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### Short Cruise Report RV Maria S Merian MSM74

St. Johns, Canada – Reykjavik, Iceland 25. May – 26. June 2018 Chief Scientist: Dr. Johannes Karstensen Captain: Ralf Schmidt



RV Maria S. Merian MSM74 cruise track from St. Johns to Reykjavik. Yellow dots indicate CTD/IADCP/UVP casts, red stars indicate mooring operations (some mooring names are given for orientation), ADCP (75kHz, 38kHz) surveys (black) tracks are shown. The map inlet shows the 53°N Array area.

## Objectives

The North Atlantic Ocean is regarded as a major driver of large-scale climate variability on interannual and longer time scales. In particular, it has previously been shown that the relatively mild climate in northern Europe is largely due to the northeastward transport of warm, subtropical water in the North Atlantic Current, which connects the warm, subtropical gyre and the cold, subpolar gyre. The North Atlantic Current is thought to be, in turn, influenced by the water mass transformation of surface water in the northern North Atlantic – north of the Greenland-Scotland Ridges and in the Labrador and Irminger Seas. By cooling, the surface water becomes denser and sinks into the deep ocean where it spreads southward, preferentially within the "Deep Western Boundary Currents" (DWBC) on the western side of the North Atlantic. Besides waters formed in the subpolar gyre, the DWBC also transport water from the overflow regions. Changes in the magnitude and hydrographic characteristics of the DWBC represent therefore the integrated effect of variations in the different processes in the water mass formation and overflow regions. In order to identify the individual sources of the variability of the DWBC, it is critical to survey the DWBC regularly, with high temporal and spatial resolution and over long periods of time.

Thus, the objective of the MARIA S. MERIAN MSM74 expedition was to study the intensity of the water mass transformation and the southward transport in the DWBC.In addition, the vertical distribution of temperature, salinity, density, oxygen, optical properties and flow velocity was measured along selected sections, the near surface salinity and temperature was continuously monitored with the thermosalinograph, meteorological data was recorded and the flow velocity up to a depth of 1300 m was acquired with ship ADCPs throughout the cruise. The expedition contributed to national (RACE) and international projects (OSNAP, AtlantOS).

### Narrative

The Maria S. Merian arrived on the 22<sup>nd</sup> of May 2018 in the morning in St. Johns, Canada, at the end of the MSM73 expedition (CS: D. Kieke, University Bremen). On the afternoon of the same day, container movement started – for MSM74 in total 8 containers were operated: 6 went on board incl. a lab container from Dalhousie and a workshop container from NOC; 2 container were loaded to the ship from the pier. Over the following, days the equipment was installed, labs prepared and science crew briefings were done.

On 25<sup>th</sup> of May, the Merian left at 8:30am for the bunker pier, and the MSM74 cruise started at 3:00pm, when Maria S. Merian left the bunker pier. Shortly after the safety drill (3:30pm) we reached the 1<sup>st</sup> station (Station 27 – Canadian Time Series) and a first CTD cast was conducted. Then we began the transit to our first operation area ("53°N Array") and which took about 1.5 days. When the ship was outside of the 3nm zone the underway data acquisition was switched on and recording started. We arrived in the afternoon of the 26<sup>th</sup> of May at the 53°N Array area and recovered the first mooring, which was the K7 mooring. The weather was grey and snowy/rainy but calm. During the night, CTD casts were done that also included biogeochemical sampling of the Dalhousie group. On the 27th of May 2018 we recovered four moorings (DSOW1, K9, DSOW2, K10) starting at 06:00 and finishing at 21:00. CTD casts followed including a first "double cast" with 150 m only for biology and full depth for CTD/biogeochemical sampling. The full depth cast was also used for calibration of SeaBird Microcats (MC), Nortek Aquadopps current meters, and mooring acoustic releasers. The weather was in general sunny and calm with sporadic snowfall. A first biological sampling was done. What followed was an incubation experiment that was executed in the 6°C scientific cold storage room (Dalhousie University group). On the 28<sup>th</sup> of May we recovered DSOW5, the outermost mooring of the 53°N Array. Some irregularities (outages) of the CTD occurred which could be tracked back to the new (unproven) IADCP voltage supply (via the CTD wire). We thus moved back to the battery pack system from GEOMAR. Later (up to cast 13) this system was malfunctioning because of a battery leakage and we used the University Hamburg battery container (RDI original container). For the upcoming re-deployments a number of instruments required reading out the data and preparation of the devices. Ciara Willis (Dalhousie) did some taxonomy work on Plankton images recorded with the UVP (provided by Anya Waite, AWI; Bremerhaven, Germany). On the 29<sup>th</sup> of May the last of the 53°N Array moorings was recovered (K8) and K10 and DSOW5 were deployed. We approached the shelf (CTD Station 21) on the 30<sup>th</sup> of May 2018 and encountered some growlers but they did not limit navigation of the ship. Heading back we deployed a number of CTDs until we reached the northeastern most part of the 53N Array where the first Argo float was deployed Later, the moorings K9 and DSOW2 were also deployed.

We then left the 53°N Array area and recovered the WHOI (USA; Amy Bower) Sound Source 01 (SS01) on the 1<sup>st</sup> of June on our way to the northwest. Working up the devices recovered the days before we realized that the motor of the McLane moored profiler was flooded and the device did not record data. Heading further to the northwest, on the 2<sup>nd</sup> of June we recovered K1 in the morning. The mooring showed many wire turns in the upper part most likely related to the break-off of the surface telemetry system in December 2017. The wire suggested that the break was due to a not well manufactured connector (a part purchased from the manufacturer of the MI.SAT I buoy). The recovery of the WHOI sound source 02, located northwest of K1, was delayed because no communicating with the releaser could be established. Only after changing from the former "best estimated position (Thallassa MSM40 cruise) towards "anchor drop" location the floating surface elements were spotted. As a consequence, recovery started late (7:30pm) and went on until 9:30pm. On the 3<sup>rd</sup> of June K1 was deployed and calibration casts were performed. The original plan to deploy the remaining two Argo floats in the K1 area was postponed because of problems with the pH sensors (calibration sheets).

The following days were dedicated to the CTD program along the "OSNAP west" section. The weather and waves were getting bad (wave height >9m) which caused intense roll of the ship (maximum roll angle of 26°). Therefore, CTD work was stopped and we changed the ship's course from 310° to 270° to better align with the wave and wind. During the 5<sup>th</sup> of June we mostly steamed westward on a reasonable course until late night. The scientific meetings during these days were filled with discussions on the first results/observations of the cruise. In the morning of 6<sup>th</sup> of June we started navigating towards the lander mooring deployment position and realized that we crossed a very intense mesoscale eddy. The eddy field was composed by a cyclone surrounded by up to four anticyclonic eddies composing a rather symmetric structure. The ADCP & CTD survey of eddies continued until we were close to the Greenlandic coast. Only few icebergs were spotted.

On the 7<sup>th</sup> of June we prepared the lander mooring deployment, which took place on the 8<sup>th</sup> of June, starting with a calibration (sound profile) CTD at the approximate target position of the lander. It revealed that the sea floor was very structured and the depth was very variable. Because we did not had a lander launching device on board we used the "Ranger 2" device (which like POSIDONIA is an underwater positioning system) for SBLN of the CTD. By knowing the exact CTD position and depth it helped to position the lander mooring on the sea floor. What followed was a very detailed bathymetric survey, which again nicely revealed a very steep and complex topography with many ridges and valleys. However, we identified a valley that appeared suitable for the deployment we envisioned

but of course different from were we did the earlier CTD. Finally we deployed the lander at a water depth of about 930 m. A CTD was done close to the deployment spot which showed a surprisingly different T/S profile compared to the earlier station, only about 1 km away.

We then transited to the northern part of the OSNAP West section, close to Greenland, and worked our way south with CTD stations on the shelf and through the DWBC following the OSNAP line. On our way south we recovered, and deployed shortly after, the two short DWBC extension moorings DSOW4/3 on the West-Greenland side (contributions to the WHOI array, Bob Pickard, USA). A second and better-targeted eddy survey was started along a more zonal track and mainly with ADCP (38kHz and 75kHz) and only a few CTDs stations at selected positions. In the centre of the cyclonic (the inner) eddy two Argo floats were deployed on the 12<sup>th</sup> of June early morning and after that we completed two more CTD casts, one with full carbon/nutrient observations. After heading further northwest, the edge of the cyclonic eddy was reached and a 4h Yo-Yo CTD, covering the lower LSW range (1100 to 1900m), was performed to follow the evolution of a warm/saline intrusion driven by a subsurface filament. We moved east towards the beginning (most southerly position) of the Kap Farvel section, starting on the 14<sup>th</sup> of June. While approaching the coast the wind increased substantially up to 9 Bft. Still, we had clear view on the coast during the last CTD station only about 3 nm away from land. After finishing the Kap Farvel section we moved north-northeast and started the OSNAP East section in the evening of the 14<sup>th</sup> of June. We continued with CTD stations the full night, including station 100, and began recovery of the M1 to M3 moorings from NOC Southampton, UK on the 16<sup>th</sup> of June at 6am. The NOC mooring operations were part of the BARTER agreement added to the cruise. All three moorings were fully recovered by 13:30. In the afternoon the RV Neil Armstrong appeared on our radar and the two ships passed each other in a distance of about 2 nm and we exchanged information via HF radio.

In the morning of the 17<sup>th</sup> of June we recovered the CIS mooring. The upper (the "slack") part of the mooring, designed from "Meteor rope", was missing and unfortunately also the upper two MicroCat instruments. The weather was calm and the recovery went well. Similarly, the LOCO mooring was recovered after CIS on the 17<sup>th</sup> of June. LOCO belongs to the NIOZ, Netherlands, and was also recovered as part of the BARTER charter that was added to the MSM74 cruise. We continued with CTD station until 18<sup>th</sup> of June when we recovered the last two moorings of the NOC OSNAP array.

The CTD program continued until on the 19<sup>th</sup> of June at about 3am when a shortage in the electric system of the ship occurred. The shortage damaged parts of one engine and the pump-jet and made navigation at station difficult. Attempts to replace the broken part kept going until 20<sup>th</sup> of June 8 am, when it was decided to leave the area for Reykjavik – thus losing a bit more than 4 days of ship time. Over the next days all groups on the ship prepared for the early arrival by packing equipment, documenting the cruise, and preparing for demobilization. Last salinity samples were analysed with the salinometer and a first release of the final CTD data set created. The ships ADCPs & TSG/Underway data were switched off 22<sup>nd</sup> of June 2018. We arrived in Reykjavik, Iceland, on Friday 22<sup>nd</sup> of June 2018 at 16:00. Further container packing was done. Transportation to the different destinations (RV Neil Armstrong; GEOMAR; Dalhousie University) was prepared and containers were unloaded from the ship on the 26<sup>th</sup> of June 2018.

### Acknowledgement

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 and friendliness 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 German Federal Ministry of Education and Research through "RACE II", by the EU H2020 project AtlantOS. We also benefited from financial contributions by the research institutions involved.

Name/Name	Aufgabe/Task	Institut/Institute
Dr. Johannes Karstensen	Fahrtleiter/Chiefscientist	GEOMAR
Christian Begler	Mooring lead, telemetry	GEOMAR
Wiebke Martens	Mooring Instruments, CTD tech.	GEOMAR
Rene Witt	Mooring, Logistics	GEOMAR
Tom Roberts	Mooring, Logistics	NOC
Dr. Penny Holliday	Mooring data, 0.5 CTD watch	NOC
Dr. Marilena Oltmanns	Mooring data respons.; CTD watch lead	GEOMAR
Arne Bendinger	IADCP respons.; CTD watch lead	CAU Kiel
Dr. Sunke Schmidtko	CTD respons.; CTD watch lead	GEOMAR
Thea Suits	Mooring data; CTD watch	CAU Kiel
Ilmar Leimann	UVP; CTD watch	CAU Kiel
Nora Fried	Salinometer respons., 0.5 CTD watch	CAU Kiel
Marie Hundsdörfer	Argo float; Real-time data; CTD watch	CAU Kiel
Dr. Joachim Ribbe	Salino helper; CTD watch	USQ
Nicolai v. Oppeln-Bronikowski	DVS & OSNAP Blog; CTD watch	Memorial
Alexandre Barboni	ADCP respons. & CTD watch	ENS
Dr. Dariia Atamanchuk	Oxy sensors & titration; Dal. team lead	Dalhousie
Liz Kerrigan	Nutrient analysis	Dalhousie
Claire Normandeau	DIC-13, TA and nutrients	Dalhousie
Ciara Willis	helper chemistry/biology	Dalhousie
Dr. Debany Fonseca	team lead Biology	Dalhousie

#### MSM 74 cruise participants (science crew)

#### Institution

**GEOMAR** (Helmholtz Zentrum für Ozeanforschung Kiel, Kiel, Germany) **CAU Kiel** (Christian-Albrechts-Universität Kiel, Germany) **NOC** (National Oceanographic Centre, Southampton, UK) **Dalhousie** (Dalhousie University, South St, Halifax, Canada) **USQ** (University of Southern Queensland, Toowoomba, Queensland, Australia) **Memorial** (Memorial University, St. Johns, Newfoundland, Canada)



Science crew participants Maria S Merian MSM74 expedition

# **Station list Maria S Merian MSM74**

Gear coding

CTD: CTD/lowered Acoustic Doppler Current Profiler/UVP and rosette sampler

MOOR: Mooring operation (Moor code: XXXRe – recovery; XXXDe – deployment (XXX internal code))

TSG, EM122, ADCP: Underway devices

Station	Date	Time	Device	Latitude	Longitude	Depth	CTD #/Moor
MSM74 1-1	25/05/18	18:57:09	Code	47° 32,799' N	052° 35,198' W	182.7	1
MSM74 0-4	25/05/18	19:22:21	TSG	47° 27.966' N	051° 23.208' W	127.1	Start
MSM74 0-3	25/05/18	19:22:21	ADCP	47° 35.534' N	052° 34.080' W	180.4	Start
 MSM74_0-2	25/05/18	20:15:40	EM122	47° 46.912' N	052° 29.883' W	170.5	Start
MSM74_2-1	26/05/18	21:48:00	MOOR	52° 50.354' N	051° 31.585' W	1445.4	Start
 MSM74_3-1	26/05/18	22:47:02	CTD	52° 50.414' N	051° 32.892' W	1388.8	2
MSM74_4-1	27/05/18	1:26:23	CTD	52° 52.742' N	051° 22.941' W	2009.8	3
MSM74_5-1	27/05/18	3:57:19	CTD	52° 56.528' N	051° 16.005' W	2317.0	4
MSM74_6-1	27/05/18	6:59:35	CTD	52° 59.208' N	051° 08.300' W	2418.9	5
MSM74_7-1	27/05/18	10:05:22	MOOR	53° 02.185' N	051° 02.902' W	2635.6	DSOW1 Re
MSM74_8-1	27/05/18	13:41:21	MOOR	53° 08.731' N	050° 50.345' W	2882.9	K9 Re
MSM74_9-1	27/05/18	17:37:36	MOOR	53° 16.379' N	050° 34.760' W	3152.7	DSOW2 Re
MSM74_10-1	27/05/18	22:17:12	MOOR	53° 24.282' N	050° 15.401' W	nan	K10 Re
MSM74_11-1	27/05/18	23:03:03	CTD	53° 23.243' N	050° 15.242' W	3363.3	6
MSM74_11-2	28/05/18	2:10:17	CTD	53° 23.245' N	050° 15.238' W	3363.6	7
MSM74_12-1	28/05/18	6:28:22	CTD	53° 24.016' N	050° 07.030' W	3475.6	8
MSM74_13-1	28/05/18	10:48:02	MOOR	53° 35.553' N	049° 47.314' W	3604.6	DSOW5/ Re
MSM74_14-1	28/05/18	12:53:05	CTD	53° 32.489' N	049° 45.176' W	3587.6	9
MSM74_15-1	28/05/18	15:28:59	MOOR	53° 35.579' N	049° 47.010' W	3598.7	DSOW5 De
MSM74_16-1	28/05/18	20:37:26	MOOR	53° 23.133' N	050° 16.054' W	3366.8	K10 De
MSM74_17-1	28/05/18	23:03:33	CTD	53° 24.129' N	050° 14.069' W	3398.9	10
MSM74_18-1	29/05/18	2:46:06	CTD	53° 17.878' N	050° 22.358' W	3307.7	11
MSM74_19-1	29/05/18	5:44:54	CTD	53° 15.008' N	050° 29.271' W	3205.2	12
MSM74_20-1	29/05/18	9:44:52	CTD	53° 07.451' N	050° 47.726' W	3011.2	13
MSM74_21-1	29/05/18	13:30:48	CTD	53° 02.830' N	051° 00.146' W	2719.2	14
MSM74_22-1	29/05/18	18:23:37	MOOR	52° 56.372' N	051° 17.987' W	2247.8	K8 Re
MSM74_23-1	29/05/18	20:24:48	CTD	52° 53.217' N	051° 23.475' W	1974.3	15
MSM74_23-2	29/05/18	23:25:30	CTD	52° 53.219' N	051° 23.477' W	1976.2	16
MSM74_24-1	30/05/18	1:49:11	CTD	52° 47.845' N	051° 36.730' W	1008.5	17
MSM74_25-1	30/05/18	3:25:39	CTD	52° 45.447' N	051° 42.450' W	505.3	18
MSM74_26-1	30/05/18	5:29:12	CTD	52° 37.091' N	052° 03.366' W	295.1	19
MSM74_26-2	30/05/18	6:32:29	CTD	52° 37.090' N	052° 03.364' W	295.3	20
MSM74_27-1	30/05/18	8:37:28	CTD	52° 32.552' N	052° 30.759' W	248.7	21
MSM74_28-1	30/05/18	14:34:43	MOOR	52° 50.573' N	051° 32.817' W	1403.4	K7 De
MSM74_29-1	30/05/18	17:59:16	MOOR	52° 57.653' N	051° 18.572' W	2227.2	K8 De
MSM74_30-1	30/05/18	20:24:54	MOOR	53° 02.968' N	051° 04.703' W	2617.0	DSOW1 De
MSM74_31-1	31/05/18	0:42:00	CTD	52° 59.355' N	051° 08.170' W	2420.8	22
MSM74_32-1	31/05/18	4:26:45	CTD	53° 11.690' N	050° 37.629' W	3147.1	23
MSM74_33-1	31/05/18	8:49:52	CTD	53° 15.010' N	050° 29.382' W	3444.8	24
MSM74_34-1	31/05/18	14:20:08	MOOR	53° 08.580' N	050° 52.376' W	2901.5	K9 De
MSM74_35-1	31/05/18	16:52:24	MOOR	53° 15.402' N	050° 33.092' W	3154.5	DSOW2 De

MSM74_36-1	31/05/18	18:58:09	CTD	53° 17.850' N	050° 22.393' W	3302.0	25
MSM74_37-1	31/05/18	22:34:20	CTD	53° 23.993' N	050° 07.038' W	3473.1	26
MSM74_37-2	01/06/18	1:26:12	FLOAT	53° 23.977' N	050° 07.003' W	3465.6	Float8506 De
MSM74_38-1	01/06/18	4:13:27	CTD	53° 32.522' N	049° 45.173' W	3827.9	27
MSM74_38-2	01/06/18	6:47:13	CTD	53° 32.522' N	049° 45.173' W	3588.5	28
MSM74_39-1	01/06/18	10:59:23	CTD	54° 01.373' N	049° 39.318' W	3645.6	29
MSM74_40-1	01/06/18	15:42:45	CTD	54° 30.209' N	049° 33.436' W	3854.8	30
MSM74_41-1	01/06/18	21:08:12	MOOR	54° 58.862' N	049° 28.966' W	0.0	SS01 Re
MSM74_41-2	01/06/18	22:37:41	CTD	54° 58.863' N	049° 28.969' W	3639.4	31
MSM74_42-1	02/06/18	14:29:09	MOOR	56° 34.728' N	052° 41.152' W	3482.0	K1 Re
MSM74_43-1	02/06/18	23:02:25	MOOR	57° 31.130' N	054° 01.835' W	3356.4	SS02 Re
MSM74_44-1	03/06/18	0:57:19	CTD	57° 30.395' N	053° 59.986' W	3364.1	32
MSM74_45-1	03/06/18	10:03:00	CTD	56° 33.693' N	052° 39.442' W	3728.3	33
MSM74_45-2	03/06/18	12:22:41	CTD	56° 33.691' N	052° 39.442' W	3483.2	34
MSM74_45-3	03/06/18	14:56:35	CTD	56° 33.689' N	052° 39.445' W	3493.7	35
MSM74_46-1	03/06/18	21:36:10	MOOR	56° 34.168' N	052° 39.622' W	3489.9	K1 De
MSM74_47-1	04/06/18	10:46:00	CTD	55° 27.846' N	049° 21.999' W	3670.8	36
MSM74_48-1	04/06/18	15:55:45	CTD	55° 56.683' N	049° 15.779' W	3957.4	37
MSM74_49-1	04/06/18	21:41:26	CTD	56° 25.986' N	049° 09.695' W	3940.8	38
MSM74_50-1	05/06/18	3:48:58	CTD	56° 54.417' N	049° 03.947' W	3623.7	39
MSM74_51-1	06/06/18	5:51:36	CTD	57° 26.998' N	051° 41.955' W	3531.6	40
MSM74_52-1	06/06/18	11:32:36	CTD	57° 45.602' N	050° 58.591' W	3578.1	41
MSM74_52-2	06/06/18	13:48:28	CTD	57° 46.106' N	050° 56.463' W	3830.2	42
MSM74_53-1	06/06/18	17:42:25	CTD	58° 07.408' N	050° 59.828' W	0.0	43
MSM74_54-1	06/06/18	23:13:25	CTD	58° 36.029' N	050° 59.995' W	3528.1	44
MSM74_55-1	07/06/18	5:00:47	CTD	59° 11.999' N	051° 00.138' W	3477.3	45
MSM74_56-1	07/06/18	9:59:30	CTD	59° 40.315' N	050° 59.976' W	3422.5	46
MSM74_57-1	07/06/18	14:10:10	CTD	60° 00.004' N	050° 59.975' W	3306.1	47
MSM74_58-1	07/06/18	18:48:43	CTD	60° 24.013' N	051° 00.012' W	3160.0	48
MSM74_59-1	08/06/18	0:38:28	CTD	60° 22.867' N	049° 30.044' W	2910.3	49
MSM74_60-1	08/06/18	5:06:34	CTD	60° 22.096' N	048° 27.183' W	1020.0	50
MSM74_61-1	08/06/18	6:13:36	EM122	60° 21.481' N	048° 26.712' W	1688.3	
MSM74_61-1	08/06/18	8:00:24	EM122	60° 22.246' N	048° 26.939' W	1008.9	
MSM74_61-2	08/06/18	9:34:58	LANDER	60° 22.276' N	048° 27.099' W	947.4	Lander De
MSM74_61-3	08/06/18	11:31:58	CTD	60° 22.262' N	048° 27.001' W	999.3	51
MSM74_62-1	08/06/18	19:53:57	CTD	59° 54.250' N	045° 27.997' W	136.2	52
MSM74_63-1	08/06/18	20:52:55	CTD	59° 51.878' N	045° 33.434' W	118.6	53
MSM74_64-1	08/06/18	21:55:07	CTD	59° 48.305' N	045° 41.822' W	136.6	54
MSM74_65-1	08/06/18	22:49:40	CTD	59° 44.841' N	045° 50.162' W	151.9	55
MSM74_66-1	08/06/18	23:54:45	CTD	59° 40.866' N	045° 59.658' W	191.3	56
MSM74_67-1	09/06/18	0:58:06	CTD	59° 38.145' N	046° 06.845' W	597.3	57
MSM74_68-1	09/06/18	2:01:26	CTD	59° 36.404' N	046° 11.824' W	893.4	58
MSM74_69-1	09/06/18	3:26:35	CTD	59° 34.078' N	046° 18.083' W	1326.5	59
MSM74_70-1	09/06/18	5:24:52	CTD	59° 32.203' N	046° 23.335' W	1810.9	60
MSM74_71-1	09/06/18	7:39:47	CTD	59° 30.093' N	046° 27.407' W	2183.4	61
MSM74_72-1	09/06/18	12:11:00	MOOR	59° 12.949' N	047° 05.549' W	3169.8	DSOW4 Re
MSM74_73-1	09/06/18	13:44:14	MOOR	59° 12.943' N	047° 05.079' W	2935.2	DSOW4 De
MSM74_74-1	09/06/18	16:44:34	MOOR	59° 00.259' N	047° 33.968' W	3111.3	
MSM74_75-1	09/06/18	17:45:02	MOOR	59° 00.448' N	047° 33.995' W	3104.3	
MSM74_76-1	09/06/18	21:13:07	CTD	59° 18.448' N	046° 52.012' W	2457.2	62

MSM74_77-1	09/06/18	23:43:30	CTD	59° 22.748' N	046° 41.394' W	2136.1	63
MSM74_78-1	10/06/18	1:47:01	CTD	59° 26.997' N	046° 32.058' W	2016.6	64
MSM74_79-1	10/06/18	5:34:59	CTD	59° 13.535' N	047° 03.517' W	2920.7	65
MSM74_79-2	10/06/18	7:38:19	CTD	59° 13.535' N	047° 03.518' W	2925.2	66
MSM74_80-1	10/06/18	10:04:33	CTD	59° 06.390' N	047° 20.164' W	2932.9	67
MSM74_81-1	10/06/18	13:32:44	CTD	58° 54.908' N	047° 46.307' W	3151.3	68
MSM74_82-1	10/06/18	17:02:40	MOOR	58° 43.965' N	048° 09.905' W	3348.9	DSOW6 De
MSM74_83-1	10/06/18	18:41:30	CTD	58° 46.935' N	048° 04.058' W	3304.7	69
MSM74_84-1	10/06/18	22:27:16	CTD	58° 34.491' N	048° 25.312' W	3479.8	70
MSM74_85-1	11/06/18	2:16:14	CTD	58° 20.866' N	048° 46.253' W	3721.6	71
MSM74_86-1	11/06/18	7:01:42	CTD	57° 52.023' N	048° 52.139' W	3483.2	72
MSM74_87-1	11/06/18	12:57:27	CTD	58° 11.005' N	050° 05.558' W	3552.7	73
MSM74_88-1	11/06/18	16:52:21	CTD	58° 17.858' N	050° 32.578' W	3538.8	74
MSM74_89-1	11/06/18	21:11:53	CTD	58° 24.328' N	050° 59.179' W	3526.1	75
MSM74_90-1	12/06/18	0:50:56	CTD	58° 30.457' N	051° 25.765' W	3525.3	76
MSM74_91-1	12/06/18	4:38:02	CTD	58° 37.492' N	051° 52.524' W	3474.0	77
MSM74_91-2	12/06/18	7:07:46	CTD	58° 37.492' N	051° 52.526' W	3482.1	78
MSM74_91-3	12/06/18	7:48:08	FLOAT	58° 37.511' N	051° 52.491' W	0.0	Float8505 De
MSM74_91-4	12/06/18	7:48:59	FLOAT	58° 37.526' N	051° 52.472' W	3484.3	Float8504 De
MSM74_92-1	12/06/18	10:46:56	CTD	58° 46.843' N	052° 29.999' W	3471.5	79
MSM74_92-2	12/06/18	13:17:27	CTD	58° 46.844' N	052° 30.001' W	3469.9	80
MSM74_92-2	12/06/18	16:48:49	CTD	58° 46.843' N	052° 29.998' W	3468.6	80
MSM74_93-1	13/06/18	1:53:51	CTD	57° 29.856' N	051° 30.131' W	3507.2	81
MSM74_94-1	13/06/18	14:06:51	CTD	57° 22.897' N	048° 58.635' W	3571.1	82
MSM74_95-1	14/06/18	13:05:40	CTD	57° 42.056' N	041° 45.470' W	3299.0	83
MSM74_96-1	14/06/18	17:21:03	CTD	58° 00.003' N	042° 00.043' W	3172.4	84
MSM74_97-1	14/06/18	21:07:43	CTD	58° 18.896' N	042° 15.672' W	2916.3	85
MSM74_98-1	15/06/18	0:42:22	CTD	58° 37.752' N	042° 31.263' W	2452.3	86
MSM74_99-1	15/06/18	3:59:48	CTD	58° 56.888' N	042° 47.286' W	1911.0	87
MSM74_100-1	15/06/18	7:11:26	CTD	59° 15.601' N	043° 02.760' W	1499.6	88
MSM74_101-1	15/06/18	8:50:34	CTD	59° 20.277' N	043° 06.892' W	984.8	89
MSM74_102-1	15/06/18	10:43:42	CTD	59° 29.116' N	043° 14.305' W	455.2	90
MSM74_103-1	15/06/18	12:12:27	CTD	59° 37.278' N	043° 21.006' W	171.1	91
MSM74_104-1	15/06/18	13:37:33	CTD	59° 46.024' N	043° 28.176' W	153.4	92
MSM74_105-1	15/06/18	14:18:21	CTD	59° 46.024' N	043° 28.178' W	152.7	93
MSM74_106-1	15/06/18	17:18:13	CTD	60° 03.087' N	042° 52.355' W	167.8	94
MSM74_107-1	15/06/18	18:22:52	CTD	60° 00.373' N	042° 39.860' W	195.1	95
MSM74_108-1	15/06/18	19:45:52	CTD	59° 58.622' N	042° 22.484' W	196.6	96
MSM74_109-1	15/06/18	20:53:52	CTD	59° 57.334' N	042° 10.229' W	482.2	97
MSM74_110-1	15/06/18	22:00:38	CTD	59° 57.047' N	042° 08.746' W	880.1	98
MSM74_111-1	15/06/18	23:18:37	CTD	59° 56.814' N	042° 05.876' W	1428.7	99
MSM74_112-1	16/06/18	1:34:07	CTD	59° 54.948' N	041° 45.343' W	1807.5	100
MSM74_113-1	16/06/18	4:04:00	CTD	59° 53.192' N	041° 25.569' W	1896.9	101
MSM74_114-1	16/06/18	8:07:39	MOOR	59° 54.481' N	041° 06.255' W	2090.3	M1 Re
MSM74_115-1	16/06/18	10:50:29	MOOR	59° 50.811' N	040° 41.130' W	2454.4	M2 Re
MSM74_116-1	16/06/18	13:27:09	MOOR	59° 48.986' N	040° 17.089' W	2546.8	M2 Re
MSM74_117-1	16/06/18	15:44:05	CTD	59° 51.238' N	041° 05.917' W	2092.1	InterruptCTD
MSM74_117-2	16/06/18	16:41:03	CTD	59° 51.237' N	041° 05.916' W	2088.1	102
MSM74_118-1	16/06/18	19:20:44	CTD	59° 49.324' N	040° 46.376' W	2554.1	103
MSM74_119-1	16/06/18	22:17:22	CTD	59° 46.884' N	040° 21.099' W	2568.0	104

MSM74_120-1	17/06/18	1:35:13	CTD	59° 43.844' N	039° 49.767' W	2724.5	105
MSM74_121-1	17/06/18	4:53:21	CTD	59° 40.794' N	039° 18.262' W	2839.8	106
MSM74_122-1	17/06/18	10:21:45	MOOR	59° 32.821' N	039° 47.549' W	2881.3	CIS Re
MSM74_123-1	17/06/18	14:11:33	MOOR	59° 12.613' N	039° 29.778' W	3011.1	LOCO Re
MSM74_123-2	17/06/18	15:23:50	CTD	59° 12.585' N	039° 29.727' W	2988.7	107
MSM74_124-1	17/06/18	19:14:01	CTD	59° 31.812' N	039° 46.936' W	2901.6	108
MSM74_124-2	17/06/18	20:50:57	CTD	59° 31.813' N	039° 46.935' W	2902.0	109
MSM74_125-1	18/06/18	0:40:08	CTD	59° 37.753' N	038° 46.935' W	2947.3	110
MSM74_126-1	18/06/18	4:35:47	CTD	59° 34.253' N	038° 13.741' W	3049.5	111
MSM74_127-1	18/06/18	8:15:36	CTD	59° 30.512' N	037° 39.058' W	3113.8	112
MSM74_128-1	18/06/18	11:44:15	MOOR	59° 35.047' N	037° 48.631' W	3121.5	M5 Re
MSM74_129-1	18/06/18	15:09:22	MOOR	59° 38.775' N	038° 33.485' W	2979.4	M4 Re
MSM74_130-1	18/06/18	20:12:35	CTD	59° 26.756' N	037° 04.377' W	3122.5	113
MSM74_131-1	19/06/18	0:17:09	CTD	59° 23.033' N	036° 29.822' W	3097.7	114
MSM74_132-1	19/06/18	2:32:59	CTD	59° 20.558' N	036° 06.179' W	3322.5	115