MARIA S. MERIAN – Reports

Western Subpolar North Atlantic transport variability

Cruise No. MSM94

02. August – 06. September 2020

Emden (Germany) – Emden (Germany)

SPNA transport 2020

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1 Cruise Summary

1.1 Summary in English

The scientific program of the MARIA S. MERIAN MSM94 expedition was dedicated to studies on the intensity of water mass transformation and the transport of water masses in the boundary current systems off Labrador and at the southwestern tip of Greenland. During the expedition we redeployed 11 moorings and recovered 1 bottom lander. Measurements of the vertical structure of temperature, salinity, density, oxygen, optical properties and the flow along selected sections have been surveyed during the MSM94 expedition. Close to the surface, permanent registrations are carried out with the thermosalinograph (temperature, salinity) and meteorological data are continuously collected. Flow measurements up to 1000m depth are performed with the ships installed ADCPs. Argo floats (IFREMER, BSH) and surface drifter (NOC, UK) were also deployed. The expedition is a contribution to international projects (OSNAP, Blue Action, EuroSea). The expedition was conducted during the COVID-19 pandemic and modifications to the science program had to be applied (e.g. Start/end-port Emden, Germany, reduced science crew and respective cut's in data acquisition).

1.2 Zusammenfassung

Das wissenschaftliche Programm der MARIA S. MERIAN MSM94-Expedition widmete sich Untersuchungen zur Wassermassenumwandlung und zum südlichen Transport im Tiefen Westlichen Randstrom vor der Küste Labradors sowie an der südwestlichen Küste vor Grönland. Während der MSM94-Expedition wurden 11 Verankerungen geborgen und wieder installiert sowie ein Bodenlander geborgen. Zudem wurde entlang ausgewählter Sektionen die Temperatur, Salzgehalt-, Dichte-, Sauerstoffverteilung und die optische Eigenschaften und der Strömung vermessen. In Oberflächennähe wurden Dauerregistrierungen mit dem Thermosalinographen (Temperatur, Salzgehalt) durchgeführt und meteorologische Daten wurden erfasst. Strömungsmessungen bis in 1000m Tiefe wurden dem Akustischen Doppler Strömungsmesser durchgeführt. Argo Floats (IFREMER, BSH) und Oberflächendrifter (NOC, UK) wurden ebenfalls ausgelegt. Die Expedition war auch ein Beitrag zu internationalen Projekten und Programmen (OSNAP, Blue Action, EuroSea). Die Expedition wurde während der COVID-19 Pandemie durchgeführt und es mussten Modifikationen am wissenschaftlichen Programm vorgenommen werden (z.B. Start/Endhafen Emden, Deutschland, reduzierte wissenschaftliche Crew und entsprechende Einschnitte in der Datenerfassung).

2 Participants

2.1 Principal Investigators

Name	Institution
Johannes Karstensen, Dr.	GEOMAR
Rainer Kiko, Dr.	Villefranche
Douglas Wallace, Prof. Dr.	Dalhousie

2.2 Scientific Party

Name	Discipline	Institution
Karstensen, Johannes, Dr.	Fahrtleiter/Chiefscientist	GEOMAR
Begler, Christian	Mooring lead, telemetry	GEOMAR
Gerke, Lennart Frederik	Oxygen, nutrients respons.	GEOMAR
Handmann, Dr Patricia Vera Klara	Mooring data respons.; CTD respons.	GEOMAR
Hans, Anna Christina	Floats and drifter, uCTD respons.	CAU Kiel
Lösel, Christiane	Underway data/TSG respons.	CAU Kiel
Martens, Wiebke	Microcat; CTD tech.	GEOMAR
Niebaum, Nils Ole	Salinometer respons.	CAU Kiel
Olbricht, Hannah Davina	Mooring technician	GEOMAR
Posern, Conny	vmADCP respons.	CAU Kiel
Rudloff, Daniel	lADCP respons.	CAU Kiel
Witt, René	Mooring technician	GEOMAR
Witting, Paul Jasper	Mooring & MicroCat helper	GEOMAR

2.3 Participating Institutions

GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
CAU Kiel Christian-Albrechts-Universität zu Kiel

3 Research Program

3.1 Description of the Work Area

The North Atlantic Ocean circulation is regarded as a major driver of large-scale climate variability on interannual and longer time scales. In particular, it has been shown that the relatively mild climate in northern Europe is closely linked to the northeastward transport of warm, subtropical water in the North Atlantic Current, which connects the warm, subtropical gyre Gulf Stream with 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 being transformed in the subpolar gyre, the DWBC also transport water southward that originate from the Greenland-Scotland Ridges 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 transformation and in the 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.

3.2 Aims of the Cruise

The aim of the MARIA S. MERIAN MSM94 expedition was to collect observational data to study different aspects of water mass transformation and southward transport of water masses in the Deep Western Boundary Current of the western subpolar North Atlantic. 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 down to a depth of 1000 m was acquired with ship ADCPs throughout the cruise (Fig. 3.1). Eleven long term moorings were recovered and redeployed and one lander was recovered. Deep (IFREMER) and Biogeo (BSH) Argo floats were deployed as well as 50 surface drifters (NOC, UK). The expedition contributed to institutional programs (POF), and international projects and programs (OSNAP, H2020 EuroSea, Blue-Action).

3.3 Agenda of the Cruise

The work program had two parts: (1) operations related to moored sensors and (2) ship based observations (Fig. 3.1). Central components of the international "Overturning in the Subpolar North Atlantic Programme" (OSNAP) are mooring arrays. Relevant for MSM94 are the "WHOI Array " that have been installed on the western side of Greenland since 2014. Moreover the "53°N Array" (in operation since 1997) at the southern exit of the Labrador Sea. This array also contributes to OSNAP and is augmented by moorings from the Bedford Institute /DFO Canada at the shelf edge ("C-Array"). In the Labrador Sea the K1 mooring is operational since 1997 in main convection area.

During the MSM94, the 53°N Array, the three German moorings in the WHOI array, and the K1 mooring have been recovered and deployed. In addition, a bottom lander, deployed in 2016 (MSM74) off western Greenland close to Kap Desolation was recovered.

Vertical profiles of properties are collected with the CTD rosette (CTD, oxygen, optical properties, currents lADCP) – "CTD+" and, at selected sections, with the underway CTD. The CTD data (salinity, oxygen) was validated on board the ship against discrete analysis of oxygen and salinity from water samples. This procedure ensures high quality data and is a quality assessment of the data during the cruise. Underway data was collected with the Thermosalinograph (Temperature, Salinity) and with meteorological sensors. Vessel mounted ADCP systems (38kHz, 75kHz) were used to survey quasi-continuously the currents in upper 500 to 1000m.

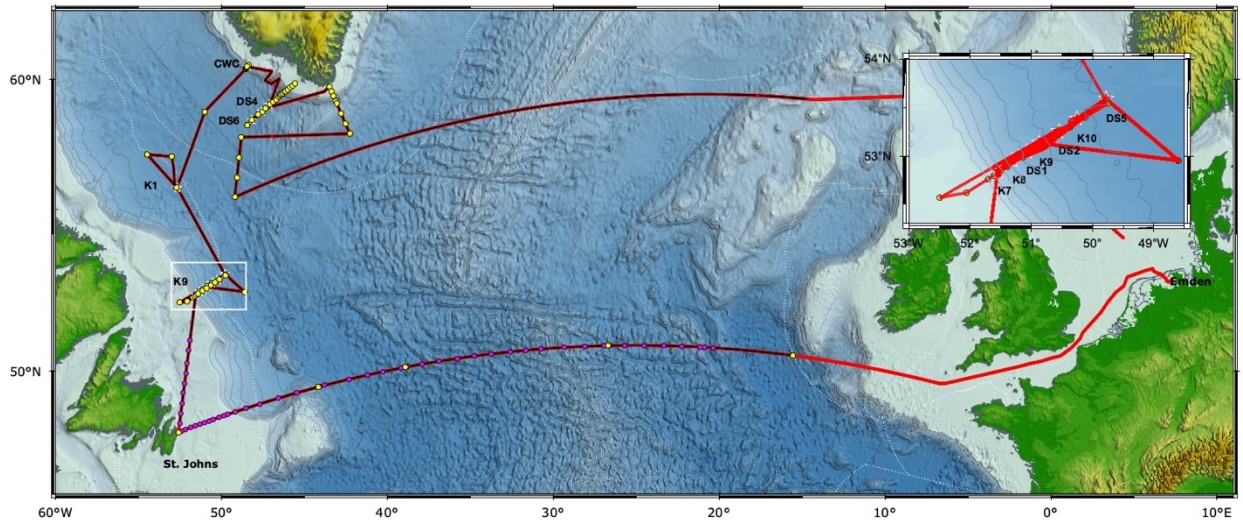

Fig. 3.1 Track chart of R/V MARIA S MERIAN MSM94 cruise track (red) and station overview. Black line: ADCP/TSG Underway data; red dots uCTD; yellow dots: CTD stations; cyan stars: Mooring location.

4 Narrative of the Cruise

The MSM94 departed from Emden on Sunday, August 2nd, 2020 08:30 LT. We passed the lock in Emden with many spectators and headed towards the North Sea and then the Strait of Dover towards the open North Atlantic. The transit time was used for setting up our equipment in the labs and at the deck. The routine ship-familiarization by the 2nd officer was done, also with a safety drill that included entering the life boat. On 3rd August we passed the narrowest part of the Strait of Dover and could watch the famous "White Cliffs of Dover" - well illuminated by the sun. Setting up the equipment continued and in particular the CTD with its multiple sensors was made ready. Weather was fine – calm seas, partly sunny. On August 5th we finally reached international waters and the underway systems (TSG, ADCP, EM122) were started. A shallow (2000m) CTD was done to test the CTD but also to test releaser for the mooring operations and a couple of instruments which had a 2000m depth rating (underway CTD probes, GEOMAR Kiel oxygen logger). Dolphins and whale were spotted. On the 6th August at 13:00 the underway CTD (uCTD) program was started with acquiring a profile every 4 hrs. On the 7th August the second CTD cast was done with many instruments for calibration attached. The uCTD program continued, but failed at one stage because the winch was not running free. The device was cleaned but still it was very difficult to turn in free mode. Throughout the transit preparation for the upcoming mooring work continued. Finally, we received on the 7th of August the diplomatic clearance for the science operations in Canadian Water and for entering St. Johns for bunkering. The uCTD operations continued to be difficult because of winch and associated robe problems. A meeting was held on 11th of August between crew and technicians to discuss the general strategy for the working work ahead. In the afternoon the "tour through the engine room" took place. Throughout the cruise we held a daily meeting at 6:30pm.

We arrived on the 12th of August at 7:00 at "Station 27" just in front of St. Johns and did a CTD cast and the data was shortly after shared with F. Cyr (DFO, St. Johns, Canada). At 08:00am the Pilot for St Johns came on board. During the bunkering nobody left the ship for reason of COVID precaution measures. Besides bunkering some goods were delivered to the ship (pCO2 sensors from URI, oxygen sensors and a GTD from Dalhousie; Seabird package; Vemko from OTN). We left St. Johns port at 12:30 and headed for the 53°N-Array. On the way the uCTD operations continued until 13th August, 08:00am. We arrived at the K7 mooring position from the 53°N-Array but low visibility prevented us from mooring recovery. We started CTD operations at selected mooring positions (1nm off positions) during the night. On the 14th of August we recovered the first 3 moorings of the 53°N Array. At night the CTD program continued and also included carbon/nutrient sampling (for OFI, GOSNAP and BSH floats). After deployment of K9 on 15th of August we headed southeast for a carbon system calibration cast for an EuroArgo pilot pH/oxygen float (WMO# 3901669) that did profile shortly before we arrived at the position. The outer most mooring of the 53°N Array (DSOW5) was recovered and directly deployed and also the neighboring K10 was recovered. The weather conditions were exceptional good during all the operations, calm seas and good visibility. Following the K10 recovery we moved to the southwest part of the section and recovered the last remaining mooring on the 53N Array to recover – K7. This mooring has been composed from German (GEOMAR) and Canadian (DFO) instruments. Starting on the shelf, at about 150m water depth, we did a CTD section across all the 53°N-Array. On-route we deployed K8 and K10 and completed the re-deployment of the 53°N array, as well as occupying a full CTD section across the array.

We then headed northwest and reached the K1 mooring area around mid-day 20th of August and did one full depth CTD for later calibration of moored instruments, and recovered the mooring. We moved northward to occupy a CTD calibration profile for another BSH Biogeochemical Argo float that we deployed in 2018, then we moved southeast and deployed a similar Argo Float. The ship returned to the K1 site and the mooring was deployed on the 21st of August 2020 along with two deep Argo float deployments. We headed northeast towards the position of a bottom lander that was deployed in 2018 (MSM74) off the Greenland coast, near Cape Desolation. On our way we did underway CTD stations and deployed on the 22nd of August another two deep Argo floats but more in the rim current area of the deep convection area. A full depth CTD was also occupied at the location. On the 23rd August we reached the area were the bottom lander had been installed during MSM74 more than 2 years ago, in 2018. We first did a CTD section from deep waters (>2800m) to the coast aligned with a steep subsea canyon. The flanks of that canyon were further surveyed with the Parasoundsystem before we turned to the lander site. At the site, the release unit was heard and the lander was recovered by noon. The weather conditions were very good, with calm seas and good visibility. For searching the lander drifting at the surface a drone was also used. Preliminary inspection of the lander data revealed that the device maybe has fallen down by 25 m within less than 15 minutes (sampling time step of pressure sensor) a couple of months after deployment. Also it looked as if the lander has initially landed in only a marginally stable position as pitch and roll angle showed high frequency variability. We steamed towards the next mooring array, which comprises 3 short moorings as part of a field of 8 more moorings all west of Greenland and part of the OSNAP array. On the way we did two section perpendicular to the topography to deployed in total 50 SVP surface drifter from on the 23. August. In the morning of the 24th we arrived at the mooring array and recovered the three moorings in one day as the weather conditions were favourite. A CTD section towards Greenland was done and the mooring instruments were calibrated and prepared for the re-deployment of the moorings. We then steamed back to the mooring positions, deployed a last Deep Argo float pair for IFREMER at a position where the topography was 2500m – these floats were the counterparts to the two deep Argo floats deployed at the same depth along the 53°N Array section. In the evening of the 25th August the DSOW4 mooring was deployed without any problems. During the following CTD cast (#54) electronic problems occurred and the cast was abandoned. As devices needed to be calibrated in deep water (3400m) the cast was repeated making use of a different conductor cable (which was the reason for the failure). After the cast the two remaining moorings were deployed on the 26th of August and three more CTD stations that belong to the OSNAP west section were occupied. We then steamed for a CTD section starting at the southern tip of Greenland, near Cape Farewell, and heading southeast. The sea was calm and we experienced only weak winds. In the morning of 27th of August we had good visibility and spotted a research vessel which turned out to be the Danish RV Dana. We had marine radio contact. During the CTD section the wind and sea increased and hampered our operations. However, we finished the section and moved back to the OSNAP West section but wind and wave made progress rather slow so that, at the end, we could only occupy a part of the remaining CTD station from OSNAP West. On the 29th of August we had to stop the CTD program to start the transit back to Emden. Arrival was scheduled for the 06th of September 08:00 with the pilot. We choose the northern and shorter route, crossing between Scotland and Shetland Islands before entering the North Sea. Underway recording was stopped on the 02nd of September 2020. The ship progressed well with mostly following seas and free wind and we

arrived in Emden on the 06th of September as planned. We entered together with the RV Meteor which arrived from the expedition M165. Our container operations were done on the 08th of September, and along with loading containers for the following cruise (MSM95).

5 Preliminary Results

5.1 CTD observations

(Patricia Handmann)

5.1.1. CTD-Rosette system

During MSM94, 70 profiles of pressure (P), temperature (T), conductivity (C) and oxygen (O) were recorded. Except of two (#1, 29; used for specific sensor calibration), all CTD/O_2 profiles were full depth ranged to the bottom or near the bottom. We used a Seabird Electronics (SBE) 9plus system, attached to the water sampler carousel, and recent Seabird Seasave software. The SBE underwater unit had, in addition to its own pressure sensor (#1162), two parallel sensor sets for T (1 #2920, 2 #4234), C (1 #4061, 2 #3373), and O (1 #735, 2 #1718). Additionally, a WET Labs ECO-AFL/FL Fluorometer (#FLNTURTD-2928), a WET Labs ECO-NTU Turbidity sensor (#FLNTURTD-3219), a WET Labs C-Star Transmissometer (#CST-1617DR), a photosynthetic active radiation sensor Biospherical/Licor SPAR (# 20195), a CTD mounted lowered acoustic Doppler current profiler system (lADCP), an underwater vision profiler (UVP) and an UV spectral sensor for the measurement of nitrate (OPUS) were mounted on/connected to the CTD frame. A Valeport altimeter system (# 42299) was used for bottom detection. A GEOMAR developed globe-shaped acoustic protector allowed the altimeter to function reliably during the cruise while it had suffered from interference from the lADCP system in previous cruises.
Due to spooling issues the winch was changed after CTD profile 11. During profile 12 there was a water intrusion into the cable. During profile 13 a disfunction of the Fluorometer was found so it was changed after profile 13 to # 3219. After profile 54 the winch was again changed due to water intrusion into the cable. The intrusion also made data acquisition during the up-cast impossible. The CTD system itself performed without major problems throughout the whole cruise. Apart from the CTD profiles where the cable was intruded by seawater, all profiles were collected spike free.

CTD-conductivity calibration

The calibration of the conductivity and oxygen sensors was conducted following the recommendations in the GO-SHIP manual (Hood et al. 2010; https://www.go-ship.org). For the calibration of the conductivity sensors 289 measurements with a precision salinometer were used (see section 5.3). The conductivity calibration on board resulted in a root mean square (rms) salinity misfit of 0.0017 psu for the both conductivity sensors after removal of the most deviating 33% of samples. The final data calibration was done at the GEOMAR and resulted in rms of 2 dbar, 0.002 °C, 0.003 for pressure, temperature, and salinity, respectively.

Oxygen calibration

The calibration of the conductivity and oxygen sensors was conducted following the recommendations in the GO-SHIP manual (Hood et al. 2010; https://www.go-ship.org). For the calibration of the oxygen sensors 381 measurements of the dissolved oxygen content using

Winkler titration were used (see subsection 5.1.3). The oxygen calibration at GEOMAR resulted in a rms oxygen misfit of 1.5 µmol/kg.

Real-time data submisison

Preliminary processed CTD data, 5-dbar binned, was sent shortly after completing the CTD profile to the Coriolis Data Centre in Brest, France, (via email: codata@ifremer.fr) for integration in the databases to be used for operational oceanography applications and the WMO supported GTS/TESAC system. The submission is integrated in the MSDOS batch script that is used for the CTD processing.

5.1.2 CTD Sections

The velocity structure (Figure 5.1) shows the typical structure of the DWBC at the exit of the Labrador Sea (Zantopp et al. 2017). A wide southwestward boundary current between 52.5°W and 49.7°W with two clearly visible current cores. One core at 51.7°W near the surface with a maximum speed of approximately 0.25 m/s representing the core of the Labrador current. The second core is located at roughly 3200 meters depth and 50.7 °W with a maximum core velocity of about 0.17 m/s. In comparison to the long term mean (Zantopp et al 2017) slight difference are seen in the maximum velocities in the cores as well as the position of the lower velocity maximum, which appears a bit deeper in our measurements. The oxygen distribution (Fig. 5.2) shows oxygen rich water on the Labrador shelf and in the LSW layer and lower oxygen in the NEADW and again more oxygen is the DSOW.

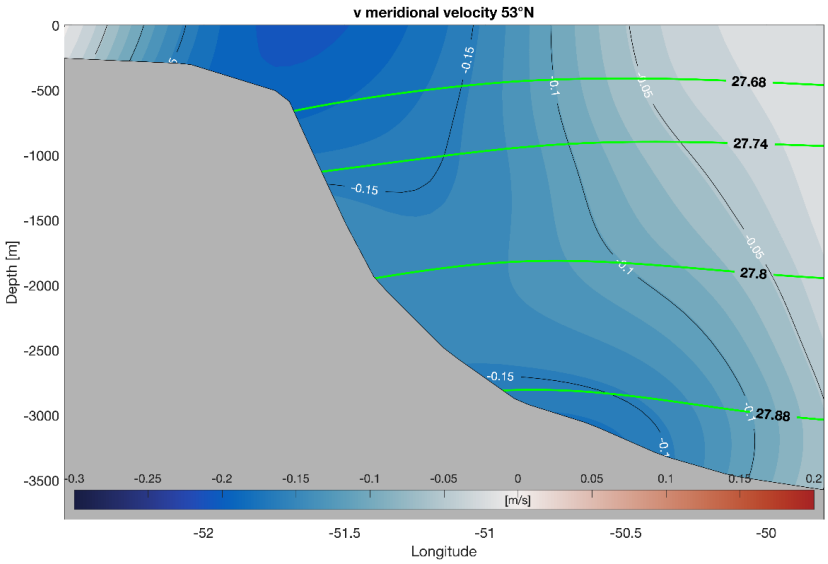

Fig. 5.1 Velocities (in m/s) through the 53°N Section. Negative values account for flow out of the Labrador Sea. Characteristic isopycnals are marked in green uLSW, cLSW, NEADW, DSOW, Velocities were rotated by -26° to align them with the topography.

The section southeast from the southern tip of Greenland (Figure 5.3) shows a very strong inflow into the Labrador Sea in the upper 1000 meters between 59.2°N and 59.6°N with velocities reaching well over 0.3 m/s and indicating the west Greenland current. Furthermore, a second band of higher velocities around 58.6°N with slighter higher velocities at the surface and a core with

velocities of around 0.17 m/s at the bottom. In between there is a weak recirculation core with velocities hardly reaching below 0 at 58.95°N at a depth of 500m. To calculate the velocities perpendicular to the section velocities were rotated with an angle of -115°.

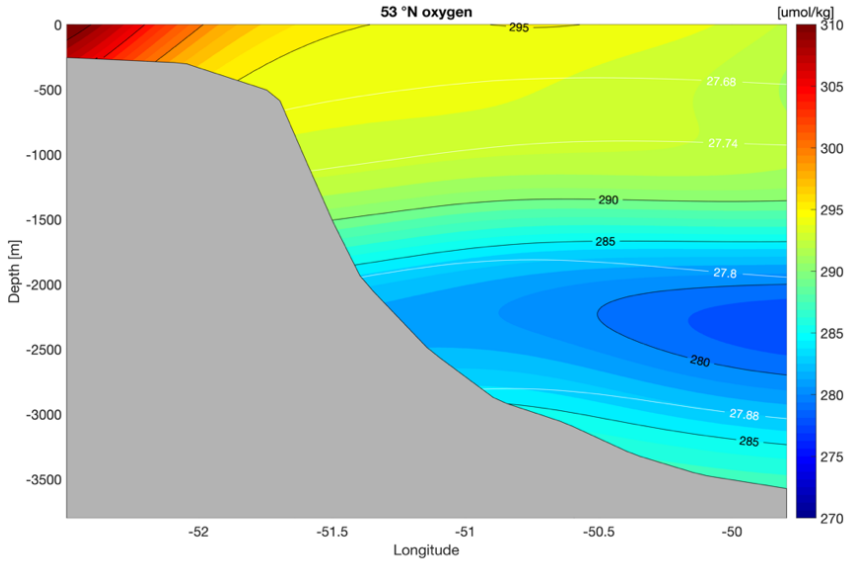

Fig. 5.2 Oxygen concentration along the 53°N section.

Salinities at this section were as expected very low on the shelf due to run off from Greenland and fresher water transported with the East Greenland Current and very saline further towards the south due to warm and saline water transported with the Irminger current (Figure 5.4).

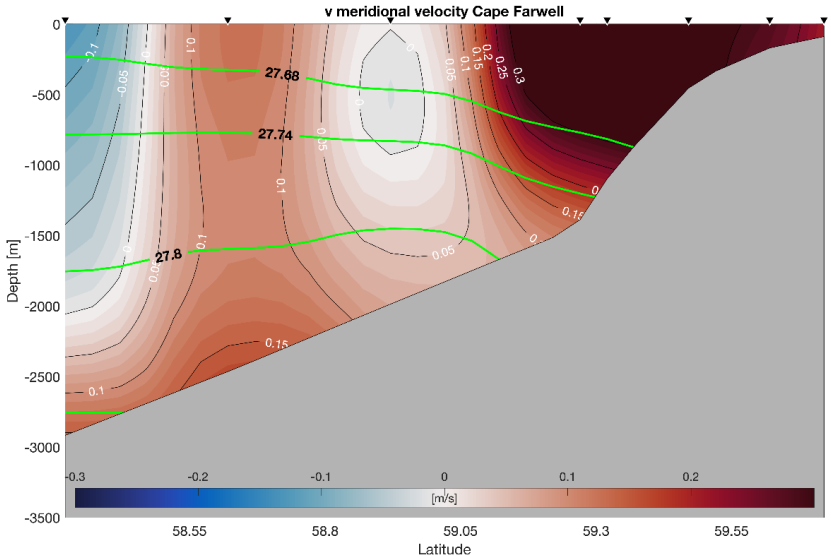

Fig. 5.3 Flow through the Cape Farwell Section. Positive values represent and inflow into the Labrador Sea. Velocities were rotated by -115° to align them with the topography

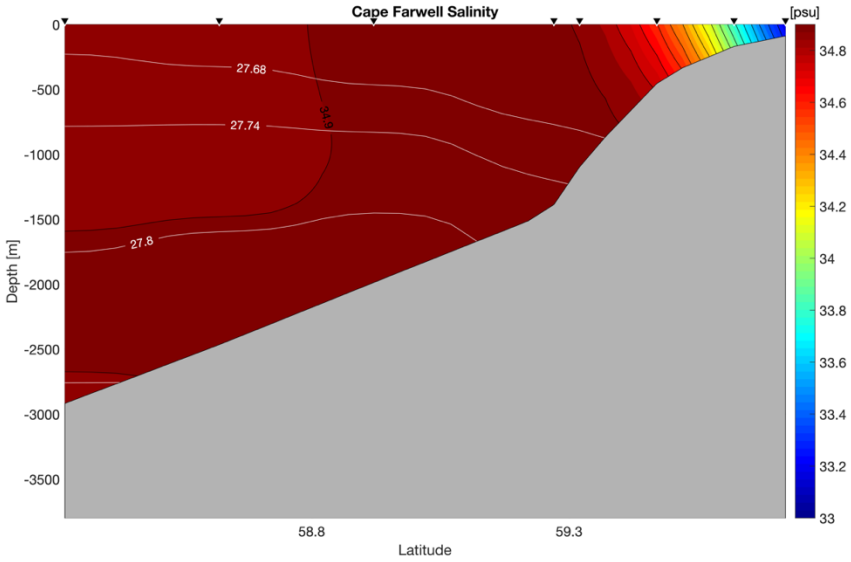

Fig. 5.4: Salinity section south of Cape Farwell

5.1.3 Underwater Vision Profiler

(A.C. Hans, C. Lösel, C. Begler)

The Underwater Vision Profiler 5 (UVP5; serial number 203) provided by the Institut de la mer de Villefranche sur Mer (PI: Rainer Kiko) was mounted on the CTD rosette. The UVP5 is used to create vertical profiles of the size-spectrum of macroscopic particles and the occurrence of phyto- and zooplankton and particles of particular size. Centerpiece of the UVP5 is a downward-facing HD camera pointed at a 0.88 litre water volume illuminated from two sides by red LED lights. The system is pressure-proof up to 6000 dbar and takes 20 pictures of the illuminated volume each second. The UVP5 was operated from CTD cast number 1 until 70. Only profile 8 could not be acquired due to failure removing the power dummy (UVP5 did not start). The images were downloaded using an own Matlab script consisting of the following sequences:

```
Local LAN Setup TCP/IPv4
----------------------------
IP_Adress: 193.49.112.200
Subnetmask: 255.255.255.0
Gateway: 193.49.112.1

DNS-Server: 193.49.112.3
Alt. DNS-Server: 193.49.112.1

UVP5 IP: 193.49.112.100
==============================

U013STBY_PRG!
>V012STBY_OK!
U017START_HD_CAM!
>V017STARTING_CAM!
>V016CAM_STARTED!
```

```
S013WATCHDOG!
>C042WATCHDOG_xxx

Copy Data from uvp5fd network drive

U016STOP_HD_CAM!
>V022SHUTTING_DOWN_CAM!
>V016CAM_STOPPED!
>C016EXITSOFT_OK!

U012RUN_UVP!
>V015RUN_UVP_OK!
```

Further, a first image processing was performed on board after profiling using the tool *Zooprocess*. (Fig. 5.5). After the first image processing, the results estimate the particles size distribution and store vignettes of the particles found in the images.

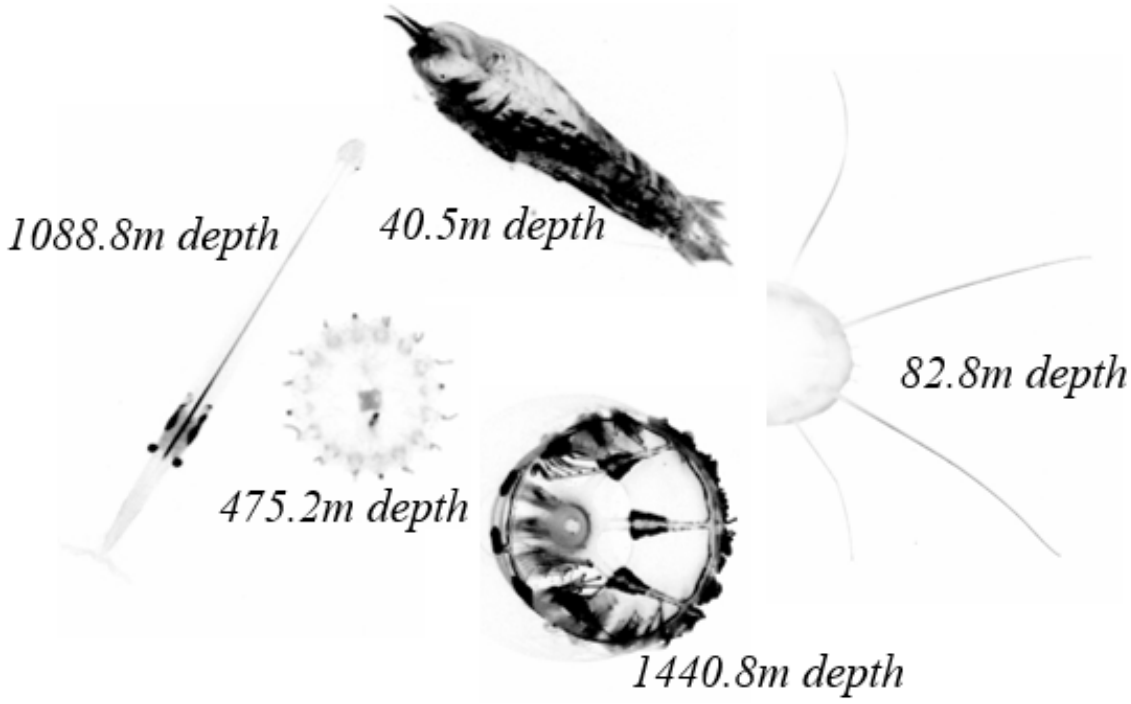

Figure 5.5. Selected images from UVP processing during MSM94 in the subpolar North Atlantic (not to scale)

5.2 Mooring Operations

5.2.1 Moorings

(P. Handmann, A.C. Hans, H. Olbricht ,W. Martens, P. Wutting, C. Begler)

As part of the international Overturning in the Subpolar North Atlantic Program (OSNAP), one goal of the cruise was to recover 7 moorings from the 53N-Array (DSOW1, 2, 5 and K7 to K10) and 3 moorings in the northern part of the Labrador Sea (WHOI array) and redeploy them. The purpose of these moorings is to measure variations in the deep western boundary currents at the entrance and exit of the Labrador Sea and to record transport and property changes of the dense overflow waters. In addition, we recovered and deployed the mooring K1 in the central Labrador Sea, which observes the local convection activity, and we recovered 1 POZ lander that was installed near Kap Desolation (off western Greenland) in a Coldwater coral reef. Mooring operations are summarized in Table 5.1 and for detailed mooring configurations see Appendix 11.1.

Table 5.1. Mooring operations during MSM94

R	D	Mooring		Date and Time (UTC)	Latitude	Longitude	Depth (m)	Magnetic deviation
x		DSOW 1	KPO 1187	14.08.2020 09:17-10:54	53° 02.320'N	051° 04.429'W	2567	-21°
x		K 9	KPO 1188	14.08.2020 12:18-14:58	53° 07.738'N	050° 51.918'W	2877	-25°
x		DSOW 2	KPO 1189	14.08.2020 16:34-18:13	53° 14.934'N	050° 32.951'W	3151	-30°
x		K 8	KPO 1186	15.08.2020 11:07-13:03	52° 57.074'N	051° 17.855'W	3513	-24°
	x	DSOW 1	KPO 1222	15.08.2020 15:08-16:01	53° 02.884'N	051° 04.877'W	2605	-21°
	x	K 9	KPO 1223	15.08.2020 17:21-19:43	53° 08.039'N	050° 52.015'W	2896	-19°
x		DSOW 5	KPO 1191	16.08.2020 11:00-12:10	53° 35.222'N	049° 46.342'W	3602	-25°
	x	DSOW 5	KPO 1226	16.08.2020 12:44-13:50	53° 35.673'N	049° 47.040'W	3604	-21°
x		K 10	KPO 1190	16.08.2020 15:59-18:45	53° 22.965'N	050° 14.436'W	3385	-21°
x		K 7	KPO 1185	17.08.2020 10:00-12:37	52° 49.895'N	051° 32.798'W	3151	-23°
	x	K 7	KPO 1220	17.08.2020 14:08-15:54	52° 50.621'N	051° 33.101'W	1390	-23°
	x	DSOW 2	KPO 1224	17.08.2020 19:41-20:31	53° 15.493'N	050° 33.303'W	3171	-20°
	x	K 8	KPO 1221	18.08.2020 17:35-19:14	52° 57.681'N	051° 18.493'W	2228	-24°
	x	K 10	KPO 1225	19.08.2020 09:01-11:56	53° 23.478'N	050° 14.395'W	3413	-22°
x		K 1	KPO 1194	20.08.2020 16:37-18:35	56° 33.954'N	052° 40.245'W	3495	-24°
	x	K 1	KPO 1229	21.08.2021 18:09-22:53	56° 34.199'N	052° 38.477'W	3498	-19°
x		DSOW 6	KPO 1206	24.08.2020 13:54-14:18	58° 43.664'N	048° 09.348'W	3363	-22°
x		DSOW 3	KPO 1192	24.08.2020 17:23-17:43	59° 00.309'N	047° 34.741'W	3112	-22°
x		DSOW 4	KPO 1193	24.08.2020 20:11-20:34	59° 12.412'N	047° 05.223'W	2942	-22°
	x	DSOW 4	KPO 1228	25.08.2020 21:22-22:09	59° 12.863'N	047° 05.001'W	2945	-22°
	x	DSOW 6	KPO 1230	26.08.2020 10:16-11:03	58° 44.089'N	048° 10.063'W	3363	-23°
	x	DSOW 3	KPO 1227	26.08.2020 13:11-13:58	59° 00.541'N	047° 33.940'W	3109	-23°
x		POZ lander	KPO_1199	23.08.2020 13:42-14:16	60° 22.136' N	048°26.708’ W	625	

5.2.2 Instrument performance

The moored instruments recovered during MSM94 (Table 5.1) worked successful with only small acquisition issues (see recovery tables in Appendix 10.1).

Apart from one Aquadopp (24543-02 in DSOW2) all 40 Aquadopps (AQD) recovered during MSM94 performed excellent within the deployment period. The download of the data from the instruments could be performed without any struggles. The AQD 24543-02 in DSOW2 (kpo 1189) showed some unexpected behavior within its pressure measurements, similar to the MicroCat (#10661) deployed at the same depth on the same mooring. This could be related to the implosion of 4 floating devices and the loss of 2 other ones on this mooring at 2719m and hence a related gain of depth of the two instruments.

Mooring K1 lost its Telemetry buyo in 2019 with the uppermost MicroCat (#2712), which was recovered in August 2019 by the RV Armstrong. Due to the loss of this floating device, the second MicroCat (# 12151) was moved towards lower depth but it was still attached to its original position on the cable. Another floating device at 41m was missing and the MicroCat #2263 moved upwards

to 65m due to the upward movement of the 3 eddy grips installed originally at 105 m. Both of the VMTs (#11818, # 11820) originally installed at 105 m were missing and lost. Two more MicroCats moved upwards, MicroCat # 2713 originally installed at 303 m moved directly beneath the termination at ~257m and MicroCat # 10693 moved from originally 504 m just under #2713 to about 257 m as well.
On Mooring K7 (kpo 1185) the VR2M (#132787) slipped down from originally 57m to about 106m just above the next MicroCat. A similar incident happened at K8 (kpo 1186) where the VR2M (#132980) slipped from 51m to the next MicroCat installed at 100m. The rotor current meters deployed in K7 (#598, #602) and K9 (#9345) recorded good but incomplete data until March/April 2020.
The RBR oxygen sensors deployed at 53°N array (Tab. 5.2) all had insufficient battery and stopped acquiring data within the deployment period, though the collected data seems to be clean. Apparently, the consumption during pause time was too high; hence, the instruments ran out of battery very early during the deployment period.

Table 5.2 RBR oxygen sensors performance

kpo_1186 (K8)	RBR-O2 52671, 52627	Record until April 2020
kpo_1188 (K9)	RBR-O2 52633 RBR-O2 52629	Record until March 2019 Record until April 2020
kpo_1190 (K10)	RBR-O2 52626 RBR-O2 52634	Record until March 2019 Record until mid July 2020

On the 11 moorings recovered during MSM94 68 MicroCats were installed. Most of them worked well, but 6 inductive ones (#1719, #2252, #2257, #2260, #2263, #3414) needed much time to download the data in several parts or two to four attempts. Several old instruments (#910, #922, #939, #941, #952, #1288, #1317, #1320) had issues while writing data to the output file and featured errors concerning the first digit of the recorded temperature or the total loss of a temperature and conductivity data point. One MicroCat (#957) had a damaged housing due to friction between the frame and the screws during recovery. Even though the cage was damaged the housing was still watertight. The frame of MicroCat # 2263 was loosened when recovered.
8 of the 68 MicroCats recovered featured some kind of data acquisition error, or were lost and found. Details on the data acquisition are shown in the mooring tables further down (Table 7.2). None of the Micro Cats completely failed or were lost due to water intrusion.
ADCPs: 3 out of 3 ADCPs performed well and provided a complete and clean record over the entire deployment periods (K7, K1, POZ-Lander).

5.2.3. Calibration of moored instruments

CTD-O_2 cast calibrations were performed for all MicroCats either as pre- or post-deployment calibrations (CTD casts 4, 12, 13, 14, 21, 25, 29, 30, 32, 56) by attaching the instruments to the CTD frame. Aquadopps were attached to the CTD frame as well during casts 2, 12, 13, 14, 15, 30, 42 (table 5.3- 5.6) in order to test the performance of the pressure and temperature sensor.
During each up-cast, 5-8 calibration stops were done over the whole profile range (depths chosen at low gradient-regimes for the respective parameters). Each stop had duration of at least 5-7 min (MicroCats), respectively, in order to ensure equilibrium at the calibration points. However, we

found that for calibration stops often, the calibration stops were not long enough (and had to be discarded afterwards) to particularly equilibrate the conductivity sensor of the MicroCats when reaching warmer water coming from the colder water below, which is likely the result of the thermal mass effect. As an alternative the next time calibration stops of at least 5 min length at about 10 m depth before starting the regular downcast profile right at the beginning of the CTD cast could be a solution to this.

The 7-minute calibration stops were too short for the temperature logger of the Aquadopps to reach equilibrium with the surroundings. The temperature sensor is flush-mounted on the Aquadopp so it measures rather the temperature of the hull than of the surrounding waters, anyways an rms in temperature of 0.1 in temperature could be reached for the Aquadopps. Hence, the Aquadopps were calibrated only for pressure.

Table 5.3 Pre-deployment Calibration of recovered instruments at MSM74, 2018

CTD Cast	Serial number MicroCat
7	0910, 0922, 1719, 0939, 941, 1288, 2252, 2717, 10662
10	6779
14	2799, 6854 10700
22	1320, 0957, 2263, 0959, 2712, 1317, 0952, 2279, 10642, 6859, 6855, 7417, 10660, 10685, 10691, 10695, 10661
32	1520, 2713, 3415, 3752, 3753, 6858
34	12151
35	10635,2264
47	10689, 10686, 10679, 10678

Table 5.4 After-recovery Calibration of recovered instruments at MSM94, 2020

CTD Cast	Serial number MicroCat
04	2712
12	1317, 2279, 1942, 10637, 6859, 10703, 10685, 10691,
13	10642, 1599, 3196, 10660, 10633, 10652, 10634, 10704, 10695, 10661
14	961, 939, 10657, 2257, 10694, 10710, 10711
21	2775, 2797, 3503
25	2261, 0941, 0959, 2799, 6779, 6854, 10700, 2717, 10680, 10969
29	12151
30	6855, 6858, 7417, 10662, 60687, 10693
32	0910, 0922, 1288, 2713, 3415, 3752, 3753, 3414, 2252, 2260
56	1320, 1520, 1719, 2263, 10689, 10686, 10679, 10678, 10635, 1718, 2264

Table 5.5 Pre-deployment Calibration at MSM94,2020 for mooring period 2020-2022

CTD Cast	Serial number MicroCat
1	2254
2	0950, 0953, 0954, 0962 2492, 2716, 2809, 2933, 3416, 10640, 10641
03	1550, 2245, 2247, 2249, 2250, 2251, 2484, 3144, 6857, 10632, 10698, 10705,
04	2254, 2255, 2262, 2271, 2488, 2712, 3411, 3413, 3757
12	2279, 10637, 10685, 10691, 10703
13	10633, 10634, 10642, 10652, 10660, 10661, 10695, 10704
14	0961, 2257, 10657, 10694, 10710, 10711
25	2717, 6854, 10680, 10696,
29	12151
30	10662, 10687, 10693
32	3752

Table 5.6 After recovery and pre-deployment calibration of Aquadopps at MSM94 for mooring period 2020-2022

CTD Cast	Serial number Aquadopp
2	26209-01, 26209-13, 26209-17, 26209-36
12	26209-22, 26209-23, 26209-14, 26209-25, 40893-1-239, 40893-1-247, 40893-1-249, 40893-1-237, 26209-31, 40893-1-238
13	40893-1-241, 40893-1-242, 40893-1-244, 40893-9-256, 40893-9-257, 40893-9-258, 40893-1-240, 24543-02, 40893-1-248, 40893-1-251,
14	40893-1-243, 40893-1-252, 40893-1-253, 40893-1-254, 40893-1-255, 40893-1-246, 40893-1-250, 40893-1-245
15	26209-04, 26209-05, 26209-08
30	26209-10, 26209-12
42	26209-15, 26209-35, 26209-07, 26209-11, 26209-26, 26209-32

5.2.4 Preliminary Results

During the deployment period from 2018-2020, the western boundary current at 53°N shows a well-defined baroclinic structure with an upper and lower velocity maximum. Though the boundary current is rather focused along the shelf break the velocities show a maximum mean velocity in the DWBC core of about 0.15 m/s (figure 5.6). From these not yet finally calibrated instrument measurements the transport time series for NADW in the DWBC at 53°N was computed and found to be around 12.2 +/- 4.65 Sv for LNADW and 12.19 +/- 5.92. Which is low in comparison to the period 1997-2018 with 15.12 +/- 4.62 Sv LNADW and 14.19 +/- 5.39 Sv LSW transport in the mean

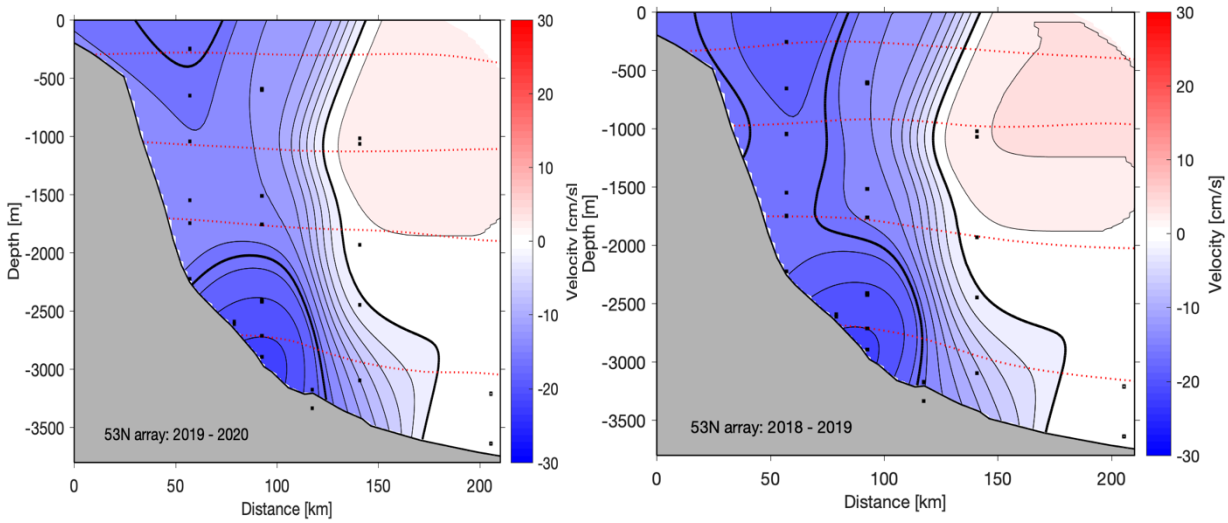

Fig. 5.6.: Mean velocity sections calculated from Aquadopp measurements along the 53°N array for the period May 2018 to May 2019 and June 2019 to August 2020.

5.2.5 POZ Bottom Lander

The POZ lander was deployed at about 625m depth at the flank of a steep canyon close to Cape Desolation, West Greenland. Recovery went well, even using a drone for lander localization at surface. The recovery revealed that the lander ADCP (300kHz, WH upward looking, Serial#6468) worked but was impacted by lander movement. The data revealed that the lander did change depth by about 25 meters at the end of 2018. Then, a couple of months later again by about 1 m, and when also its orientation changed. The RBR XR-620 CT+Paro (serial#15174) showed a leak in the logger (Paro probably still operational); an Aanderaa optode (serial# 691) worked; Flasher

(Novatech ST-400A) did not work/flooded; RF Beacon (Novatech RF-700A1, serial W07-044) did not work – reason unknown; KUM Quat K/MT 562 releaser worked well.

5.3 Salinometer

(Nils Niebaum)

In order to calibrate the salinity derived from the conductivity sensors of the CTD system, the salinity of water samples was measured using the GEOMAR OPTIMARE Precision Salinometer (OPS 20). The OPS measures conductivity and converse it to salinity and the derived salinity is used to define good or bad measurements.

Water samples from the CTD-rosette were taken with the established Flensburger bottles. In addition, water samples were taken from Maria S. Merian thermosalinograph. Before measuring the water samples had to be degassed. In order to do so, the samples were placed in a water bath at a temperature of about 40°C inside the Salinometer-lab. After approximately 30 minutes the bath was replaced by fresh warm water (approximately 40°C). Another 30 minutes later the Flensburger bottles were opened quickly (for no longer than 1 or 2 seconds) to release the pressure created due to outgassing of dissolved gases and the thermal expansion of the air inside the bottle. The samples then cooled down for at least 10 hours to the temperature in the Salinometer-lab.

At the beginning of each measurement day an IAPSO standard sea water (batch: P162) with a respective salinity of 34.993 was measured to calibrate the Salinometer. Right after the standardization a "Substandard" (see below) was measured. After several measurements of water samples, a substandard was measured to check for possible drifts.

Substandard water was taken from deep CTD casts from at least two CTD-rosette bottles closed at the same depth and filled in a large 20-liter container. This water was then filled in a box of 24 Flensburger bottles and degassed like the measurement bottles.

Overall 353 successful conductivity measurements were performed, using the GEOMAR OPTIMARE Precision Salinometer (OPS 20), of which 289 water samples originated from 65 of the 70 CTD stations, 38 water samples were taken at the thermosalinograph sample outlet and 48 substandard samples were measured. The substandard probes were taken at three CTD Stations (Fig. 5.7). Roughly 15 samples were not measured due to unstable/drifting conductivity values or false filling of the Flensburger bottles.

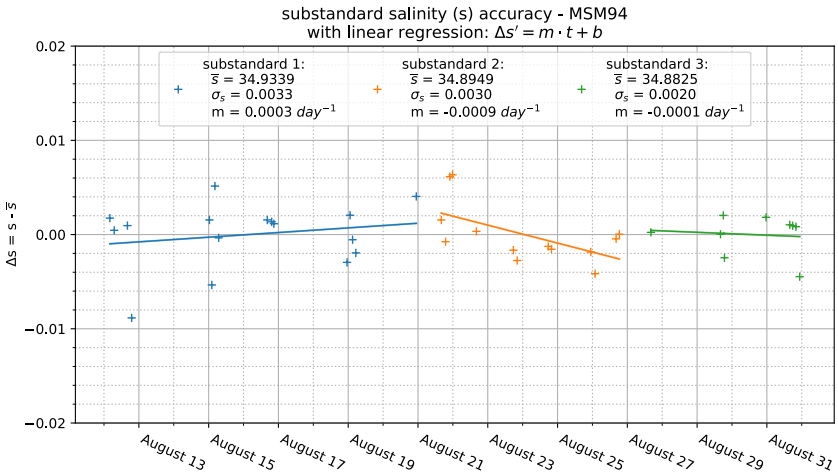

Fig 5.7 Temporal evolution of substandard measurements during MSM94. Substandard was collected in three batches and shown values are normalized by subtracting the mean of each batch.

5.4 Acoustic Doppler Current Profiler data

5.4.1 Lowered ADCP

(D. Rudloff, R. Witt)

During the entire cruise the CTD/Rosette system was equipped with a lowered ADCP setup based on two Teledyne RDI ADCPs. The setup consisted of an upward and downward looking 300-kHz workhorse ADCP. These two instruments were mounted inside the CTD rosette with especially manufactured frames protecting the instruments and allowing zero obstruction of the acoustic beams. The LADCP system delivered consistently good data throughout the whole cruise. All the time the same instruments (upward looking: S/N 24497; downward-looking: S/N 24535) were used and did not showed any problems. A GEOMAR-developed energy supply system that draws energy for the ADCPs from the CTD system worked well throughout the cruise.

For the data and command transmission between the ADCPs and a Windows PC, we used a recently GEOMAR in house developed system based on XBee wireless modules. Sending commands to the ADCPs worked well for all profiles. However, data transfer from the ADCPs to the PC brought up some minor issues. Occasionally, the downloaded profiles were incomplete or just one of the two profiles were downloaded. There was no pattern of when or why that happened. Those profiles could be downloaded easily manually afterwards, and it does not influence the data we gained in the end. It just showed the need of a double check of the profiles after downloading them.

When doing CTD-Stations in shallow water there was sometimes not enough time between the stations to download the profiles, which forced us to download the profiles manually later anyway. This procedure takes some time afterwards as you cannot all profiles at once but must do it one by one. It is time consuming but works well.

Data processing took place during the cruise using the GEOMAR LADCP processing software V11.0beta, which includes both shear and inversion methods to derive an absolute velocity profile. The processing includes the processed CTD and vessel-mounted ADCP data.

Overall the LADCP system delivered good deep-ocean velocity profiles when processed in conjunction with the observations of the vessel-mounted ADCP (VMADCP) and when coming close enough to the seafloor to obtain TRDI bottom track data (see figure 5.2).

5.4.2 Ship mounted ADCP

(C. Posern)

Two ship mounted ADCP, Ocean Surveyor 38 kHz (OS38), installed in the midships shaft, and 75 kHz (OS75), installed in the ship's hull mount, were used during MSM94 to measure ocean currents in the upper ocean. Both instruments were started after leaving the EEZ of Ireland and stopped shortly when staying at the St. Johns port (2020/08/12 08:31–16:25) and finally stopped when entering the EEZ of Great Britain. The OS38 did not measure from 2020/08/23 14:30 until 2020/08/24 00:52 due to unknown reason, maybe after the data downloaded at 2020/08/23 14:13, the sADCP were not turned on again). Apart from that, both instruments worked well during the whole cruise. The OS38 ran in narrowband mode, the OS75 in broadband mode. The OS75 instrument was configured with 100 bins of 8 m, with a range of 10 m to 600 m. The OS38 used 50 bins of 32 m, with a range between 22 m and 1500 m. The pinging per minute setting was as fast as possible.

Navigation data

Beam and navigation data were collected on ADCP PCs using the VmDas software, integrated and merged in single .ENX files. The primary source of navigation data was the Kongsberg Seapath 200 GPS.

Processing

A backup of the velocity data was made daily on the ships server and the data were processed almost daily with Matlab using the vmadcp toolbox from GEOMAR (FB1/PO). Routines used on board were osheader.m, osdatasip.m and osrefine_old.m. The result was a misalignment angle of 0.4455° for the OS38 and 0.7813° for the OS75. The amplitude factor found was 1.001375 and 1.013817 respectively. The first two bins have been removed for analysing because they are contaminated by the ships velocity.

Preliminary Results

As a result of the first data analysing we show here mesoscale structures observed in the Labrador Sea (Fig 5.8). Eddy 1 was detected on the track north from the mooring K1 to the shelf of Greenland at 2020/08/22 (start: 51.9102 W/57.6877 N; end: 51.4889 W/58.3012 N). It was an anticyclonic eddy of approx. 60 km in diameter, 750 m depth and a baroclinic appearance. When compared to the underway CTD data (not shown here) there was a colder area of surface water and a warm core at about 400 m depth with isopycnals corresponding to the anticyclonic circulation. The Eddy transported fresh water in its core.

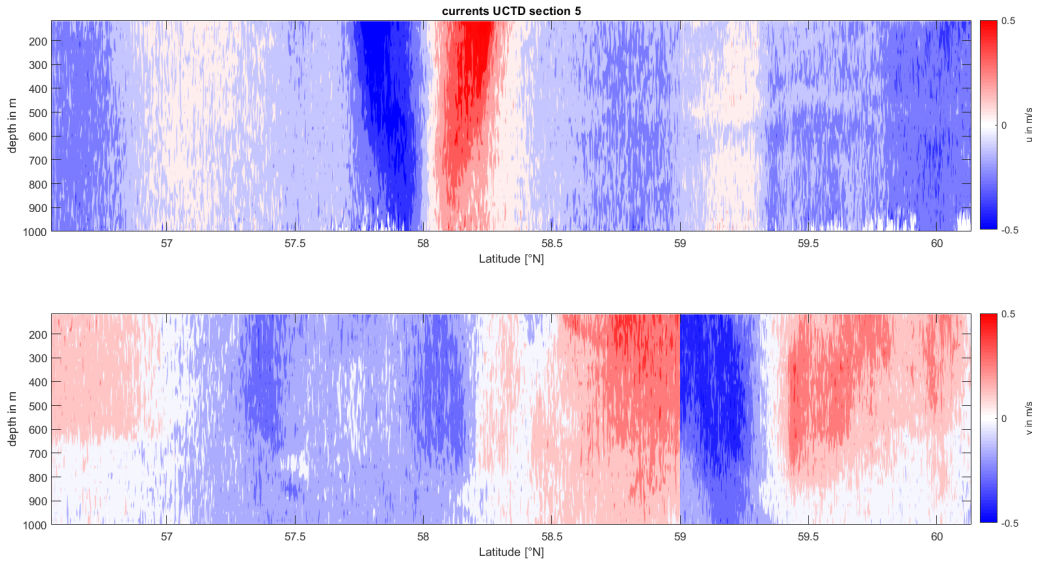

Fig. 5.8: Example for a meridonal (upper) and zonal (lower) currents along a section where also underway CTD data was collected (for section location see Fig. 5.8).

5.5 Underway data

5.5.1 Underway CTD

(A.C. Hans)

An Oceanscience Underway CTD 10-400 system was used during the cruise to make measurements of upper ocean temperature and salinity while underway. The system consists of a CTD probe with a tail spool, on which the desired length of line is spooled on using a rewinder. The probe falls freely through the water column, sampling temperature, conductivity and pressure at about 16 Hz. Deployment and recovery of the probe are done using a winch and small davit that form part of the uCTD system. Data is recorded internally and uploaded via Bluetooth connection.

During the MSM94 science cruise, one single uCTD probe was used for profiling: SN 70200333 (probe-1). A total of 75 uCTD casts were completed between 2020/08/06 and 2020/08/25 (See table 5.7 and figure 5.8). Most of the profiles were done to a target depth of 400 m (435 m line spooled on, free-fall time of 100 s), except near the Canadian and the Greenland shelf where we performed shallower profiles with less or no line wound onto the tail spool. The depth reached by the probe varied due to different winches used and varying ship velocity but was generally within 50 m of the target depth.

Table 5.7 Probe (serial number, SN) used for the mentioned profiles

SN	Profile number
70200333	1-75 (all)

Two calibration casts were performed with the uCTD probes attached to the rosette during CTD casts to 2000 m depth with 5-7 calibration stops à 7 min (See table 5.8). Probe-1 was stable in its data collection. A second probe (SN 70200155, probe-2) was attached during the calibration casts as well but not used for profiling as probe-1 was working smoothly. Further, probe-2 did not work during the first calibration cast due to issues with the magnet removal.

Table 5.8 Probes (serial number, SN) mounted on the listed CTD casts for calibration

SN	CTD Cast (not used for profiler during MSM94)
70200333, 70200155	1,44

After profiling, the raw data were processed and calibrated. Calibration coefficients were determined by comparing the temperature and salinity data at 6±1 m to the TSG data, which was calibrated with the calibrated CTD data, resulting in a root mean square (rms) temperature misfit of 0.062 °C and a conductivity misfit of 0.074 S/m after removal of the most deviating 11% of samples. A linear pressure correction was determined by comparing uCTD and calibrated CTD data for the combined casts. To verify the used coefficients, the now calibrated temperature and salinity data were compared with the calibrated CTD data for both the two combined casts and casts close in time and space (difference in time < 1 day). Position data was gained by matching up the uCTD profile times to the DAVIS Ship-data record.

Different minor problems were encountered during the survey such as knots on the lines (4). Besides, there were few issues with the motor and the resistance of the winch, though both did not affect the profiling.

5.4.1 Preliminary Results

The underway CTD data was collected in a way that allowed several section to be constructed (Fig. 5.9 and Fig. 5.10). A wide range of temperature and salinity values were encountered during the cruise and contained cold and fresh Labrador Current water but also warm and fresh (summer cruise) waters were observed. For the westward transit from Emden to St. Johns a gradual decrease in salinity is observed as well as more colder conditions towards the west, as expected.

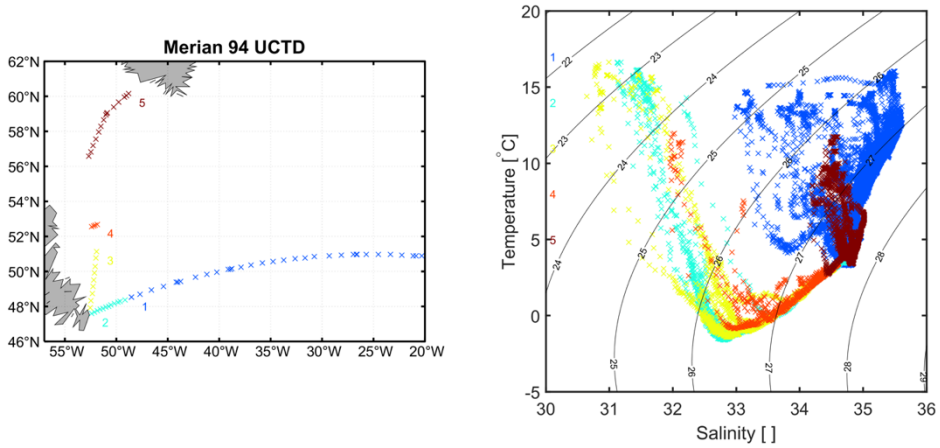

Fig. 5.9.: (Left) Position of acquired uCTD profiles during MSM94. (Right) T/S diagram for the sections sampled (corresponding color coding).

The temperature and salinity changes along the section from east (observations started outside the UK EEZ) to west (Fig. 5.10) nicely show the existence of a number of mesoscale eddies carrying T/S anomalies in their cores. Likewise, approaching the Newfoundland Shelf, the cold and very fresh waters are clearly seen. Underway system such as the uCTD but even more the Moving Vessel profiler (not available for this cruise) are perfect observing devices for transit operations of the research ships and should be considered to be added as standard, shared equipment, such as the ship maintained CTDs.

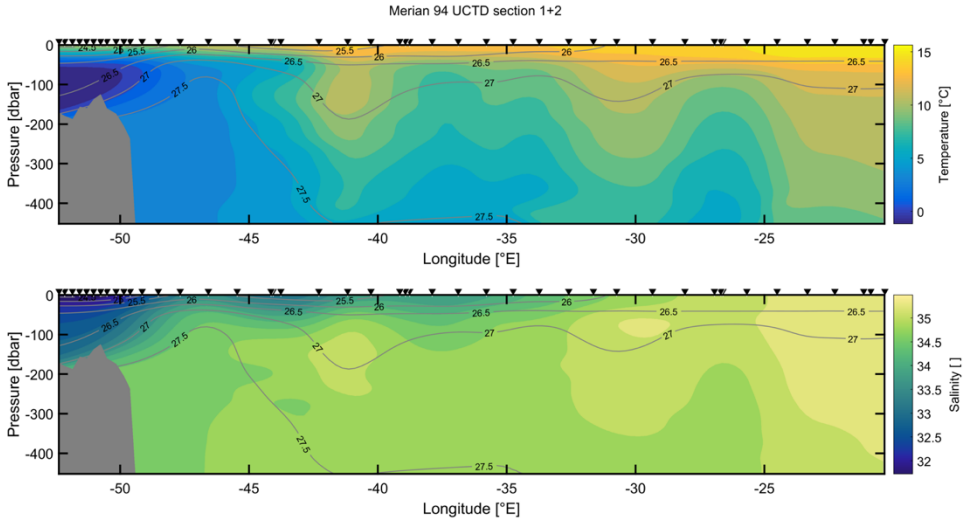

Fig. 5.10 Depth profile for temperature (top) and salinity (bottom) approaching the Canadian shelf – complying with section 1 and 2 marked in figure 5.8 (left). The downward triangles mark stations for uCTD profiles. Density contours are superimposed.

5.5.2 DSHIP data

(C. Lösel)

Thermosalinograph

On Maria S. Merian underway sea surface water properties are measured through the "Rein See Wasser System" (RSWS). The RSWS contains two separate measurement units, which alternate on 12-hour cycles, taking water from about 6m below the design water line to measure Temperature, Salinity, Chlorophyll and Turbidity. When one device is switched on, the other device is flushed with water to prevent biofouling, however the RSWS system provides also a merged continuous record from both units, as well as data from the individual sensors. Temperature is measured externally on the ship hull using a Sea Bird Electronics (SBE) Sensor 45. Conductivity, Chlorophyll and Turbidity are sampled internally inside the pumped RSWS container units. Salinity is calculated from internal conductivity cell and internal temperature sensor. Access to all underway data is provided through the DAVIS SHIP (DSHIP) intranet server portal (http://dship1:8080/dship-extraction/). Recording started on 05.08.2020 at 6pm and went on for the whole transit to St. Johns. On 12.08.2020 there is no data for the time we were in the harbor from 07.45 am until 4.35 pm. Additionally there is a small gap on the morning of 25. August.

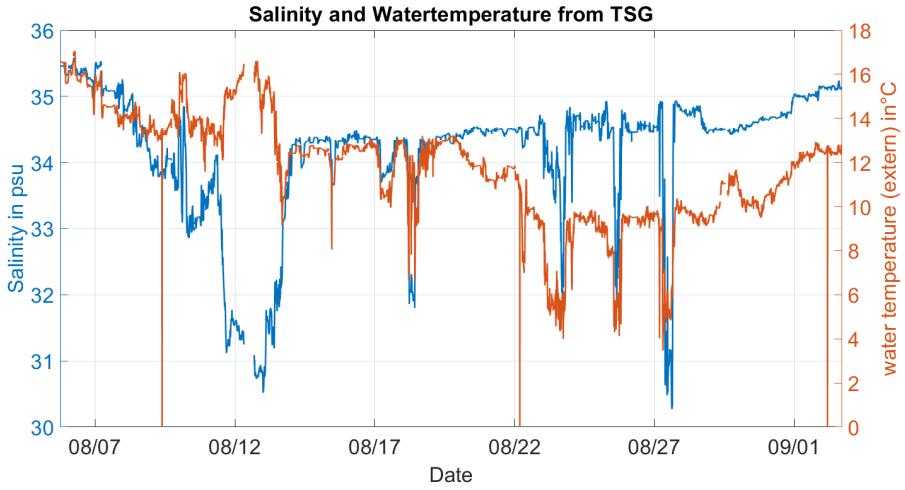

Fig. 5.11.: Timeseries of the Water Temperature and Salinity of the RSWS

On this cruise, we took a special look on the change of the measurement units. During a research cruise in the beginning of the year, it was noted that there are differences in the TSG calibration with the calibrated CTD at 6m depth and the salinometer samples. Therefore, for one of the measurement units there were no suitable calibration values found. During MSM94, we took more TSG samples than usual (during the transit to St. Johns 10-15 min before and after every change of the measurement unit) to get to know more about the problem. We assume that there is a leakage in the rinse water unit of the mentioned measurement unit leading to an additional fresh water input. A final conclusion can just be drawn after further analysis which will be done by the DAM underway data TSG responsible (Michael Schlundt).

Weather Station Data

On the Maria S. Merian top deck mast and navigation deck mast various sensors record air temperature, humidity, wind speed, precipitation and radiation for the entire cruise except for a small gap on the morning of 25.8. when a network error occurred and the measured data wasn't

transmitted correctly. Below is a table of the main weather station sensors and their approximate height above the water surface (Table 5.9). The weather station data was accessed similarly as for the RSWS data through the DSHIP portal with a one-minute resolution. The values of the water temperature are taken from the RSWS.

Table 5.9: Parameters and Height of Sensors above mean sea level

Parameter	Sensor Height (m)
Humidity	26
Wind Speed	29
Air Temperature	29
Solar and IR Radiation	16
Precipitation	16
Barometer	16
Water Temperature	-6

The data reveal air temperatures followed the general ocean surface temperatures, with a clear diurnal cycle in the beginning of our cruise when we were still close to the land (Fig 5.11). There is a significant peak in the air temperature and humidity (Fig 5.12) for the time we stayed in St. Johns' harbor.

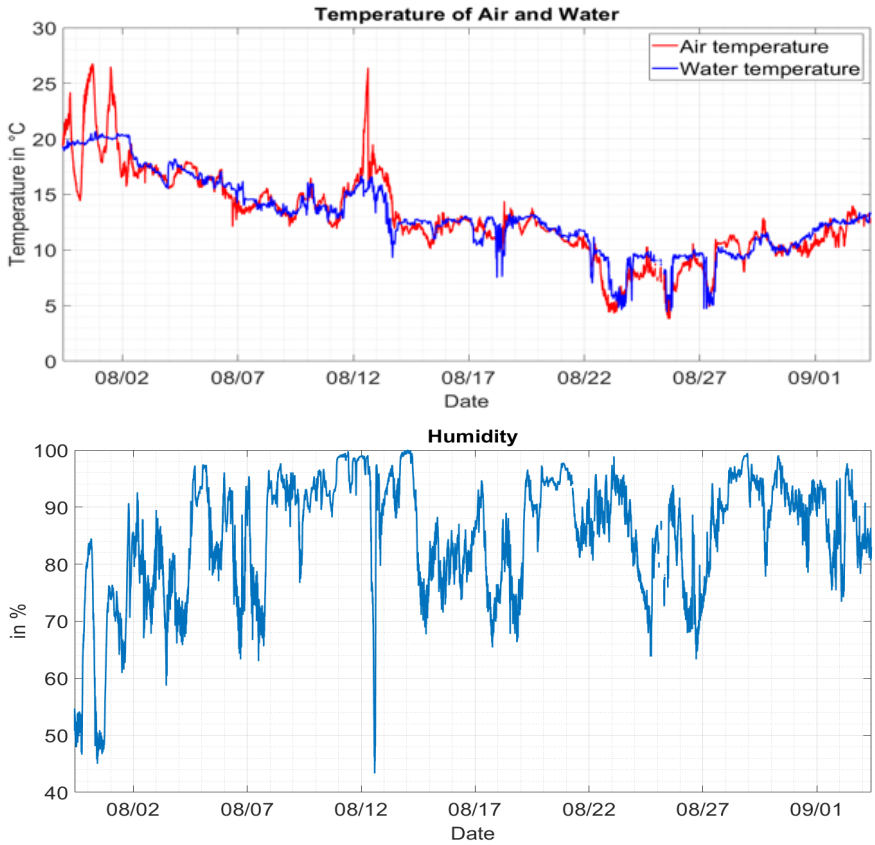

Fig. 5.12.: (upper) Timeseries of air (red) and sea surface (blue) temperatures. (lower) Timeseries of humidity during MSM94

We encountered only one storm on our whole cruise, which can be seen in the data between the 27 and 28.8. There is a peak in the wind speed and a significant drop in the air pressure (Fig 5.13).

There was also a lot of precipitation in that night with generally little rain over the whole cruise (Fig 5.13).

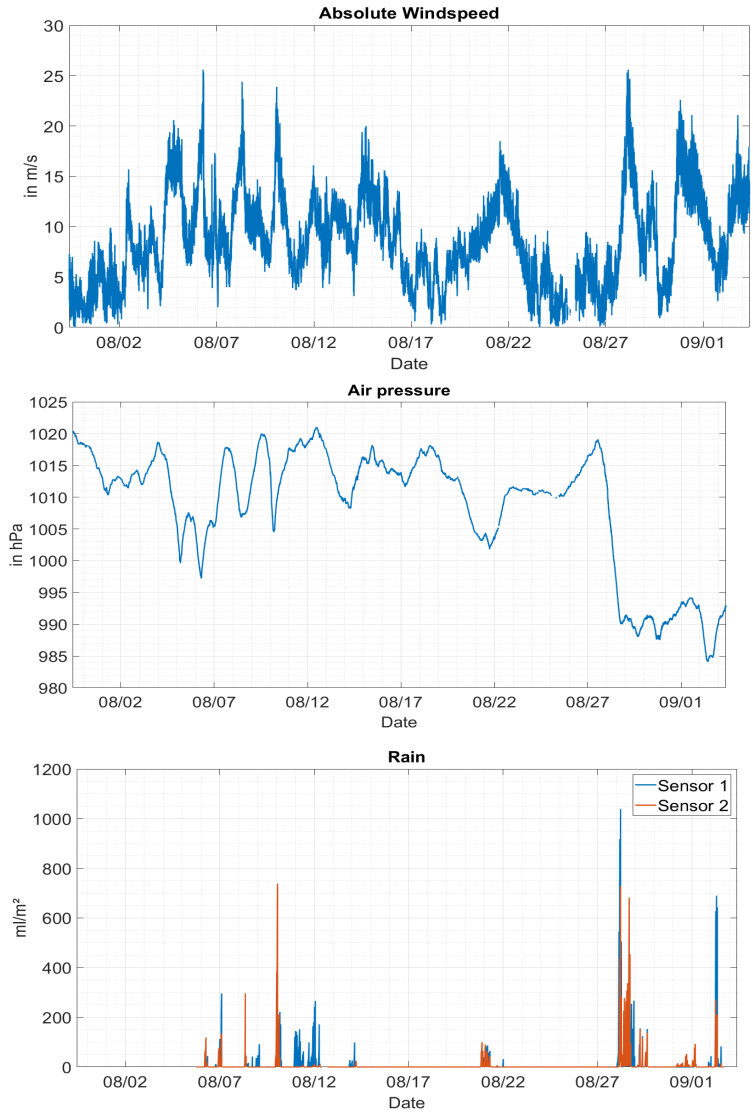

Fig. 5.13.: (upper) Precipitation), (middle) surface air pressure, and (lower) wind speed during the MSM94 expedition.

A special weather event happened on the 10. August, just two days before reaching St. Johns' harbor, when we experienced a thick layer of fog around us. Fog kept appearing and reappearing several times the following week. The region in front of Newfoundland, where the cold Labrador Current meets the warm Gulf Stream, is known for fog caused by cooling of air with high water vapor content. The air is cooled by the cold sea underneath and cannot hold as much moisture as it could before. This can be seen in the timing of the observations during the time with thick fog (Fig. 5.14). The first occurrence of fog was sighted on the 10.8. around 10pm UTC. This is marked by the first vertical line. At this time, the air temperature drops rapidly and the humidity reaches 100%. The fog disappears only around 11 UTC the next day, when the air temperatures rise and above the temperatures of the water. The disappearance is marked by the second vertical line. This pattern repeats itself a few times. Every time the air temperature cools down, the fog starts to build

up. The huge peak in the air temperature and in the humidity marks the few hours we spend in the bay of St. Johns.

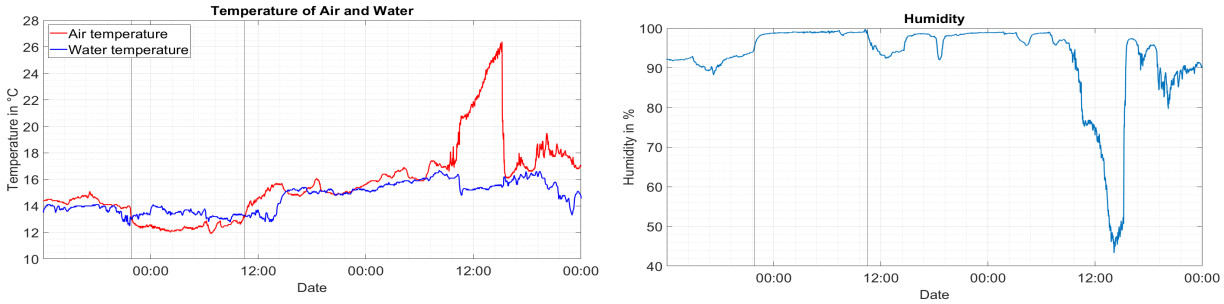

Fig. 5.14.: Temperature of Air and Water (left) and Humididty (right) for the period with a fog event from 10. To 12. August 2020

5.6 Biogeochemisty

(Lennart Gerke)

5.6.1 Oxygen Winkler titration & nutrient sampling

To calibrate the SEB 43 oxygen sensor connected to the CTD and keep track of the drift, water samples were collected from Niskin bottles and dissolved oxygen was measured via Winkler titration (Winkler 1888). The water samples were collected directly after the CTD rosette was put on deck and before all other samples to limit any distortion by outgassing of the water. Therefore a piece of Tygon tube was used to transfer the water from the Niskin bottles into calibrated sampling flasks. The sample bottles were flushed 3-4 times their volume to ensure air-bubble free samples. Oxygen fixation was carried out directly after sampling by adding each 1 mL of the two fixation reagents ($MnCl_2$ and NaI/NaOH) to the sample bottle with bottle-top dispensers (EM-Dispenser 0.4-2 mL, Hirschmann). The samples were shaken for 30 seconds to ensure all oxygen was fixed and to ensure the reaction took place completely. After collecting all samples from the Niskin bottles they were stored in the dark for at least 30 minutes to ensure that no further oxygen production via photosynthesis takes place within the sample.

Titrations were performed within the sample bottles using a 20 mL SI Analytic universal titration Burette (SN: 00693123), which was switched August 18th due to a problem with the magnetic stirrer. Afterwards the 20 mL SI Analytic Titronic 300 Burette (SN: 10058872) was used. After adding 1 mL of 50% hydrochloric acid the solution was titrated with Sodium Thiosulfate. Within the titration 1 mL of an iodine stark solution was added to determine the final amount of Sodium Thiosulfate more easily.

The Sodium Thiosulfate factor was determined using a 50 mL SI Analytic universal titration Burette (SN: 00693160) to add 10 mL of a standard solution (KiO_3). These standard measurements were carried out each day to keep track of the Sodium Thiosulfate factor. The Sodium Thiosulfate and the Standard solutions (KiO_3) were renewed every week.

A total of 381 samples were measured and from 103 doubles and triplets the mean standard deviation of 1.44 µmol/L was determined. After removing outliers the standard deviation was 0.68 µmol/L.

Nutrient samples were taken in plastic tube using a syringe with filter. The samples were shock frozen and kept at -20°C. Analysis will be done in Kiel, GEOMAR. These samples will be used to calibrate the Nutrient sensor mounted to the CTD.

5.6.2 DIC/TA sampling

During the cruise DIC/TA samples were taken at 10 CTD stations to provide calibration data for the pCO2 sensors (Jamie Palter URI) and for a Biogeo Argo Float (BSH & Tobias Steinhoff GEOMAR). All in all 54 samples were collected and poisoned for measurements on shore. The water samples were collected directly after the oxygen samples were taken from the Niskin bottles. The sample bottles were flushed 1.5 times their volume to ensure air-bubble free samples. Afterwards all samples were poisoned by adding1-2 µL of mercuric chloride ($HgCl_2$).

5.7 Drifter deployment

(A.C. Hans)

During MSM94, 9 floats and 50 SVP drifters were deployed. The individual ID-numbers as well as deployment positions and dates are listed below (Table 5.10). On behalf of the Ifremer (Damien Desbruyeres, Noé Poffa) we deployed 8 deep ARVOR floats designed for the ARGO program (Table 5.10). Floats were equipped with a pumped CTD and an oxygen optode, acquiring profiles in the upper 4000m of the ocean. Prior to deployment, auto-tests were conducted which were all successful. The floats were then deployed manually while steaming with 2-4kn against the current. At the positions of deployment, a CTD profile was conducted as well.

Table 5.10: Deployment details for the deep ARVOR floats

Float serial #	IMEI	WMO	Latitude	Longitude	Deployment Date (UTC)	CTD#
AD2700-18FR009	300234067118700	6902970	52° 59.414'N	051° 08.130'W	18-Aug-2020 21:49	22
AD2700-19FR002	300234060114320	6903029	52° 59.439'N	051° 08.121'W	18-Aug-2020 21:50	22
AD2700-18FR015	300234068815870	6902976	56° 33.410'N	052° 44.072'W	21-Aug-2020 23:25	28
AD2700-19FR003	300234068283300	6903030	56° 33.357'N	052° 44.072'W	21-Aug-2020 23:26	28
AD2700-19FR005	300234068286320	6903032	59° 00.008'N	050° 59.878'W	22-Aug-2020 16:18	32
AD2700-19FR007	300234068281190	6903034	59° 00.009'N	050° 59.814'W	22-Aug-2020 16:19	32
AD2700-17FR006	300234065894840	6902886	59° 18.568'N	046° 53.446'W	25-Aug-2020 20:25	42
AD2700-18FR001	300234065795480	6902888	59° 18.537'N	046° 53.528'W	25-Aug-2020 20:26	42

On behalf of the Bundesamt für Seeschifffahrt und Hydrographie (BSH) and in collaboration with the Marine Chemistry group at GEOMAR (Tobias Steinhoff, Arne Körtzinger) we deployed 1 Teledyne Webb Research APEX-BGC profiling float (Table 5.11). The float was equipped with a pumped CTD, an oxygen optode, a fluorometer, and a pH sensor, acquiring profiles in the upper 2000m of the ocean. Prior to deployment, a self-test was conducted which was successful. The float was then deployed manually while steaming with 2kn against the current.

Table 5.11: Deployment details for the APEX-BGC float

Float serial #	IMEI	WMO	Latitude	Longitude	Self-Test Date (UTC)	Deployment Date (UTC)	CTD #
8903	300125061425420	7900566	57° 34.937'N	53° 00.00'W	21-Aug-2020 12:03	21-Aug-2020 12:24	31

On behalf of the National Oceanography Centre, Southampton (Eleanor Frajka-Williams, Ilona Goszczko) we deployed 50 GDP (Global Drifter Program) SVP (Surface Velocity Program) drifters equipped with temperature sensors and GPS positioning system, produced by the Lagrangian Drifter Lab at Scripps. They were deployed manually along two sections across the Greenland continental ridge (Table 5.12) and are meant to follow the currents at 15 m depth thanks to a 'holey sock' drogue. Further, they activate themselves when in contact to sea water, so no prior actions where necessary.

Table 5.12: Deployment details for the SVP drifters

WMO	Deployment Date (UTC)	Latitude	Longitude	Depth (m)
4402639	23.08.2020 18:12	60° 13.846' N	046° 57.343' W	468.3
4402653	23.08.2020 18:35	60° 11.196' N	047° 00.901' W	367.0
4402651	23.08.2020 18:37	60° 11.136' N	047° 01.045' W	363.2
6501696	23.08.2020 18:39	60° 11.026' N	047° 01.156' W	362.1
4402570	23.08.2020 18:42	60° 10.925' N	047° 01.255' W	358.9
4402640	23.08.2020 19:01	60° 08.827' N	047° 04.164' W	348.0
6501702	23.08.2020 19:03	60° 08.734' N	047° 04.275' W	399.9
6501701	23.08.2020 19:05	60° 08.664' N	047° 04.348' W	419.9
6501699	23.08.2020 19:07	60° 08.610' N	047° 04.433' W	452.5
6402573	23.08.2020 19:30	60° 06.072' N	047° 08.141' W	838.0
4402636	23.08.2020 19:32	60° 05.996' N	047° 08.249' W	855.9
4402638	23.08.2020 19:33	60° 05.920' N	047° 08.378' W	882.2
6402572	23.08.2020 19:34	60° 05.869' N	047° 08.475' W	904.2
6402569	23.08.2020 20:08	60° 02.415' N	047° 14.410' W	1263.1
4402650	23.08.2020 20:09	60° 02.346' N	047° 14.549' W	1306.7
4402652	23.08.2020 20:12	60° 02.254' N	047° 14.732' W	1366.4
6402571	23.08.2020 20:14	60° 02.192' N	047° 14.867' W	1376.4
4402649	23.08.2020 20:36	60° 00.248' N	047° 17.649' W	1738.7
6501697	23.08.2020 20:38	60° 00.165' N	047° 17.807' W	1789.2
4402646	23.08.2020 20:40	60° 00.086' N	047° 17.961' W	1902.9
4402635	23.08.2020 20:42	60° 00.016' N	047° 18.102' W	1939.2
6501698	23.08.2020 21:04	59° 57.815' N	047° 21.759' W	2627.4
6501695	23.08.2020 21:06	59° 57.727' N	047° 21.912' W	2639.7
4402623	23.08.2020 21:07	59° 57.664' N	047° 22.017' W	2647.6
4402624	23.08.2020 21:09	59° 57.604' N	047° 22.074' W	2649.4
4402642	23.08.2020 22:19	59° 51.373' N	046° 58.716' W	2521.2
4402648	23.08.2020 22:22	59° 51.425' N	046° 58.566' W	2505.6
4402645	23.08.2020 22:24	59° 51.467' N	046° 58.430' W	2478.6
4402627	23.08.2020 22:26	59° 51.504' N	046° 58.306' W	2460.5
4402641	23.08.2020 22:46	59° 52.817' N	046° 54.110' W	1984.5
4402644	23.08.2020 22:48	59° 52.857' N	046° 53.973' W	1934.9

4402632	23.08.2020 22:50	59° 52.891' N	046° 53.848' W	1864.0
4402620	23.08.2020 22:53	59° 52.933' N	046° 53.675' W	1840.5
4402643	23.08.2020 23:12	59° 54.296' N	046° 49.495' W	1656.7
6501704	23.08.2020 23:14	59° 54.324' N	046° 49.402' W	1647.7
4402626	23.08.2020 23:15	59° 54.362' N	046° 49.295' W	1640.3
4402631	23.08.2020 23:17	59° 54.396' N	046° 49.197' W	1634.9
4402637	23.08.2020 23:36	59° 55.793' N	046° 44.898' W	1272.0
4402629	23.08.2020 23:38	59° 55.827' N	046° 44.775' W	1261.8
4402628	23.08.2020 23:39	59° 55.854' N	046° 44.678' W	1270.1
4402622	23.08.2020 23:42	59° 55.892' N	046° 44.537' W	1269.9
4402619	24.08.2020 00:00	59° 57.320' N	046° 40.216' W	917.3
4402630	24.08.2020 00:02	59° 57.355' N	046° 40.116' W	910.1
4402621	24.08.2020 00:04	59° 57.403' N	046° 39.973' W	897.6
4402634	24.08.2020 00:06	59° 57.440' N	046° 39.850' W	887.3
4402647	24.08.2020 00:26	59° 58.775' N	046° 35.654' W	444.1
4402625	24.08.2020 00:28	59° 58.809' N	046° 35.524' W	424.3
6501703	24.08.2020 00:30	59° 58.847' N	046° 35.406' W	405.2
6501700	24.08.2020 00:31	59° 58.877' N	046° 35.343' W	389.5
4402633	24.08.2020 00:49	60° 00.281' N	046° 31.545' W	166.4

6 Station List

Gear coding

CTD: CTD/lowered Acoustic Doppler Current Profiler/UVP and rosette sampler; MOOR: Mooring operation; TSG: Thermosalinograph, EM122: Deep-Sea Multibeam Echosounder, ADCP: Acoustic Doppler Current Profiler, uCTD: Underway CTD;

Station No.	Date Time	Gear	Latitude	Longitude	Depth (m)	Remarks
MSM94_0_ Underway-1	2020/07/30 10:05:31	Weather-station	53° 21.110' N	007° 11.910' E	36.5	recording start
MSM94_0_ Underway-2	2020/08/05 18:00:00	TSG ADCP EM122	65° 43.986' N	005° 21.996' W	2786.2	recording start
MSM94_1-1	2020/08/05 19:10:26	CTD	50° 34.824' N	015° 32.827' W	4205.1	CTD#1
MSM94_2-1	2020/08/06 13:38:55	uCTD	50° 52.343' N	020° 12.649' W	3737.9	Dummy
MSM94_3-1	2020/08/06 14:05:05	uCTD	50° 52.649' N	020° 20.153' W	3969.0	UCTD-01
MSM94_4-1	2020/08/06 16:03:50	uCTD	50° 53.909' N	020° 53.276' W	3169.5	uCTD-02
MSM94_5-1	2020/08/06 17:03:06	uCTD	50° 54.441' N	021° 08.857' W	3268.3	uCTD-03
MSM94_6-1	2020/08/06 21:14:43	uCTD	50° 56.355' N	022° 16.467' W	3649.8	uCTD-04
MSM94_7-1	2020/08/07 01:00:30	uCTD	50° 57.568' N	023° 20.004' W	3715.0	uCTD-05
MSM94_8-1	2020/08/07 05:08:36	uCTD	50° 58.242' N	024° 30.990' W	4090.6	uCTD-06
MSM94_9-1	2020/08/07 09:19:43	uCTD	50° 58.201' N	025° 40.742' W	3753.9	uCTD-07
MSM94_10-1	2020/08/07 12:40:41	uCTD	50° 57.672' N	026° 36.319' W	3607.6	uCTD-08
MSM94_11-1	2020/08/07 14:17:11	uCTD	50° 57.590' N	026° 41.604' W	3630.7	CTD#2
MSM94_12-1	2020/08/07 16:20:29	uCTD	50° 57.605' N	026° 42.405' W	3623.4	uCTD-09
MSM94_13-1	2020/08/07 17:14:40	uCTD	50° 57.372' N	026° 56.427' W	3621.5	uCTD-10
MSM94_14-1	2020/08/07 21:07:38	uCTD	50° 55.888' N	028° 05.793' W	3617.9	uCTD-11

MSM94_15-1	2020/08/08 01:24:38	uCTD	50° 53.525' N	029° 20.357' W	2893.3	uCTD-12
MSM94_16-1	2020/08/08 06:15:35	uCTD	50° 49.943' N	030° 43.745' W	3381.4	uCTD-13
MSM94_17-1	2020/08/08 09:57:47	uCTD	50° 47.058' N	031° 38.120' W	3660.9	uCTD-14
MSM94_18-1	2020/08/08 14:02:29	uCTD	50° 43.557' N	032° 35.611' W	3854.8	uCTD-15
MSM94_19-1	2020/08/08 18:10:40	uCTD	50° 38.778' N	033° 43.601' W	3395.6	uCTD-16
MSM94_20-1	2020/08/08 22:04:48	uCTD	50° 33.913' N	034° 44.548' W	4072.3	uCTD-17
MSM94_21-1	2020/08/09 02:04:33	uCTD	50° 28.364' N	035° 47.041' W	3424.1	uCTD-18
MSM94_22-1	2020/08/09 06:11:37	uCTD	50° 21.891' N	036° 52.792' W	3721.6	uCTD-19
MSM94_23-1	2020/08/09 10:06:31	uCTD	50° 15.332' N	037° 53.521' W	4154.8	uCTD-20
MSM94_24-1	2020/08/09 12:04:42	uCTD	50° 11.781' N	038° 24.394' W	4106.5	no data
MSM94_25-1	2020/08/09 13:24:49	uCTD	50° 09.227' N	038° 45.895' W	4404.8	UCTD-21
MSM94_26-1	2020/08/09 15:22:59	CTD	50° 08.173' N	038° 54.342' W	4326.1	CTD#3
MSM94_27-1	2020/08/09 17:23:37	uCTD	50° 07.818' N	038° 56.620' W	4311.2	uCTD-22
MSM94_28-1	2020/08/09 18:08:10	uCTD	50° 06.663' N	039° 08.315' W	4080.1	uCTD-23
MSM94_29-1	2020/08/09 22:04:22	uCTD	49° 57.799' N	040° 15.491' W	4402.4	uCTD-24
MSM94_30-1	2020/08/10 02:03:13	uCTD	49° 50.130' N	041° 10.720' W	4734.7	uCTD-25
MSM94_31-1	2020/08/10 07:14:50	uCTD	49° 40.130' N	042° 18.109' W	4371.1	uCTD-26 engine of the winch stopped working
MSM94_32-1	2020/08/10 13:00:10	uCTD	49° 26.892' N	043° 40.570' W	3940.1	Dummy
MSM94_33-1	2020/08/10 13:23:26	uCTD	49° 25.943' N	043° 46.254' W	3915.5	uCTD-27
MSM94_34-1	2020/08/10 14:30:29	uCTD	49° 22.961' N	044° 03.824' W	3626.7	uCTD-28
MSM94_35-1	2020/08/10 16:07:30	CTD	49° 22.108' N	044° 08.930' W	3491.5	CTD#4
MSM94_36-1	2020/08/10 18:02:03	uCTD	49° 22.022' N	044° 09.541' W	3723.1	uCTD-29
MSM94_37-1	2020/08/10 19:16:46	uCTD	49° 18.504' N	044° 29.572' W	2984.2	UCTD-30 knots in the wire
MSM94_38-1	2020/08/10 23:10:10	uCTD	49° 08.173' N	045° 26.946' W	2491.0	uCTD-31
MSM94_39-1	2020/08/11 03:15:46	uCTD	48° 55.156' N	046° 35.282' W	2709.9	uCTD-32
MSM94_40-1	2020/08/11 07:18:56	uCTD	48° 42.080' N	047° 40.057' W	2362.7	uCTD-33
MSM94_41-1	2020/08/11 11:07:12	uCTD	48° 31.254' N	048° 31.759' W	1714.8	uCTD-34
MSM94_42-1	2020/08/11 14:28:10	uCTD	48° 23.224' N	049° 08.804' W	723.2	uCTD-35
MSM94_43-1	2020/08/11 16:53:53	uCTD	48° 16.911' N	049° 37.213' W	235.9	uCTD-36
MSM94_44-1	2020/08/11 18:02:57	uCTD	48° 13.730' N	049° 51.266' W	205.0	uCTD-37
MSM94_45-1	2020/08/11 19:42:35	uCTD	48° 09.573' N	050° 09.420' W	174.6	uCTD-38
MSM94_46-1	2020/08/11 21:39:51	uCTD	48° 04.627' N	050° 30.705' W	161.3	uCTD-39
MSM94_47-1	2020/08/11 23:00:01	uCTD	48° 01.200' N	050° 45.223' W	124.9	uCTD-40
MSM94_48-1	2020/08/12 00:31:10	uCTD	47° 57.263' N	051° 01.735' W	136.8	uCTD-41
MSM94_49-1	2020/08/12 01:59:01	uCTD	47° 53.432' N	051° 17.604' W	160.1	uCTD-42
MSM94_50-1	2020/08/12 03:31:51	uCTD	47° 49.331' N	051° 34.355' W	156.2	uCTD-43
MSM94_51-1	2020/08/12 05:03:47	uCTD	47° 45.236' N	051° 50.893' W	186.5	uCTD-44
MSM94_52-1	2020/08/12 06:45:56	uCTD	47° 40.644' N	052° 09.191' W	179.8	uCTD-45
MSM94_0_ Underway-3	2020/08/12 07:45:00	TSG ADCP EM122	47° 37.961' N	052° 19.770' W	179.4	3nm Canada
MSM94_53-1	2020/08/12 08:03:56	uCTD	47° 36.956' N	052° 23.050' W	171.8	uCTD-46
MSM94_55-1	2020/08/12 09:39:43	CTD	47° 32.817' N	052° 35.177' W	180.4	CTD#5
MSM94_0_ Underway-3	2020/08/12 16:35:00	TSG ADCP EM122	47° 48.156' N	052° 32.776' W	174.6	Outside 3nm Canada

MSM94_56-1	2020/08/12 17:10:06	uCTD	47° 55.596' N	052° 31.113' W	186.5	uCTD-47
MSM94_57-1	2020/08/12 19:02:21	uCTD	48° 18.961' N	052° 26.570' W	202.5	uCTD-48
MSM94_58-1	2020/08/12 21:01:53	uCTD	48° 43.136' N	052° 21.896' W	269.3	uCTD-49
MSM94_59-1	2020/08/12 23:08:08	uCTD	49° 07.984' N	052° 17.248' W	323.2	uCTD-50
MSM94_60-1	2020/08/13 01:00:41	uCTD	49° 30.284' N	052° 12.968' W	331.1	uCTD-51
MSM94_61-1	2020/08/13 03:02:28	uCTD	49° 54.398' N	052° 08.297' W	286.1	uCTD-52
MSM94_62-1	2020/08/13 05:00:40	uCTD	50° 17.519' N	052° 03.780' W	249.4	uCTD-53
MSM94_63-1	2020/08/13 07:19:09	uCTD	50° 46.186' N	051° 58.114' W	218.7	uCTD-54
MSM94_64-1	2020/08/13 09:07:05	uCTD	51° 09.123' N	051° 53.558' W	230.7	uCTD-55
MSM94_65-1	2020/08/13 18:17:32	CTD	52° 51.180' N	051° 31.789' W	1451.7	CTD#6
MSM94_66-1	2020/08/13 20:41:59	CTD	52° 58.340' N	051° 18.050' W	2271.2	CTD#7
MSM94_67-1	2020/08/13 23:19:27	CTD	53° 03.808' N	051° 04.047' W	2629.2	CTD#8
MSM94_68-1	2020/08/14 02:09:08	CTD	53° 09.222' N	050° 51.739' W	2892.7	CTD#9
MSM94_69-1	2020/08/14 05:56:28	CTD	53° 16.387' N	050° 33.258' W	3159.0	CTD#10
MSM94_70-1	2020/08/14 09:10:20	Mooring	53° 02.377' N	051° 04.465' W	2593.6	DSOW1 released
MSM94_71-1	2020/08/14 12:18:13	Mooring	53° 07.738' N	050° 51.918' W	2914.8	K9 released
MSM94_72-1	2020/08/14 16:34:06	Mooring	53° 14.934' N	050° 32.951' W	0.0	DSOW2 released
MSM94_73-1	2020/08/14 21:26:17	CTD	53° 22.279' N	050° 14.510' W	3401.2	CTD#11
MSM94_74-1	2020/08/15 01:49:55	CTD	53° 34.699' N	049° 45.758' W	3763.3	CTD#12
MSM94_75-1	2020/08/15 11:07:31	Mooring	52° 57.074' N	051° 17.855' W	2206.7	K8 / KPO 1186 released
MSM94_76-1	2020/08/15 16:01:42	Mooring	53° 02.884' N	051° 04.877' W	2605.2	DSOW1 deployed
MSM94_77-1	2020/08/15 19:43:53	Mooring	53° 08.039' N	050° 52.015' W	2895.6	K9 deployed
MSM94_78-1	2020/08/16 03:52:10	CTD	52° 57.201' N	048° 35.990' W	3731.2	CTD#13 Float calib.
MSM94_79-1	2020/08/16 11:03:06	Mooring	53° 35.222' N	049° 46.342' W	3608.3	DSOW5 released
MSM94_80-1	2020/08/16 13:51:03	Mooring	53° 35.673' N	049° 47.040' W	3604.3	DSOW5 deployed
MSM94_81-1	2020/08/16 15:59:32	Mooring	53° 22.965' N	050° 14.436' W	3422.6	K10 released
MSM94_82-1	2020/08/16 23:15:55	CTD	53° 15.403' N	050° 33.229' W	3167.0	CTD#14
MSM94_83-1	2020/08/17 10:00:39	Mooring	52° 49.895' N	051° 32.798' W	1256.1	K7 released
MSM94_84-1	2020/08/17 15:54:06	Mooring	52° 50.621' N	051° 33.101' W	1390.3	K7 deployed
MSM94_85-1	2020/08/17 20:31:10	Mooring	started	53° 15.493' N	332.1	DSOW2 deployed
MSM94_86-1	2020/08/17 22:40:44	CTD	53° 16.286' N	050° 33.893' W	3164.5	CTD#15
MSM94_87-1	2020/08/18 07:29:32	CTD	52° 33.912' N	052° 29.785' W	259.8	CTD#16
MSM94_88-1	2020/08/18 07:56:03	uCTD	52° 34.449' N	052° 25.409' W	271.0	uCTD-56
MSM94_89-1	2020/08/18 08:39:06	uCTD	52° 36.108' N	052° 11.642' W	300.2	uCTD-57
MSM94_90-1	2020/08/18 09:27:42	CTD	52° 37.108' N	052° 03.382' W	301.1	CTD#17
MSM94_91-1	2020/08/18 09:47:18	uCTD	52° 37.706' N	052° 01.902' W	303.2	uCTD-58
MSM94_92-1	2020/08/18 10:25:17	uCTD	52° 41.831' N	051° 51.680' W	308.3	uCTD-59
MSM94_93-1	2020/08/18 11:24:17	CTD	52° 45.496' N	051° 42.517' W	1011.2	CTD#18
MSM94_94-1	2020/08/18 12:33:10	CTD	52° 47.734' N	051° 36.703' W	1006.8	CTD#19
MSM94_95-1	2020/08/18 14:03:42	CTD	52° 50.643' N	051° 29.810' W	1470.4	CTD#20
MSM94_96-1	2020/08/18 15:51:14	CTD	52° 53.207' N	051° 23.398' W	1979.0	CTD#21
MSM94_97-1	2020/08/18 19:16:41	Mooring	52° 57.681' N	051° 18.493' W	2228.1	K8 deployed
MSM94_98-1	2020/08/18 21:00:04	CTD	52° 59.359' N	051° 08.177' W	2418.9	CTD#22
MSM94_99-1	2020/08/18 21:49:29	Float	52° 59.414' N	051° 08.130' W	2418.3	

MSM94_100-1	2020/08/18 21:50:02	Float	52° 59.439' N	051° 08.121' W	2424.3	
MSM94_101-1	2020/08/18 23:55:10	CTD	53° 05.529' N	050° 52.917' W	2902.2	CTD#23
MSM94_102-1	2020/08/19 02:57:22	CTD	53° 11.697' N	050° 37.638' W	3156.1	CTD#24
MSM94_103-1	2020/08/19 06:04:53	CTD	53° 17.887' N	050° 22.330' W	3305.8	CTD#25
MSM94_104-1	2020/08/19 12:17:55	Mooring	53° 23.241' N	050° 15.662' W	3361.4	K10 deployed/ KPO1225
MSM94_105-1	2020/08/19 13:59:56	CTD	53° 24.014' N	050° 07.115' W	3479.6	CTD#26
MSM94_106-1	2020/08/19 17:43:21	CTD	53° 32.521' N	049° 45.196' W	3594.3	CTD#27
Information	2020/08/20 14:15:14	EM122	55°42.796' N	051°48.920' W	3364	Changed device (serial #999)
MSM94_107-1	2020/08/20 14:15:14	CTD	56° 34.267' N	052° 40.950' W	3485.9	CTD#28
MSM94_108-1	2020/08/20 15:42:45	Mooring	56° 33.954' N	052° 40.245' W	3484.8	K1 released
MSM94_109-1	2020/08/21 01:58:52	CTD	57° 39.134' N	054° 28.394' W	3313.3	CTD#29
MSM94_109-2	2020/08/21 04:07:49	CTD	57° 39.138' N	054° 28.399' W	3314.1	CTD#30
MSM94_110-1	2020/08/21 11:36:24	CTD	57° 35.015' N	053° 00.039' W	3471.8	CTD#31
MSM94_111-1	2020/08/21 12:57:18	Float	57° 34.937' N	053° 00.000' W	3469.2	Float deployed
MSM94_112-1	2020/08/21 22:54:14	Mooring	56° 34.202' N	052° 38.446' W	3494.0	K1 deployed
MSM94_113-1	2020/08/21 23:08:59	uCTD	56° 33.914' N	052° 41.057' W	3487.6	uCTD-60
MSM94_114-1	2020/08/21 23:25:20	Float	56° 33.410' N	052° 44.072' W	3482.6	Float deployed
MSM94_115-1	2020/08/21 23:26:46	Float	56° 33.357' N	052° 44.083' W	3486.7	Float deployed
MSM94_116-1	2020/08/22 01:08:15	uCTD	56° 49.904' N	052° 29.814' W	3503.6	uCTD-61
MSM94_117-1	2020/08/22 03:03:36	uCTD	57° 10.395' N	052° 15.480' W	3503.1	uCTD-62
MSM94_118-1	2020/08/22 05:04:46	uCTD	57° 32.418' N	052° 00.618' W	3525.2	uCTD-63
MSM94_119-1	2020/08/22 07:18:21	uCTD	57° 56.999' N	051° 43.871' W	3450.8	uCTD-64
MSM94_120-1	2020/08/22 09:04:46	uCTD	58° 16.624' N	051° 30.328' W	3523.3	uCTD-65
MSM94_121-1	2020/08/22 11:05:05	uCTD	58° 38.835' N	051° 14.876' W	3514.1	uCTD-66
MSM94_122-1	2020/08/22 12:43:32	uCTD	58° 57.405' N	051° 01.926' W	3498.8	uCTD-67
MSM94_123-1	2020/08/22 14:13:39	CTD	59° 00.004' N	051° 00.027' W	3501.4	CTD#32
MSM94_123-2	2020/08/22 16:18:16	Float	59° 00.008' N	050° 59.878' W	3501.9	Float deployed
MSM94_123-3	2020/08/22 16:19:03	Float	59° 00.009' N	050° 59.814' W	3500.1	Float deployed
MSM94_124-1	2020/08/22 16:26:51	uCTD	59° 00.619' N	050° 58.617' W	3499.8	uCTD-68
MSM94_125-1	2020/08/22 16:57:25	uCTD	59° 04.448' N	050° 51.890' W	3496.8	uCTD-69
MSM94_126-1	2020/08/22 19:08:46	uCTD	59° 23.841' N	050° 15.743' W	3449.8	uCTD-70
MSM94_127-1	2020/08/22 21:15:39	uCTD	59° 40.238' N	049° 44.585' W	3337.3	uCTD-71
MSM94_128-1	2020/08/22 23:05:21	uCTD	59° 56.592' N	049° 13.239' W	3085.2	uCTD-72
	2020/08/23 00:09	uCTD	60° 03.288' N	049° 00.456' W	2977	uCTD-73
MSM94_129-1	2020/08/23 01:12:07	uCTD	60° 09.890' N	048° 47.576' W	2887.4	UCTD-74
MSM94_130-1	2020/08/23 03:07:52	CTD	60° 18.277' N	048° 31.954' W	2702.1	CTD#33
MSM94_131-1	2020/08/23 05:06:49	CTD	60° 19.615' N	048° 30.051' W	2466.5	CTD#34
MSM94_132-1	2020/08/23 06:54:37	CTD	60° 20.674' N	048° 28.412' W	2101.1	CTD#35
MSM94_133-1	2020/08/23 08:27:08	CTD	60° 21.506' N	048° 26.825' W	1700.4	CTD#36
MSM94_134-1	2020/08/23 09:47:18	CTD	60° 23.400' N	048° 24.819' W	1014.1	CTD#37
MSM94_135-1	2020/08/23 10:46:40	CTD	60° 24.660' N	048° 22.131' W	479.8	CTD#38
MSM94_136-1	2020/08/23 12:45:19	CTD	60° 22.529' N	048° 27.722' W	591.2	CTD#39
MSM94_137-1	2020/08/23 14:16:27	Lander	60° 22.725' N	048° 27.871' W	628.0	Lander recovered

MSM94_138-1	2020/08/23 18:12:51	Drifter	60° 13.846' N	046° 57.343' W	468.3	Drifter1
MSM94_139-1	2020/08/23 18:35:25	Drifter	60° 11.196' N	047° 00.901' W	367.0	Drifter2
MSM94_140-1	2020/08/23 18:37:16	Drifter	60° 11.136' N	047° 01.045' W	363.2	Drifter3
MSM94_141-1	2020/08/23 18:39:49	Drifter	60° 11.026' N	047° 01.156' W	362.1	Drifter4
MSM94_142-1	2020/08/23 18:42:07	Drifter	60° 10.925' N	047° 01.255' W	358.9	Drifter5
MSM94_143-1	2020/08/23 19:01:58	Drifter	60° 08.827' N	047° 04.164' W	348.0	Drifter6
MSM94_144-1	2020/08/23 19:03:57	Drifter	60° 08.734' N	047° 04.275' W	399.9	Drifter7
MSM94_145-1	2020/08/23 19:05:36	Drifter	60° 08.664' N	047° 04.348' W	419.9	Drifter8
MSM94_146-1	2020/08/23 19:07:07	Drifter	60° 08.610' N	047° 04.433' W	452.5	Drifter9
MSM94_147-1	2020/08/23 19:30:51	Drifter	60° 06.072' N	047° 08.141' W	838.0	Drifter10
MSM94_148-1	2020/08/23 19:32:18	Drifter	60° 05.996' N	047° 08.249' W	855.9	Drifter11
MSM94_149-1	2020/08/23 19:33:51	Drifter	60° 05.920' N	047° 08.378' W	882.2	Drifter12
MSM94_150-1	2020/08/23 19:34:59	Drifter	60° 05.869' N	047° 08.475' W	904.2	Drifter13
MSM94_151-1	2020/08/23 20:08:07	Drifter	60° 02.415' N	047° 14.410' W	1263.1	Drifter14
MSM94_152-1	2020/08/23 20:09:54	Drifter	60° 02.346' N	047° 14.549' W	1306.7	Drifter15
MSM94_153-1	2020/08/23 20:12:26	Drifter	60° 02.254' N	047° 14.732' W	1366.4	Drifter16
MSM94_154-1	2020/08/23 20:14:21	Drifter	60° 02.192' N	047° 14.867' W	1376.4	Drifter17
MSM94_155-1	2020/08/23 20:36:32	Drifter	60° 00.248' N	047° 17.649' W	1738.7	Drifter18
MSM94_156-1	2020/08/23 20:38:27	Drifter	60° 00.165' N	047° 17.807' W	1789.2	Drifter19
MSM94_157-1	2020/08/23 20:40:23	Drifter	60° 00.086' N	047° 17.961' W	1902.9	Drifter20
MSM94_158-1	2020/08/23 20:42:07	Drifter	60° 00.016' N	047° 18.102' W	1939.2	Drifter21
MSM94_159-1	2020/08/23 21:04:21	Drifter	59° 57.815' N	047° 21.759' W	2627.4	Drifter22
MSM94_160-1	2020/08/23 21:06:14	Drifter	59° 57.727' N	047° 21.912' W	2639.7	Drifter23
MSM94_161-1	2020/08/23 21:07:44	Drifter	59° 57.664' N	047° 22.017' W	2647.6	Drifter24
MSM94_162-1	2020/08/23 21:09:12	Drifter	59° 57.604' N	047° 22.074' W	2649.4	Drifter25
MSM94_163-1	2020/08/23 22:19:38	Drifter	59° 51.373' N	046° 58.716' W	2521.2	Drifter26
MSM94_164-1	2020/08/23 22:22:07	Drifter	59° 51.425' N	046° 58.566' W	2505.6	Drifter27
MSM94_165-1	2020/08/23 22:24:18	Drifter	59° 51.467' N	046° 58.430' W	2478.6	Drifter28
MSM94_166-1	2020/08/23 22:26:16	Drifter	59° 51.504' N	046° 58.306' W	2460.5	Drifter29
MSM94_167-1	2020/08/23 22:46:54	Drifter	59° 52.817' N	046° 54.110' W	1984.5	Drifter30
MSM94_168-1	2020/08/23 22:48:55	Drifter	59° 52.857' N	046° 53.973' W	1934.9	Drifter31
MSM94_169-1	2020/08/23 22:50:43	Drifter	59° 52.891' N	046° 53.848' W	1864.0	Drifter32
MSM94_170-1	2020/08/23 22:53:13	Drifter	59° 52.933' N	046° 53.675' W	1840.5	Drifter33
MSM94_171-1	2020/08/23 23:12:35	Drifter	59° 54.296' N	046° 49.495' W	1656.7	Drifter34
MSM94_172-1	2020/08/23 23:14:09	Drifter	59° 54.324' N	046° 49.402' W	1647.7	Drifter35
MSM94_173-1	2020/08/23 23:15:58	Drifter	59° 54.362' N	046° 49.295' W	1640.3	Drifter36
MSM94_174-1	2020/08/23 23:17:32	Drifter	59° 54.396' N	046° 49.197' W	1634.9	Drifter37
MSM94_175-1	2020/08/23 23:36:23	Drifter	59° 55.793' N	046° 44.898' W	1272.0	Drifter38
MSM94_176-1	2020/08/23 23:38:25	Drifter	59° 55.827' N	046° 44.775' W	1261.8	Drifter39
MSM94_177-1	2020/08/23 23:39:56	Drifter	59° 55.854' N	046° 44.678' W	1270.1	Drifter40
MSM94_178-1	2020/08/23 23:42:02	Drifter	59° 55.892' N	046° 44.537' W	1269.9	Drifter41
MSM94_179-1	2020/08/24 00:00:40	Drifter	59° 57.320' N	046° 40.216' W	917.3	Drifter42
MSM94_180-1	2020/08/24 00:02:12	Drifter	59° 57.355' N	046° 40.116' W	910.1	Drifter43
MSM94_181-1	2020/08/24 00:04:21	Drifter	59° 57.403' N	046° 39.973' W	897.6	Drifter44
MSM94_182-1	2020/08/24 00:06:05	Drifter	59° 57.440' N	046° 39.850' W	887.3	Drifter45
MSM94_183-1	2020/08/24 00:26:33	Drifter	59° 58.775' N	046° 35.654' W	444.1	Drifter46
MSM94_184-1	2020/08/24 00:28:39	Drifter	59° 58.809' N	046° 35.524' W	424.3	Drifter47
MSM94_185-1	2020/08/24 00:30:32	Drifter	59° 58.847' N	046° 35.406' W	405.2	Drifter48

MSM94_186-1	2020/08/24 00:31:36	Drifter	59° 58.877' N	046° 35.343' W	389.5	Drifter49
MSM94_187-1	2020/08/24 00:49:32	Drifter	60° 00.281' N	046° 31.545' W	166.4	Drifter50
MSM94_188-1	2020/08/24 06:07:39	CTD	59° 13.888' N	047° 03.937' W	2927.8	CTD#40
MSM94_189-1	2020/08/24 09:51:30	CTD	58° 59.917' N	047° 32.140' W	3108.0	CTD#41
MSM94_190-1	2020/08/24 13:05:04	Mooring	58° 43.664' N	048° 09.348' W	3358.8	DSOW 6 / KPO 1206 released
MSM94_191-1	2020/08/24 16:35:30	Mooring	59° 00.309' N	047° 34.741' W	3095.9	DSOW3 released
MSM94_192-1	2020/08/24 19:25:51	Mooring	59° 12.412' N	047° 05.223' W	2940.4	DSOW4 released
MSM94_193-1	2020/08/24 22:23:21	CTD	59° 18.719' N	046° 52.587' W	2474.1	CTD#42
MSM94_194-1	2020/08/25 01:47:40	CTD	59° 22.785' N	046° 41.965' W	2153.4	CTD#43
MSM94_195-1	2020/08/25 03:59:01	CTD	59° 27.218' N	046° 32.208' W	2025.2	CTD#44
MSM94_196-1	2020/08/25 06:46:15	CTD	59° 30.310' N	046° 27.332' W	2199.3	CTD#45
MSM94_197-1	2020/08/25 08:27:29	CTD	59° 32.390' N	046° 23.324' W	1767.6	CTD#46
MSM94_198-1	2020/08/25 10:01:10	CTD	59° 34.209' N	046° 18.187' W	1316.4	CTD#47
MSM94_199-1	2020/08/25 11:25:16	CTD	59° 36.449' N	046° 11.976' W	905.4	CTD#48
MSM94_200-1	2020/08/25 12:28:45	CTD	59° 38.250' N	046° 06.920' W	594.4	CTD#49
MSM94_201-1	2020/08/25 13:27:21	CTD	59° 40.967' N	045° 59.841' W	209.9	CTD#50
MSM94_202-1	2020/08/25 14:28:53	CTD	59° 44.867' N	045° 50.164' W	170.1	CTD#51
MSM94_203-1	2020/08/25 15:26:56	CTD	59° 48.300' N	045° 41.878' W	153.9	CTD#52
MSM94_204-1	2020/08/25 16:21:40	CTD	59° 51.879' N	045° 33.530' W	124.7	CTD#53
MSM94_205-1	2020/08/25 16:43:00	uCTD	59° 50.553' N	045° 36.747' W	139.9	uCTD-75
MSM94_206-1	2020/08/25 20:25:43	Float	59° 18.568' N	046° 53.446' W	2499.9	Float deployed
MSM94_207-1	2020/08/25 20:26:26	Float	59° 18.537' N	046° 53.528' W	2500.4	Float deployed
MSM94_208-1	2020/08/25 22:08:47	Mooring	59° 12.863' N	047° 05.001' W	2944.6	DSOW4 deployed
MSM94_209-2	2020/08/26 05:25:45	CTD	58° 34.478' N	048° 25.296' W	3493.0	CTD#54 technical problems
MSM94_210-1	2020/08/26 08:04:23	CTD	58° 34.476' N	048° 25.297' W	3493.4	CTD#55
MSM94_211-1	2020/08/26 11:03:35	Mooring	58° 44.089' N	048° 10.063' W	3363.4	DSOW6/KPO 1230 deployed
MSM94_212-1	2020/08/26 13:59:22	Mooring	59° 00.541' N	047° 33.940' W	3109.3	DSOW3/KPO1227 deployed
MSM94_213-1	2020/08/26 17:25:18	CTD	58° 44.998' N	048° 09.532' W	3354.3	CTD#56
MSM94_214-1	2020/08/26 21:37:36	CTD	58° 54.901' N	047° 46.334' W	3163.4	CTD#57
MSM94_215-1	2020/08/27 01:01:48	CTD	59° 06.404' N	047° 20.131' W	2936.8	CTD#58
MSM94_216-1	2020/08/27 12:17:15	CTD	59° 46.006' N	043° 28.149' W	158.6	CTD#59
MSM94_217-1	2020/08/27 13:40:01	CTD	59° 37.255' N	043° 21.297' W	179.9	CTD#60
MSM94_218-1	2020/08/27 15:00:45	CTD	59° 29.099' N	043° 14.123' W	474.4	CTD#61
MSM94_219-1	2020/08/27 16:41:45	CTD	59° 20.085' N	043° 06.495' W	1014.1	CTD#62
MSM94_220-1	2020/08/27 18:18:01	CTD	59° 15.515' N	043° 02.796' W	1510.6	CTD#63
MSM94_221-1	2020/08/27 21:17:54	CTD	58° 56.676' N	042° 46.900' W	1931.0	CTD#64
MSM94_222-1	2020/08/28 00:33:44	CTD	58° 37.771' N	042° 31.261' W	2467.0	CTD#65
MSM94_223-1	2020/08/28 04:50:14	CTD	58° 19.183' N	042° 15.443' W	2916.2	CTD#66
MSM94_224-1	2020/08/29 00:41:35	CTD	58° 12.009' N	048° 47.992' W	3468.2	CTD#67
MSM94_225-1	2020/08/29 06:28:52	CTD	57° 33.013' N	048° 55.938' W	3492.5	CTD#68
MSM94_226-1	2020/08/29 12:10:34	CTD	56° 54.006' N	049° 03.860' W	3634.1	CTD#69

MSM94_227-1	2020/08/29 18:14:42	CTD	56° 15.337' N	049° 10.976' W	3688.6	CTD#70
MSM94_0_Underway-4	2020/09/02 17:00:00	TSG EM122 ADCP	59°23.364' N	014°37.652' W	869.0	Stop recording

7 Data and Sample Storage and Availability

(GEOMAR Data management: datamanagement@geomar.de)

In Kiel a joint Datamanagement-Team is active, which stores the data in a web based multiuser-system. In a first phase the data are only available to the user groups (e.g. OSNAP via OSNAP website). Latest after a three year proprietary time these data will be made public by distributing them to national and international data archives through the GEOMAR data management team, i.e. the data will be submitted to PANGAEA. When the data sets will be archived in the PANGAEA Open Access library digital object identifiers (DOIs) will be assigned. A kml link can be found at https://portal.geomar.de/metadata/leg/kmlexport/351730.

Type	Available (internal GEOMAR)	Free Access (PANGAEA)	Contact
CTD O_2 data	11/2020	08/2023	jkarstensen@geomar.de
vmADCP data	11/2020	08/2023	jkarstensen@geomar.de
Mooring data	03/2021	08/2023	jkarstensen@geomar.de
lADCP data	11/2020	08/2023	jkarstensen@geomar.de
TSG data	DAM	tbd	mschlundt@geomar.de
Multibeam data	DAM	tbd	awoelfl@geomar.de
UVP data	11/2020	08/2023	rkiko@geomar.de

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10 Abbreviations

ADCP	Acoustic Doppler Current Profiler
CTD	Conductivity-Temperature-Depth Sonde
BMBF	Bundesministerium für Bildung und Forschung
DFG	Deutsche Forschungsgemeinschaft
DSOW	Demark Strait Overflow Water
EM122	Deep-Sea Multibeam Echosounder (station table)
GEOMAR	Helmholtz Center for Ocean Research Kiel
GPF	Gutachterpanel Forschungsschiffe
KPO_*	Kiel Physical Oceanography mooring identifier
LSW	Labrador Sea Water
lADCP	Lowered Acoustic Doppler Current Profiler
(L)NADW	(Lower) North Atlantic Deep Water
MOOR	Mooring operations (station table)
OFI	Ocean Frontiers Institute, Canada
OSNAP	Overturning in the Subpolar Atlantic Program
POZ Lander	Paläozeanographie Lander
SVP	Surface Velocity Drifter Programm
TSG	Thermosalinograph
uCTD	Underway Conductivity-Temperature-Depth Sonde
UVP	Underwater Vision Profiler

11 Appendix

11.1. Mooring recovered

Mooring Recovery mooring K7					**Notes:**	**KPO_1185**
Vessel:	Merian	MSM74				
Deployed:	30-May	2018	14:34			
Vessel:	Merian	MSM94				
Recovered:	17-Aug	2020	12:37			
Latitude:		52°	49.895' N			
Longitude:		051°	32.798' W			
Water depth:		3151	Mag Var:	-23		
ID	**Designed Depth**	**Instr. Type**	**s/n**	**Start-up**	**Remarks**	
KPO_1185_01	41	Argos	11458	**ready**		

KPO_1185_02	56	MicroCat/P SM	2797	x	Complete record
KPO_1185_03	57	VR2W	132787	x	
KPO_1185_04	106	MicroCat IM	6779	x	Complete record
KPO_1185_05	214	MicroCat/P SM	3503	x	Complete record
KPO_1185_06	406	LR_ADCP	3367 Bio	x	Complete record
KPO_1185_07	418	MicroCat/P SM	2775	x	Complete record
KPO_1185_08	612	RBR-O2	52635	x	Complete record
KPO_1185_09	612	MicroCat IM	2261	x	Complete record
KPO_1185_10	613	Aquadopp IM	26209.4	x	Complete record
KPO_1185_11	901	RCM-11	598	x	Record until April 2020
KPO_1185_12	912	Aquadopp IM	26209.5	x	Complete record
KPO_1185_13	913	MicroCat IM	2799	x	Complete record
KPO_1185_14	1102	RCM-11	602	x	Record until April 2020
KPO_1185_15	1113	RBR_O2	52630	x	Complete record
KPO_1185_16	1113	MicroCat/P SM	10700	x	Complete record
KPO_1185_17	1374	MicroCat/P SM	6854	x	Complete record
KPO_1185_18	1375	Aquadopp IM	26209.8	x	Complete record
KPO_1185_19	1376	Release AR861	270	Code	Enable: 1404/ Release: 1455
KPO_1185_20	1376	Release AR661	428	Code:	Enable: 2457 / Release: 2459

Mooring Recovery mooring K8				**Notes:**	**KPO_1186**
Vessel:	Merian	MSM74			
Deployed:	30-May	2018	17:59		
Vessel:	Merian	MSM94			
Recovered:	15-Aug	2020	13:03		
Latitude:		52°	57.074’ N		
Longitude:		051°	17.855’ W		
Water depth:		3513	Mag Var:	-24	

ID	**Designed Depth**	**Instr. Type**	**s/n**	**Start-up**	**Remarks**
KPO_1186_01	36	Argos	5511	Ready	
KPO_1186_02	51	MicroCat/P SM	10634	x	Complete record
KPO_1186_03	51	VR2W	132980	x	Complete record
KPO_1186_04	100	MicroCat SM	3196	x	Complete record
KPO_1186_05	100	Aquadopp IM	408939.256	x	Complete record
KPO_1186_06	210	Aquadopp IM	408939.257	x	Complete record
KPO_1186_07	608	RBR-O2	52671	x	Stopped recording in April 2020 due to insufficient battery
KPO_1186_08	609	MicroCat IM	961	x	Complete record
KPO_1186_09	609	Aquadopp IM	408939.258	x	Complete record
KPO_1186_10	999	Aquadopp DW	408931.240	x	Complete record
KPO_1186_11	1508	MicroCat SM	1599	x	Complete record
KPO_1186_12	1508	Aquadopp DW	408931.241	x	Complete record
KPO_1186_13	1698	MicroCat/P SM	10633	x	Complete record
KPO_1186_14	1799	RBR-O2	52627	x	Stopped recording in April 2020 due to insufficient battery
KPO_1186_15	1799	MicroCat IM	2257	x	Complete record
KPO_1186_16	1899	Aquadopp DW	408931.242	x	Complete record
KPO_1186_17	2172	MicroCat/P IM	10704	x	Complete record
KPO_1186_18	2172	Aquadopp DW	408931.244	x	Complete record
KPO_1186_19	2184	Release AR861	1645	Code:	Enable: 0A8A / Release: 0A55

KPO_1186_20	2184	Release AR861	1643	Code:	Enable: 0A88 / Release: 0A55

Mooring Recovery mooring DSOW1					**Notes:**	**KPO_1187**
Vessel:	Merian	MSM74				
Deployed:	30-May	2018	20:24			
Vessel:	Merian	MSM94				
Recovered:	14-Aug	2020	10:54			
Latitude:		53°	02.320'	N		
Longitude:		051°	04.429'	W		
Water depth:		2567	Mag Var:	-21		

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1187_01	1516	Xeos	2269	x	
KPO_1187_02	1518	MicroCat/P IM	10652	x	Complete record
KPO_1187_03	1668	MicroCat IM	1719	x	Complete record
KPO_1187_04	1818	MicroCat/P SM	10703	x	Complete record
KPO_1187_05	2428	MicroCat SM	1942	x	Complete record
KPO_1187_06	2428	Aquadopp DW	408931.237	x	Complete record
KPO_1187_07	2572	Aquadopp DW	408931.238	x	Complete record
KPO_1187_08	2592	MicroCat/P SM	10637	x	Complete record
KPO_1187_09	2603	Release AR861	1648	code:	Enable: 0A8D / Release: 0A55
KPO_1187_10	2603	Release RT861	555	code:	Enable: 020F / Release: 0255

Mooring Recovery mooring K9					**Notes:**	**KPO_1188**
Vessel:	Merian	MSM74				
Deployed:	31-May	2018	14:20			
Vessel:	Merian	MSM94				
Recovered:	14-Aug	2020	14:58			
Latitude:		53°	07.738'	N		
Longitude:		050°	51.918'	W		
Water depth:		2877	Mag Var:	-25		

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1188_01	66	Xeos	12264	ready	
KPO_1188_02	102	MicroCat/P SM	10691	x	Complete record
KPO_1188_03	103	VR2W	132770	x	
KPO_1188_04	211	Aqudaopp DW	26209.23	x	Complete record
KPO_1188_05	602	RCM-8	9344	x	Complete record
KPO_1188_06	604	Aquadopp DW	26209.22	x	Complete record
KPO_1188_07	613	RBR-O2	52628	x	Complete record
KPO_1188_08	614	MicroCat/P IM Pump	10660	x	Complete record
KPO_1188_09	1004	RCM-8	9345	x	Did not record speed from mid march 2020 to mid july 2020
KPO_1188_10	1005	Aquadopp DW	26209.25	x	Complete record
KPO_1188_11	1514	MicroCat IM	959	x	Readout problems and multiple gaps of several weeks in record
KPO_1188_12	1515	Aquadopp DW	408931.239	x	Complete record
KPO_1188_13	1755	MicroCat SM	1317	x	Complete record
KPO_1188_14	1855	RBR_O2	52633	x	Runs until mid March 2019 due to insufficient battery
KPO_1188_15	1955	MicroCat/P SM	642	x	Complete record

KPO_1188_16	2005	RCM-8	9833	x	Complete record
KPO_1188_17	2006	Aquadopp DW	408931.247	x	Complete record
KPO_1188_18	2406	RCM-8	10500	x	Complete record
KPO_1188_19	2407	Aquadopp DW	408931.248	x	Complete record
KPO_1188_20	2417	MicroCat/P IM	10695	x	Complete record
KPO_1188_21	2697	RCM-8	11576	x	Complete record
KPO_1188_22	2698	Aquadopp DW	408931.249	x	Complete record
KPO_1188_23	2708	MicroCat SM	957	x	Complete record
KPO_1188_24	2855	RCM-8	11617	x	Complete record
KPO_1188_25	2856	Aquadopp DW	408931.251		Complete record
KPO_1188_26	2876	RBR-O2	52629	x	Runs until mid April 2020 due to insufficient battery
KPO_1188_27	2876	MicroCat/P IM Pump	10685	x	Complete record
KPO_1188_28	2887	Release AR861	1642	Code:	Enable: 0A87 / Release: 0A55
KPO_1188_29	2887	Release AR661	188	Code:	Enable: 8181 / Release: 8182

Mooring Recovery mooring DSOW2					**Notes:**	**KPO_1189**
Vessel:	Merian	MSM74				
Deployed:	31-May	2018	16:52			
Vessel:	Merian	MSM94				
Recovered:	14-Aug	2020	18:13			
Latitude:		53°	14.934' N			
Longitude:		050°	32.951' W			
Water depth:		3151	Mag Var:	-30		

ID	**Designed Depth**	**Instr. Type**	**s/n**	**Start-up**	**Remarks**
KPO_1189_01	2675	Xeos	15173	ready	
KPO_1189_02	2723	MicroCat/P IM Pump	10661	x	Pressure Sensor starts at ~2750 dbar, sinks in October 2018 to 3250 and gradually recovers to ~3100dbar
KPO_1189_03	2723	Aquadopp DW	24543.02	x	Pressure Sensor starts at ~2750 dbar, sinks in October 2018 to 3250 and gradually recovers to ~3100dbar
KPO_1189_04	2971	MicroCat SM	952	x	Complete record
KPO_1189_05	2972	Aquadopp DW	26209.14	x	Complete record
KPO_1189_06	3131	MicroCat/P SM	6859	x	Pressure drifts from 3190 to 3195 within deployment period
KPO_1189_07	3131	Aquadopp DW	26209.31	x	Complete record
KPO_1189_08	3142	Release AR861	1256	code:	Enable: 08BD / Release: 0855
KPO_1189_09	3142	Release AR861	1650	code:	Enable: 0A8F / Release: 0A55

Mooring Recovery mooring K10					**Notes:**	**KPO_1190**
Vessel:	Merian	MSM74				
Deployed:	28-May	2018	20:36			
Vessel:	Merian					
Recovered:	16-Aug	2020	18:45			
Latitude:		53°	22.965' N			
Longitude:		050°	14.436' W			
Water depth:		3385	Mag Var:	-21		

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1190_01	79	Argos	667	ready	
KPO_1190_02	106	MicroCat/P IM	2717	x	Complete record
KPO_1190_03	106	VR2W	132987	x	
KPO_1190_04	214	MicroCat SM	939	x	Complete record
KPO_1190_05	215	Aquadopp DW	408931.243	x	Complete record
KPO_1190_06	405	MicroCat SM	910	x	Complete record
KPO_1190_07	613	MicroCat SM	1288	x	Complete record
KPO_1190_08	614	RBR-O2	52626	x	Runs until mid March 2019 due to insufficient battery
KPO_1190_09	614	Aquadopp DW	408931.246	x	Complete record
KPO_1190_10	1012	MicroCat/P IM	10694	x	Complete record
KPO_1190_11	1257	MicroCat/P IM	10680	x	Complete record
KPO_1190_12	1512	MicroCat SM	922	x	Complete record
KPO_1190_13	1512	Aquadopp DW	408931.250	x	Complete record
KPO_1190_14	1907	RBR-O2	52634	x	Runs until mid May 2020 due to insufficient battery
KPO_1190_15	1907	MicroCat/P IM	10696	x	Mid july 2020 errornous function of conductivity sensor
KPO_1190_16	2010	MicroCat SM	941	x	Complete record
KPO_1190_17	2011	Aquadopp DW	408931.252	x	Complete record
KPO_1190_18	2409	MicroCat/P SM	10710	x	Complete record
KPO_1190_19	2808	MicroCat IM	2252	x	Complete record
KPO_1190_20	2808	Aquadopp DW	408931.253	x	Complete record
KPO_1190_21	3108	MicroCat IM	2260	x	Complete record
KPO_1190_22	3341	MicroCat/P SM	10711	x	Complete record
KPO_1190_23	3341	Aquadopp DW	408931.254	x	Complete record
KPO_1190_24	3352	Release AR861	1651	code	Enable: 0A90 / Release: 0A55
KPO_1190_25	3352	Release AR661	822	code	Enable: 4AA0/ Release: 4AA9

Mooring Recovery mooring DSOW5					**Notes:**	**KPO_1191**
Vessel:	Merian	MSM74				
Deployed:	28-May	2018	15:28			
Vessel:	Merian	MSM94				
Recovered:	16-Aug	2020	12:10			
Latitude:		53°	35.222'	N		
Longitude:		049°	46.342'	W		
Water depth:		3602	Mag Var:	-25		

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1191_01	3118	XEOS	11307	ready	
KPO_1191_02	3166	MicroCat/P IM	3414	x	Pressure started to produce false data in September 2019
KPO_1191_03	3166	Aquadopp DW	408931.245	x	Complete record
KPO_1191_04	3581	MicroCat/P IM	10667	x	Complete record
KPO_1191_05	3581	Aquadopp DW	408931.255	x	Complete record
KPO_1191_06	3592	Release AR861	271	code:	Enable: 1405 / Release: 1455
KPO_1191_07	3592	Release AR861	1548	code:	Enable: 0A04 / Release: 0A55

Mooring Recovery mooring DSOW3					**Notes:**	**KPO_1192**
Vessel:	Merian	MSM74				
Deployed:	09-Jun	2018	17:45			
Vessel:	Merian	MSM94				

Recovered:	24-Aug	2020	17:43		
Latitude:		59°	00.309' N		
Longitude:		047°	34.741' W		
Water depth:		3112	Mag Var:	-22	

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1192_01	2529	Xeos	15172	ready	
KPO_1192_02	2575	MicroCat/p IM	10678	x	Complete record
KPO_1192_03	2576	Aquadopp DW	26209.26	x	Complete record
KPO_1192_04	3080	MicroCat/P IM	2264	x	Complete record
KPO_1192_05	3080	Aquadopp DW	26209.32	x	Complete record
KPO_1192_06	3091	Release RT661	37	code:	Enable: 5067 / Release: 5069

Mooring Recovery mooring DSOW4					**Notes:**	**KPO_1193**
Vessel:	Merian	MSM74				
Deployed:	09-Jun	2018	13:44			
Vessel:	Merian	MSM94				
Recovered:	24-Aug	2020	20:34			
Latitude:		59°	12.412' N			
Longitude:		047°	05.223' W			
Water depth:		2942	Mag Var:	-22		

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1193_01	2360	XEOS	12616	ready	
KPO_1193_02	2406	MicroCat/P IM	10679	x	Complete record
KPO_1193_03	2407	Aquadopp DW	26209.35	x	Complete record
KPO_1193_04	2911	MicroCat/P IM	2718	x	Complete record
KPO_1193_05	2911	Aquadopp IM	26209.07	x	Complete record
KPO_1193_06	2922	Release RT661	32	code	Enable: 5042 / Release: 5044

Mooring Recovery mooring K1					**Notes:**	**KPO_1194**
Vessel:	Merian	MSM74				
Deployed:	03-Jun	2018	21:36			
Vessel:	Merian	MSM94				
Recovered:	20-Aug	2020	18:35			
Latitude:		56°	33.654' N			
Longitude:		052°	40.245' W			
Water depth:		3495	Mag Var:	-24		

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1194_01	-151	Xeos	300034013904330	**ready**	
KPO_1194_02	-141	MicroCat/P IM	2712	**x**	Was lost and found and brought to geomar, complete record until Mid August 2019
KPO_1194_03	-126	MicroCat IM ODO	12151	**x**	Jump in oxygen from ~300 umol/Kg to 380 umol/Kg in April 2020, Stepwise gradual decrease in pressure, conductivity to 0 in April 2020
KPO_1194_04	53	Argos	7848	**x**	
KPO_1194_05	65	MicroCat/P IM	10662	**x**	Complete record
KPO_1194_06	65	Aquadopp IM	408939.259	**x**	Complete record
KPO_1194_07	105	MicroCat/P IM	2263	**x**	Complete record
KPO_1194_08	105	VMT	11818	**x**	
KPO_1194_09	105	VMT	11820	**x**	
KPO_1194_10	257	QM-ADCP	14909	**x**	Complete record
KPO_1194_11	303	MicroCat/P IM	2713	**x**	Complete record

KPO_1194_12	504	MicroCat/P IM	10693	**x**	Complete record
KPO_1194_13	754	MicroCat/P IM	3752	**x**	Complete record
KPO_1194_14	754	Aquadopp IM	26209.10	**x**	Complete record
KPO_1194_15	905	MicroCat/P IM	3415	**x**	Complete record
KPO_1194_16	1155	MicroCat/P IM Pump	10678	**x**	Complete record
KPO_1194_17	1306	MicroCat/P SM	1320	**x**	Complete record
KPO_1194_18	1507	MicroCat/P IM	3753	**x**	Complete record
KPO_1194_19	1507	O2-Logger	943	**x**	Complete record
KPO_1194_20	1507	Aquadopp IM	26209	**x**	Complete record
KPO_1194_21	1798	MicroCat IM	1520	**x**	Complete record
KPO_1194_22	1998	MicroCat IM	7417	**x**	Complete record
KPO_1194_23	2202	MicroCat/P SM	6858	**x**	decrease of pressure from ~3518 dbar to 3527 dbar, Conductivity to 0 in April 2020
KPO_1194_24	3464	MicroCat SM	6855	**x**	Complete record
KPO_1194_25	3479	Release AR661	235	Code:	Enable: A121 / Release: A122
KPO_1194_26	3479	Release AR861	1549	Code:	Enable: 0A05 / Release: 0A55

Mooring Recovery mooring DSOW6					**Notes:**	**KPO_1206**
Vessel:	Merian	MSM74				
Deployed:	10-Jun	2018	17:02			
Vessel:	Merian	MSM94				
Recovered:	24-Aug	2020	14:18			
Latitude:		58°	43.664’ N			
Longitude:		048°	09.248’ W			
Water depth:		3633	Mag Var:	-22		
ID	**Designed Depth**	**Instr. Type**	**s/n**	**Start-up**	**Remarks**	
KPO_1206_01	2742	Xeos	300034013 902340	ready		
KPO_1206_02	2818	MicroCat/P IM	10635	x	Complete record	
KPO_1206_03	2819	Aquadopp IM	26209.11	x	Complete record	
KPO_1206_04	3323	MicroCat/P IM	10689	x	Complete record	
KPO_1206_05	3324	Aquadopp DW	26209.15	x	Complete record	
KPO_1206_06	3335	Release RT661	41	Code:	Enable: E847 / Release: E849	

Mooring Recovery mooring POZ-Lander					**Notes:**	**KPO_1210**
Vessel:	Merian	MSM74				
Deployed:	08-Jun	2018	09:34			
Vessel:	Merian	MSM94				
Recovered:	23-Aug	2020	14:16			
Latitude:		60°	22.725’ N			
Longitude:		048°	27.871’ W			
Water depth:		628	Mag Var:	-21		
ID	**Designed Depth**	**Instr. Type**	**s/n**	**Start-up**	**Remarks**	
KPO_1210_01	890	Optode	691	x	Complete record	
KPO_1210_02	890	ADCP RDI WHS300	6468	x	Complete record	
KPO_1210_03	890	MicroCat/P IM	10686	x	Complete record	
KPO_1210_04	890	Release KUM Quat K/MT 562	0804169-644323	code:	Enable: 656204 Release: 644323	

10.2 Moorings deployed

Mooring Deployment mooring K7	**Notes:**	**KPO_1220**

Vessel:	Merian	MSM94			
Deployed:	17-Aug	2020	15:54		
Vessel:					
Recovered:					
Latitude:		52°	50.621' N		
Longitude:		051°	33.101' W		
Water depth:		1390	Mag Var:	-23	

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1220_01	46	Argos	2264	ready	
KPO_1220_02	46	ADCP Type VR2W	135891	x	
KPO_1220_03	49	pCO2 Pro-CV	40-755-75	x	
KPO_1220_04	49	pCO2 Batt.	40-767-35	x	
KPO_1220_05	49	SBE-5P	05-8735	x	
KPO_1220_06	49	MicroCat/P SM	6857	x	
KPO_1220_07	49	Dal_O2	3413	x	
KPO_1220_08	103	MicroCat IM	0950	x	
KPO_1220_09	203	MicroCat/P SM	10705	x	
KPO_1220_10	405	LR_ADCP	12538	x	
KPO_1220_11	405	MicroCat/P IM	3411	x	
KPO_1220_12	602	RBR-O2	052631	x	
KPO_1220_13	602	MicroCat/P IM	3416	x	
KPO_1220_14	602	Aquadopp IM	40890-1-241	x	
KPO_1220_15	901	MicroCat IM	0953	x	
KPO_1220_16	901	Aquadopp	40893-1-242	x	
KPO_1220_17	1100	RBR-O2	052627	x	
KPO_1220_18	1100	MicroCat/P SM	10695	x	
KPO_1220_19	1100	Aquadopp IM	40893-1-243	x	
KPO_1220_20	1367	Aquadopp IM	40893-1-244	x	
KPO_1220_21	1368	MicroCat/P SM	3413	x	
KPO_1220_22	1376	Release AR861	095	code:	Enable: 0485 / Release: 0455
KPO_1220_23	1376	Release RT661	174	code:	Enable: 9337 / Release:9339

Mooring Deployment mooring K8				**Notes:**	**KPO_1221**
Vessel:	Merian	MSM94			
Deployed:	18-Aug	2020	19:14		
Vessel:					
Recovered:					
Latitude:		52°	57.681' N		
Longitude:		051°	18.493' W		
Water depth:		2228	Mag Var:	-24	

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1221_01	45	Argos	9243	ready	
KPO_1221_02	47	MicroCat/P SM	2251	x	
KPO_1221_03	47	VR2W	132987	x	
KPO_1221_04	100	MicroCat SM	0962	x	
KPO_1221_05	100	Aquadopp IM	40893-1-252	x	
KPO_1221_06	200	Aquadopp IM	40893-1-253	x	
KPO_1221_07	597	RBR_O2	05262	x	
KPO_1221_08	597	MicroCat/P IM	2488	x	

KPO_1221_09	597	Aquadopp IM	40893-1-254	x	
KPO_1221_10	997	Aquadopp DW	40893-1.255	x	
KPO_1221_11	1499	MicroCat SM	2245	x	
KPO_1221_12	1499	Aquadopp DW	40893-9-256	x	
KPO_1221_13	1797	RBR-O2	052634	x	
KPO_1221_14	1797	MicroCat/P IM	2712	x	
KPO_1221_15	1797	Aquadoppp DW	40893-9-257	x	
KPO_1221_16	2168	MicroCat/P IM	10640	x	
KPO_1221_17	2168	Aquadopp DW	40890-9-258	x	
KPO_1197_18	3508	Release AR661	822	Code:	Enable: 4AA0 / Release: 4AA9
KPO_1197_19	3508	Release AR861	1651	Code:	Enable: 0A90 / Release: 0A55

Mooring Deployment mooring DSOW1					**Notes:**	**KPO_1222**
Vessel:	Merian	MSM94				
Deployed:	15-Aug	2020	16:01			
Vessel:						
Recovered:						
Latitude:		53°	02.884’	N		
Longitude:		051°	04.877’	W		
Water depth:		2605	Mag Var:	-21		

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1222_01	2367	Xeos	15173	ready	
KPO_1222_02	2369	MicroCat/P SM	2271	x	
KPO_1222_03	2413	MicroCat SM	2250	x	
KPO_1222_04	2413	Aquadopp DW	P26209-23	x	
KPO_1222_05	2548	MicroCat/P SM	10637	x	
KPO_1222_06	2548	Aquadopp DW	P26209-22		
KPO_1222_07	2603	Release AR861	435	code:	Enable: 1469 / Release: 1455
KPO_1222_08	2603	Release RT661	31	code:	Enable: 5037 / Release: 5039

Mooring Deployment mooring K9					**Notes:**	**KPO_1223**
Vessel:	Merian	MSM94				
Deployed:	15-Aug	2020	19:43			
Vessel:						
Recovered:						
Latitude:		53°	08.039’	N		
Longitude:		050°	52.015’	W		
Water depth:		2896	Mag Var:	-19		

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1223_01	97	Argos	2269	ready	
KPO_1223_02	97	ADCP Type VR2W	127610	x	
KPO_1223_03	99	pCO2 Pro-CV	40-754-75	x	
KPO_1223_04	99	pCO2 Batt.	40-759-35	x	

KPO_1223_05	99	SBE-5P	05-9741	x	
KPO_1223_06	99	MicroCat/P SM	2484	x	
KPO_1223_07	99	Dal_O2	3409	x	
KPO_1223_08	197	Aquadopp DW	P26209-13	x	
KPO_1223_09	599	RBR-O2	52628	x	
KPO_1223_10	599	MicroCat/P IM Pump	10698	x	
KPO_1223_11	599	Aquadopp DW	P26209-17	x	
KPO_1223_12	999	Aquadopp DW	P26209-36	x	
KPO_1223_13	1501	MicroCat IM	2254	**x**	
KPO_1223_14	1501	Aquadopp DW	40893-1-239	**x**	
KPO_1223_15	1844	RBR-O2	52629	**x**	
KPO_1223_16	1844	MicroCat/P SM	3757	**x**	
KPO_1223_17	1995	Aquadopp DW	40893-1-249	**x**	
KPO_1223_18	2398	MicroCat IM	2809	**x**	
KPO_1223_19	2398	Aquadopp DW	P26209-25	**x**	
KPO_1223_20	2697	MicroCat SM	2249	**x**	
KPO_1223_21	2697	Aquadopp DW	40893-1-247	**x**	
KPO_1223_22	2878	Aquadopp DW	P26209-14	**x**	
KPO_1223_23	2878	RBR-O2	52633	**x**	
KPO_1223_24	2879	MicroCat/P IM Pump	10685	**x**	
KPO_1223_25	2887	Release AR861	1772	**Code:**	Enable: 0AF0 / Release: 0A55
KPO_1223_26	2887	Release AR661	460	**Code:**	Enable: 5811 / Release: 5813

Mooring Deployment mooring DSOW2					**Notes:**	**KPO_1224**
Vessel:	Merian	MSM94				
Deployed:	17-Aug	2020	20:31			
Vessel:						
Recovered:						
Latitude:		53°	15.493’ N			
Longitude:		050°	33.303’ W			
Water depth:		3171	Mag Var:	-20		
ID	**Designed Depth**	**Instr. Type**		**s/n**	**Start-up**	**Remarks**
KPO_1224_01	2672	BE2-top		11307	ready	
KPO_1224_02	2720	MicroCat/P IM		10703	x	
KPO_1224_03	2720	Aquadopp DW		40893-1-237	x	
KPO_1224_04	2971	MicroCat SM		2247	x	
KPO_1224_05	2971	Aquadopp DW		40893-1-240	x	
KPO_1224_06	3124	MicroCat/P SM		10641	x	
KPO_1224_07	3124	Dal-O2		3312	x	
KPO_1224_08	3124	Aquadopp DW		40893-1-245	x	
KPO_1224_09	3142	Release RT661		108	code:	Enable: E962 / Release: E964
KPO_1224_10	3142	Release AR861		110	code:	Enable: 0498 / Release: 0455

Mooring Deployment mooring K10				**Notes:**	**KPO_1225**
Vessel:	Merian	MSM94			
Deployed:	19-Aug	2020	11:56		
Vessel:					
Recovered:					
Latitude:		53°	23.478’ N		

Longitude:			050°	14.395'	W	
Water depth:			3413	Mag Var:	-22	
ID	**Designed Depth**	**Instr. Type**	**s/n**	**Start-up**	**Remarks**	
KPO_1225_01	90	BE2-top	3000340139 04330	ready		
KPO_1225_02	90	MicroCat/P IM	10652	x		
KPO_1225_03	92	VR2W	132770	x		
KPO_1225_04	92	Dal-O2	20-03-3412	x		
KPO_1225_05	196	MicroCat SM	961	x		
KPO_1225_06	196	Aquadopp DW	P26209-4	x		
KPO_1225_07	596	RBR-O2	052630	x		
KPO_1225_08	596	MicroCat/P SM	10711	x		
KPO_1225_09	596	Aquadopp DW	P26209-5	x		
KPO_1225_10	993	Dal-O2	20-03-3416	x		
KPO_1225_11	993	MicroCat IM	1550	x		
KPO_1225_12	993	Aquadopp DW	P26209-8	x		
KPO_1225_13	1493	MicroCat SM	3144	x		
KPO_1225_14	1493	Aquadopp DW	P24543-2	x		
KPO_1225_15	1993	RBR-O2	052635	x		
KPO_1225_16	1993	MicroCat SM	2279	x		
KPO_1225_17	1993	Aquadopp DW	40893-1-246	x		
KPO_1225_18	2499	MicroCat/P SM	10710	x		
KPO_1225_19	2499	Aquadopp DW	40893-1-248	x		
KPO_1225_20	2999	MicroCat/P IM	10657	x		
KPO_1225_21	2999	Aquadopp DW	40893-1-250	x		
KPO_1225_22	3334	Dal-O2	20-03-3415	x		
KPO_1225_23	3334	MicroCat/P SM Pump	10661	x		
KPO_1225_24	3334	Aquadopp DW	40893-1-251	x		
KPO_1225_25	3352	Release AR861	270	code:	Enable:1404 / Release: 1455	
KPO_1225_26	3352	Release AR661	52	code:	Enable: E925 / Release: E926	

Mooring Deployment mooring DSOW5					**Notes:**	**KPO_1226**
Vessel:	Merian	MSM94				
Deployed:	16-Aug	2020	13:50			
Vessel:						
Recovered:						
Latitude:			53°	35.673'	N	
Longitude:			049°	47.040'	W	
Water depth:			3604	Mag Var:	-21	
ID	**Designed Depth**	**Instr. Type**	**s/n**	**Start-up**	**Remarks**	
KPO_1226_01	3123	Xeos	12264	ready		
KPO_1226_02	3172	MicroCats/P IM	2262	x		
KPO_1226_03	3172	Aquadopp DW	P26209-31	x		
KPO_1226_04	3574	MicroCat/P IM	2716	x		
KPO_1226_05	3574	Dal-O2	3499	x		
KPO_1226_06	3574	Aquadopp DW	40893-1-238	x		
KPO_1226_07	3592	Release RT661	107	code:	Enable: E957 / Release: E959	
KPO_1226_08	3592	Release AR661	191	code:	Enable: 8187 / Release: 8188	

Mooring Deployment mooring DSOW3	**Notes:**	**KPO_1227**

Vessel:	Merian	MSM94			
Deployed:	26-Aug	2020	13:58		
Vessel:					
Recovered:					
Latitude:		59°	00.541' N		
Longitude:		047°	33.940' W		
Water depth:		3109	Mag Var:	-23	

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1227_01	2551	BE2-top	5506	ready	
KPO_1227_02	2573	Aquadopp IM	P26209-7	x	
KPO_1227_03	2573	MicroCat/P IM	6854	x	
KPO_1227_04	3079	Aquadopp IM	P26209-11	x	
KPO_1227_05	3079	RBR-O2	204329	x	
KPO_1227_06	3079	MicroCat/P IM	10704	x	
KPO_1227_07	3090	Release AR861	1645	code:	Enable: 0A8A / Release: 0A55
KPO_1227_08	3090	Release AR861	1643	code:	Enable: 0A88/ Release: 0A55

Mooring Deployment mooring DSOW4				**Notes:**	**KPO_1228**
Vessel:	Merian	MSM94			
Deployed:	25-Aug	2020	22:09		
Vessel:					
Recovered:					
Latitude:		59°	12.863' N		
Longitude:		047°	05.001' W		
Water depth:		2945	Mag Var:	-22	

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1228_01	2382	Xeos	2268	ready	
KPO_1228_02	2404	Aquadopp DW	P26209-26	x	
KPO_1228_03	2404	MicroCats/P IM	10634	x	
KPO_1228_04	2910	Aquadopp DW	P26209-32	x	
KPO_1228_05	2910	MicroCat/P IM	3752	x	
KPO_1228_06	2921	Release AR861	271	code:	Enable: 1405 / Release: 1455
KPO_1228_07	2921	Release AR861	1548	code:	Enable: 0A04 / Release: 0A55

Mooring Deployment mooring K1				**Notes:**	**KPO_1229**
Vessel:	Merian	MSM94			
Deployed:	21-Aug	2020	22:53		
Vessel:					
Recovered:					
Latitude:		56°	34.199' N		
Longitude:		052°	38.477' W		
Water depth:		3498	Mag Var:	-19	

ID	Designed Depth	Instr. Type	s/n	Start-up	Remarks
KPO_1229_01	-253	Develogic Iridium Float	300534060 856780	ready	
KPO_1229_02	-220	MicroCat/P IM	10693	**x**	
KPO_1229_03	-205	MicroCat/P SM	10632	x	
KPO_1229_04	-205	MicroCat IM ODO	12151	x	
KPO_1229_05	-205	GTD	36-334-15	x	
KPO_1229_06	56	MicroCat/P IM	10662	x	
KPO_1229_07	105	MicroCat IM	2492	x	
KPO_1229_08	105	VMT	24357	x	
KPO_1229_09	105	VMT	25049	x	
KPO_1229_10	257	QM-ADCP	14911	x	
KPO_1229_11	299	MicroCat/P IM	2717	x	

KPO_1229_12	500	MicroCat/P IM	10680	x	
KPO_1229_13	750	MicroCat IM	2933	x	
KPO_1229_14	750	Aquadopp IM	P26209-1	x	
KPO_1229_15	1001	MicroCat/P IM	10694	x	
KPO_1229_16	1152	MicroCAt/P IM Pump	10660	x	
KPO_1229_17	1302	MicroCat SM	2255	x	
KPO_1229_18	1506	MicroCat IM	0954	x	
KPO_1229_19	1506	O2-logger	100	x	
KPO_1229_20	1506	Aquadopp IM	P26209-12	x	
KPO_1229_21	1807	MicroCat/P IM	10696	x	
KPO_1229_22	2008	MicroCat IM	2257	x	
KPO_1229_23	2207	MicroCat/P IM	10691	x	
KPO_1229_24	2207	Aquadopp IM	P26209-10	x	
KPO_1229_25	3468	MicroCat SM Pump	10642	x	
KPO_1229_26	3476	Release RT861	555	code:	Enable: 020F / Release: 0255
KPO_1229_27	3476	Release AR861	1642	code:	Enable: 0A87 / Release: 0A55

Mooring Deployment mooring DSOW6					**Notes:**	**KPO_1230**
Vessel:	Merian	MSM94				
Deployed:	26-Aug	2020	11:03			
Vessel:						
Recovered:						
Latitude:		58°	44.089’	N		
Longitude:		048°	10.063’	W		
Water depth:		3363	Mag Var:	-23		

ID	**Designed Depth**	**Instr. Type**	**s/n**	**Start-up**	**Remarks**
KPO_1230_01	2795	Xeos	15172	ready	
KPO_1230_02	2817	Aquadopp DW	P26209-15	x	
KPO_1230_03	2817	MicroCats/P IM	10633	x	
KPO_1230_04	3323	Aquadopp DW	P26209-35	x	
KPO_1230_05	3323	MicroCat/P Im	10687	x	
KPO_1230_06	3334	Release AR861	1648	code:	Enable: 0A8D / Release: 0A55
KPO_1230_07	3334	Release AR861	1650	code:	Enable: 0A8F / Release: 0A55