05	BPS	02:01	59° 48.55	60° 30.77	1001.6	Deployment of Bottom pressure sensor 2
MSM 21-1a/219	21	23.05	ROS/CTD/LADCP	04:13	59° 51.04	60° 14.47	1504.0	
MSM 21-1a/219		23.05	BPS	04:41	59° 51.05	60° 14.47	1504.0	Deployment of Bottom pressure sensor 3
MSM 21-1a/220	22	23.05	ROS/CTD/LADCP	06:29	59° 54.26	59° 55.30	1768.7	
MSM 21-1a/221	23	23.05	ROS/CTD/LADCP	08:52	59° 56.23	59° 34.18	2229.3	
MSM 21-1a/222	24	23.05	ROS/CTD/LADCP	11:31	59° 56.50	59° 11.99	2542.6	
MSM 21-1a/223	25	23.05	ROS/CTD/LADCP	14:40	59° 56.51	58° 47.91	2586.9	
MSM 21-1a/224	26	23.05	ROS/CTD/LADCP	17:44	59° 56.50	58° 19.96	2701.5	
MSM 21-1a/225	27	23.05	ROS/CTD/LADCP	21:42	59° 56.49	57° 29.96	2853.5	
MSM 21-1a/226	28	25.05	ROS/CTD/LADCP	16:13	52° 39.99	51° 52.94	307.7	
MSM 21-1a/227	29	25.05	ROS/CTD/LADCP	17:48	52° 44.61	51° 41.79	500.3	
MSM 21-1a/227		25.05	BPS	18:07	52° 44.61	51° 41.80	500.0	Deployment of Bottom pressure sensor 4
MSM 21-1a/228	30	25.05	ROS/CTD/LADCP	19:22	52° 46.98	51° 35.82	1004.0	
MSM 21-1a/228		25.05	BPS	19:48	52° 46.98	51° 35.82	999.6	Deployment of Bottom pressure sensor 5
MSM 21-1a/229	31	25.05	ROS/CTD/LADCP	21:01	52° 50.17	51° 28.45	1497.2	
MSM 21-1a/229		25.05	BPS	21:34	52° 50.17	51° 28.45	1496.9	Deployment of Bottom pressure sensor 6
MSM 21-1a/230	32	25.05	ROS/CTD/LADCP	22:44	52° 52.30	51° 22.65	1979.5	
MSM 21-1a/231	33	26.05	ROS/CTD/LADCP	00:42	52° 55.40	51° 15.89	2281.1	
MSM 21-1a/232	34	26.05	ROS/CTD/LADCP	03:25	53° 00.72	51° 02.65	2597.4	Ship had to turn during downcast because the rope touched the ship
MSM 21-1a/233	35	26.05	ROS/CTD/LADCP	06:14	53° 06.20	50° 50.40	2945.1	
MSM 21-1a/234	36	26.05	ROS/CTD/LADCP	09:31	53° 13.90	50° 34.08	3187.8	

Station No.		Date	Gear	Time	Latitude	Longitude	Water	Remarks
Event label	CTD#	2012		UTC	[°N]	[°W]	depth	
MSM 21-1a/235	37	26.05	ROS/CTD/LADCP	12:52	53° 21.55	50° 14.08	3431.0	
MSM 21-1a/236	38	26.05	ROS/CTD/LADCP	18:02	53° 30.11	49° 53.64	3561.0	
MSM 21-1a/237	39	26.05	ROS/CTD/LADCP	22:10	53° 38.83	49° 32.85	3663.0	
MSM 21-1a/238	40	27.05	ROS/CTD/LADCP	00:49	53° 47.86	49° 12.16	3743.0	
MSM 21-1a/239	41	27.05	ROS/CTD/LADCP	05:38	53° 57.02	48° 52.05	3776.2	
MSM 21-1a/240	42	27.05	ROS/CTD/LADCP	09:53	54° 10.00	48° 24.95	3789.0	
MSM 21-1a/241	43	27.05	ROS/CTD/LADCP	14:09	54° 20.05	47° 55.05	3833.0	
MSM 21-1a/242	44	27.05	ROS/CTD/LADCP	20:55	54° 44.00	46° 59.85	3459.0	
MSM 21-1a/243	45	28.05	ROS/CTD/LADCP	02:31	55° 08.01	46° 04.03	3408.0	
MSM 21-1a/244	46	28.05	ROS/CTD/LADCP	09:21	55° 45.00	45° 07.00	3277.0	
MSM 21-1a/245	47	28.05	ROS/CTD/LADCP	15:30	56° 23.00	44° 08.03	3356.0	
MSM 21-1a/246	48	28.05	ROS/CTD/LADCP	22:27	57° 00.00	43° 08.01	3478.0	
MSM 21-1a/247	49	29.05	ROS/CTD/LADCP	05:42	57° 37.99	42° 07.05	3318.4	
MSM 21-1a/248	50	29.05	ROS/CTD/LADCP	12:07	58° 16.00	41° 05.00	3172.9	
MSM 21-1a/249	51	29.05	ROS/CTD/LADCP	18:03	58° 52.99	40° 14.97	3044.0	
MSM 21-1a/250	52	30.05	ROS/CTD/LADCP	01:02	59° 37.49	39° 09.51	2892.0	
MSM 21-1a/251	53	30.05	ROS/CTD/LADCP	04:52	59° 41.05	39° 42.09	2782.0	
MSM 21-1a/252		30.05	MOR	06:40	59° 40.74	39° 44.44	2778.7	Recovery of mooring CIS
MSM 21-1a/253	54	30.05	ROS/CTD/LADCP	13:39	59° 44.50	40° 11.80	2648.0	
MSM 21-1a/254		30.05	MOR	16:01	59° 36.65	39° 45.88	2831.9	Deployment of mooring CIS
MSM 21-1a/255	55	31.05	ROS/CTD/LADCP	01:16	59° 48.00	40° 38.50	2587.0	
MSM 21-1a/256	56	31.05	ROS/CTD/LADCP	04:24	59° 51.11	41° 02.01	2150.0	
MSM 21-1a/257	57	31.05	ROS/CTD/LADCP	06:42	59° 53.25	41° 21.75	1925.7	
MSM 21-1a/258	58	31.05	ROS/CTD/LADCP	08:45	59° 55.25	41° 37.25	1846.1	
MSM 21-1a/259	59	31.05	ROS/CTD/LADCP	10:43	59° 57.27	41° 50.18	1810.1	
MSM 21-1a/260	60	31.05	ROS/CTD/LADCP	12:45	59° 59.52	42° 03.10	989.8	
MSM 21-1a/261	61	31.05	ROS/CTD/LADCP	13:59	60° 00.65	42° 15.18	471.0	
MSM 21-1a/262	62	31.05	ROS/CTD/LADCP	14:52	60° 01.13	42° 28.73	182.0	
MSM 21-1a/263	63	01.06	ROS/CTD/LADCP	12:25	62° 59.87	40° 30.03	235.3	
MSM 21-1a/264	64	01.06	ROS/CTD/LADCP	14:10	62° 55.99	40° 15.04	1316.0	
MSM 21-1a/265	65	01.06	ROS/CTD/LADCP	15:50	62° 53.99	40° 05.04	1651.0	
MSM 21-1a/266	66	01.06	ROS/CTD/LADCP	17:49	62° 51.00	39° 50.04	1825.7	
MSM 21-1a/267		02.06	MOR	09:39	63° 32.48	36° 31.70	1760.0	Recovery of mooring F2New
MSM 21-1a/268		02.06	MOR	12:11	63° 28.74	36° 18.80	1966.0	Recovery of mooring UK1
MSM 21-1a/269		02.06	MOR	14:07	63° 21.03	36° 08.24	2189.0	Recovery of mooring G1
MSM 21-1a/270		02.06	MOR	16:11	63° 16.76	35° 52.93	2340.0	Recovery of mooring UK2
MSM 21-1a/271	67	02.06	ROS/CTD/LADCP	21:21	63° 50.00	36° 58.01	351.2	
MSM 21-1a/272	68	02.06	ROS/CTD/LADCP	22:29	63° 46.00	36° 50.52	653.0	
MSM 21-1a/273	69	02.06	ROS/CTD/LADCP	23:56	63° 42.00	36° 43.01	1688.0	

Station No.		Date	Gear	Time	Latitude	Longitude	Water	Remarks
Event label	CTD#	2012		UTC	[°N]	[°W]	depth	
MSM 21-1a/274	70	03.06	ROS/CTD/LADCP	01:45	63° 38.00	36° 35.51	1638.2	
MSM 21-1a/275	71	03.06	ROS/CTD/LADCP	03:26	63° 34.01	36° 28.08	1773.7	
MSM 21-1a/276	72	03.06	ROS/CTD/LADCP	05:14	63° 30.02	36° 20.51	1911.0	
MSM 21-1a/277	73	03.06	ROS/CTD/LADCP	07:09	63° 26.00	36° 13.01	2075.7	
MSM 21-1a/278	74	03.06	ROS/CTD/LADCP	09:07	63° 22.00	36° 06.01	2176.5	
MSM 21-1a/279		03.06	MOR	10:53	63° 29.00	36° 17.34	1977.6	Deployment of mooring UK1
MSM 21-1a/280	75	03.06	ROS/CTD/LADCP	14:19	63° 18.02	35° 59.03	2278.9	
MSM 21-1a/281		03.06	MOR	15:28	63° 17.77	35° 54.17	2316.9	Deployment of mooring UK2
MSM 21-1a/282	76	03.06	ROS/CTD/LADCP	17:24	63° 14.00	35° 51.58	2384.0	
MSM 21-1a/283	77	03.06	ROS/CTD/LADCP	19:43	63° 10.00	35° 44.01	2481.9	
MSM 21-1a/284	78	04.06	ROS/CTD/LADCP	21:32	65° 54.00	26° 19.55	286.0	
MSM 21-1a/285	79	04.06	ROS/CTD/LADCP	22:19	65° 55.51	26° 26.13	286.0	
MSM 21-1a/286	80	04.06	ROS/CTD/LADCP	23:05	65° 57.00	26° 32.58	286.0	
MSM 21-1a/287	81	04.06	ROS/CTD/LADCP	23:49	65° 58.51	26° 39.13	278.0	
MSM 21-1a/288	82	05.06	ROS/CTD/LADCP	00:34	65° 59.98	26° 45.53	375	
MSM 21-1a/289	83	05.06	ROS/CTD/LADCP	01:26	66° 00.95	26° 50.07	482	
MSM 21-1a/290	84	05.06	ROS/CTD/LADCP	06:55	65° 33.00	29° 05.04	1089	
MSM 21-1a/291	85	05.06	ROS/CTD/LADCP	08:11	65° 35.99	29° 10.04	976.6	
MSM 21-1a/292	86	05.06	ROS/CTD/LADCP	09:19	65° 38.98	29° 14.96	755.9	
MSM 21-1a/293	87	05.06	ROS/CTD/LADCP	10:20	65° 41.97	29° 19.95	515.0	
MSM 21-1a/294	88	05.06	ROS/CTD/LADCP	11:33	65° 44.95	29° 25.01	371.9	
MSM 21-1a/295	89	05.06	ROS/CTD/LADCP	12:48	65° 47.98	29° 29.90	313.0	
MSM 21-1a/296	90	05.06	ROS/CTD/LADCP	14:36	65° 51.01	29° 34.98		
MSM 21-1a/297	91	05.06	ROS/CTD/LADCP	18:34	65° 29.99	29° 00.02	1217.4	
MSM 21-1a/298	92	05.06	ROS/CTD/LADCP	19:58	65° 26.95	28° 54.94	1276.0	
MSM 21-1a/299	93	05.06	ROS/CTD/LADCP	21:18	65° 23.98	28° 50.10	1300.6	