Dr. Frank Wenzhöfer
Alfred-Wegener-Institute
Helmholtz-Centrum for Polar and Marine Research
Am Handelshafen 12
D-27570 Bremerhaven, Germany

Tel.: +49 (0)471 4831 2182
Fax: +49 (0)471 4831 1776
email: frank.wenzhoefer@awi.de

Short Cruise Report

Maria S. Merian MSM 29 "HAUSGARTEN"

Tromsø (Norway) – Tromsø (Norway)

June 23 – July 12, 2013

Chief Scientist: Dr. Frank Wenzhöfer

Captain: Ralf Schmidt

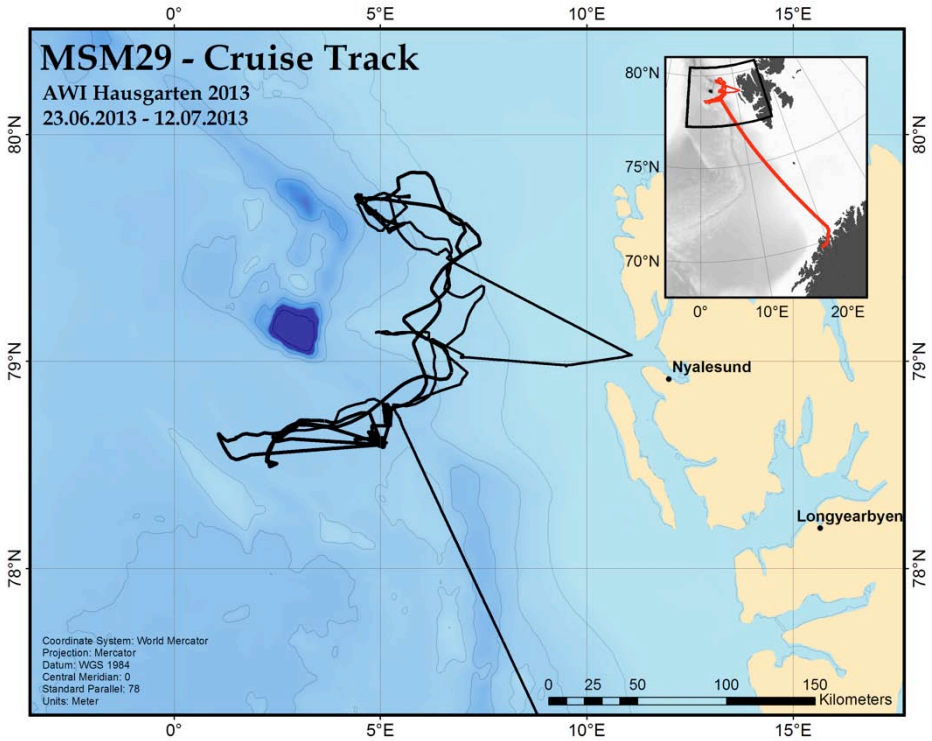

Fig. 1 Track plot of MSM 29

Objectives

Cruise leg MSM 29 investigated the consequences climate changes and the decline in sea ice has on Arctic ecosystems, which is one of the most important challenges for Earth Sciences. Arctic ecosystems are adapted to the prevailing environmental conditions. Abiotic steering parameters (e.g. hydrodynamics, temperature, ice cover, light, pH, O_2 and nutrient concentration) influence productivity and structure of pelagic and benthic communities. Rapidly changing physical and chemical conditions, as observed and projected for the future, will affect the ecosystem functioning including productivity, remineralisation, carbon sequestration and energy flow between ecosystem compartments and across trophic levels.

The cruise made an important contribution to the long-term ecosystem time-series study that started in 1999 at HAUSGARTEN to investigate temporal variability in a variety of biological, geochemical, and sedimentological parameters. The HAUSGARTEN observatory is located in the eastern Fram Strait west of Svalbard (Fig. 1 and 2). The observatory includes 17 permanent sampling sites along a depth transect from Vestnesa Ridge to the Molloy Deep (1000 - 5500 m) and along a latitudinal transect following the 2500 m isobath crossing the central HAUSGARTEN station HG-IV (Fig. 2). The HAUSGARTEN observatory also serves as an experimental area for biological long-term experiments at the deep seafloor. The marine ecosystem at the site is – owing to ongoing sea ice retreat – at present located in the highly productive Marginal Ice Zone and will very likely continuously shift to an open ocean ecosystem with changed productivity and food input to the deep-sea benthos. Research at the observatory includes the characterization and quantification of marine organic matter to the deep seafloor, the exchange processes at the sediment-water interface, the distribution of biogenic sediment compounds (indicating benthic activity and biomass) and the evaluation of spatial and temporal distribution patterns of benthic organisms of all size classes.

The main objectives of MSM 29 were (1) to carry out in situ experiments and incubations for studying the effects of changing environmental conditions on pelagic and benthic processes and communities, (2) to provide data on the functional responses of key species in pelagic and benthic compartments to changing food and abiotic conditions and (3) to study the variation of biogeochemical fluxes in the water column and at the sediment water interface in time series measurements with moorings, lander systems and dedicated ROV-operated instruments.

We used a multidisciplinary and quantitative approach in addressing carbon and nutrient fluxes, the connection, composition and structure of benthic and pelagic communities at different temporal and spatial scales. The expected results will improve our knowledge of changes in climate and sea ice cover on Arctic ecosystems.

Narrative

Cruise leg MSM29 started in the morning of June 23 in Tromsø, Norway. After two days transit, where the scientists and technicians used the time to finish the preparation of the labs and large instruments (AUV, ROV, Lander, TV-MUC and OFOS), we reached our working area west of Svalbard. On arrival in the area of our long-term observatory

HAUSGARTEN (Fig. 2) our first task was to reach an ice-free station. According to satellite-based ice charts our working area west of Svalbard showed an exceptionally dense ice cover. Station work started on June 25 at our southern HAUSGARTEN site S-2 (Fig.2). A newly developed Profiling-Mooring with an underwater winch (project ICOS-D, BMBF) was deployed at this site. During 14-days of deployment a new profiler-system carrying a CTD and CO_2 sensor was programmed to profile the upper 100m of the water column to provide high-resolution data on biogeochemical processes in arctic surface waters. Additionally an Incubation-Lander was deployed at the same site. This Lander simulated a settling food pulse by injection of stable-isotope labelled phytodetritus into the chambers, which allows following the pathway of organic matter through the benthic community. Both systems were to be recovered at the end of the cruise. After trying to reach our main working site HG-IV (Fig. 2), which was not possible due to the ice cover, we decided to continue with the eastern part of the HAUSGARTEN depth transect. During the following two days we sampled at our stations HG-II and HG-I (Fig. 2), which included water column CTD/Rosette as well as sediment samples with the TV-MUC. At HG-I we were also able to perform the first ROV dive. Using a ROV-operated microprofiler we measured oxygen profiles to estimate the benthic oxygen consumption and thus the rates of organic matter mineralization at the seafloor. The dive was also used to start a biological long-term experiment at the deep seafloor. Small inert fluorescing microspheres (60 µm and 80-125 µm in diameter), so-called Luminophores, were spread by the ROV on a defined area at the seafloor to initiate an experiment assessing bioturbation rates by larger benthic organisms. A revisit for sampling the site is planned for 2015. On June 27 we continued our East-Transect towards Svalbard and sampled the three shallow sites (KH, V12 and Kb0; Fig. 2) with CTD/Rosette and TV-MUC, before we started our transit to the northern sites.

In the early morning of June 28 we reached station N-3 (79°35'N; Fig. 2) and luckily the ice cover as loose enough for CTD/Rosette and TV-MUC sampling. Unfortunately ice density then started to increase and precluded the recovery of our mooring at N-4 (Fig. 2). By moving outside of the drift-ice field we were able to perform a first short AUV dive for system calibration as well as a short Lander deployment to measure benthic oxygen consumption. Because the new ice maps showed some promising openings in the southern working area RV Maria S. Merian headed towards station S-2. After deploying a second algae incubation lander we started to transit towards our central station HG-IV in the night of June 30. Due to bad weather conditions (low visibility) and increasing ice cover we had to give up and returned to our southern sites to finish the CTD/Rosette and TV-MUC sampling.

The beginning of the second week was dedicated to an intensive water column work with AUV and ROV dives, and Particle Camera (ParCa) deployments. The vertically profiling still image particle camera images marine particles every 10 m for later statistical analysis of dimensions and density. In the night of July 1 the AUV was recovered after its successful first long mission along the ice edge. Over several kilometres the upper water column was monitored with O_2-, nitrate- and light sensors and sampled with a custom-built water sampling system at 22 locations. The water column studies were completed with a ROV dive investigating the sinking velocities of individual marine particles at different water depths. This was achieved by injecting dyed seawater into the water column to provide a stationary reference for the observations of the moving particles.

In the early morning of July 2 we made a second attempt to head to our central site HG-IV but the increasing ice cover prevented again RV Maria S. Merian from reaching the site. After recovering one of our algae incubation lander at S-2 we headed again towards our northern sites. On July 4 we were able to successfully recover the water column mooring at N-4, which was deployed in 2012 to sample sinking particles and record currents and physicochemical properties in the water column. Our program at N-4 was then completed with a short Lander deployment to measure benthic oxygen consumption and sediment sampling with the TV-MUC before a new water column mooring was deployed for retrieval in 2014. To finish our task at the northern sites an OFOS transect to map the seafloor was started at N-3. However, due to the increasing ice cover and ice drift the OFOS mapping had to be aborted and on mid-day of July 5 we headed south to spend the last days trying to reach HG-IV. During the transit we deployed the ParCa system at the ice edge. The vertically profiling still image camera (ParCa) was used for an in situ optical acquisition of marine particles; ParCa takes still images every 10 m, which can be statistically analyzed. The goal of the ParCa deployment at and around the HAUSGARTEN sites was to get an overview of the in situ concentration and size of marine particles in the water column of this area.

Since the weather and ice conditions did not allow to transit to the central site we decided to head to the southernmost site S-3 (Fig. 2). After deploying a benthic lander for oxygen flux measurements on July 7 a fourth ROV dive was performed dedicated to the scaling of benthic processes and communities. The goal of this dive was to investigate the spatial scaling and variability of benthic respiration rates and microbial community composition. At different sites separated by defined distances, oxygen microprofiles were recorded and push core taken. Detailed investigations of the marine particle transport using the HD camera of the ROV completed the dive. In the evening the new Profiling-Mooring was recovered at station S-2. Programming, communication and sensor measurements worked successfully but unfortunately the underwater winch did not perform properly due to mechanical problems. In the morning of July 8 we finished the CTD/Rosette and TV-MUC sampling at our southern sites (S-1) and started another try to reach HG-IV. Although we faced some drifting ice fields RV Maria S. Merian was able to reach our central site. At HG-IV we recovered the second water column mooring and a long-term lander. Both instruments were deployed in 2012 and equipped with sediment traps and oceanographic sensors (including sensors for O_2, currents, temperature, and salinity). Due to moving ice fields instrument retrieval was challenging but all instruments and sampling devices were successfully recovered. Our work at HG-IV was complemented by CTD/Rosette and TV-MUC sampling and a ParCa deployment. Finally, a new mooring and a long-term benthic oxygen lander were deployed The lander was equipped with four oxygen sensors and is programmed to perform sediment oxygen profiles every week for the next 12 months to investigate seasonal variations in benthic oxygen consumption.

Our station work during MSM 29 ended with the recovery of the second algae incubation lander at S-2. In the early morning of July 10th we started our transit to Tromsø, which we reached in the morning of July 12.

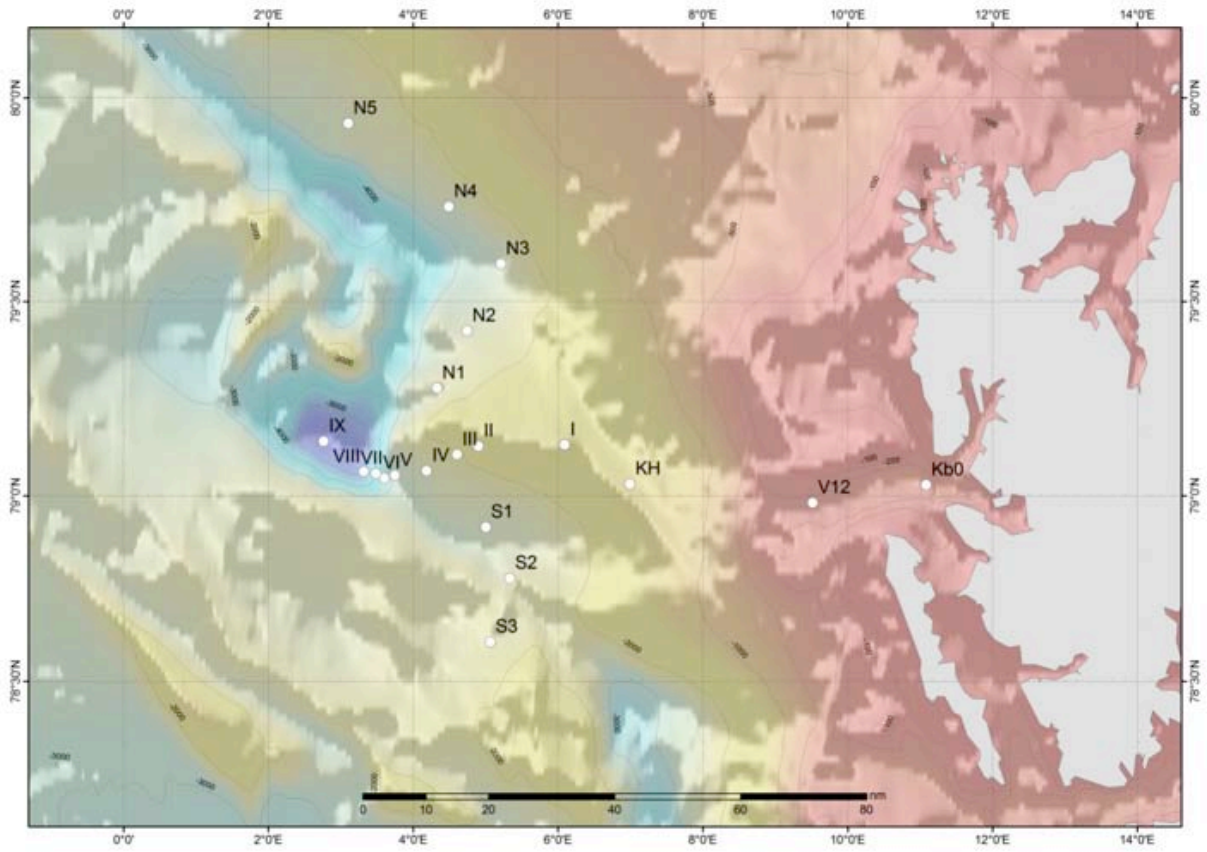

Fig. 2: Permanent sampling sites of the HAUSGARTEN observatory (HG-I – HG-IX, N1 – N5, and S1 – S3), including stations repeatedly sampled within the KONGHAU project (KH, V12, and Kb0).

Acknowledgements

We thank the Captain and crew of the RV Maria S. MERIAN expedition MSM29 for their excellent support of our work at sea. Also, we thank the ROV QUEST team for excellent dives. Many thanks go to the German Embassy in Norway and Denmark, and to the MERIAN coordination office (Leitstelle) for their help with the permissions and the harbour logistics. Deutsche Forschungsgemeinschaft provided the ship time. Financial support for the different projects carried out during the cruise was provided through the HGF – Research-Program PACES (Polar Regions and Coasts in the changing Earth System), the ERC project Abyss (European Research Council Advanced Investigator Grant 294757: Assessment of Bacterial Life and Matter Cycling in Deep-Sea Surface Sediments), the BMBF project TRANSDRIFT, as well as by the research institutes involved. We gratefully acknowledge this support.

Teilnehmerliste

1.	Wenzhöfer, Frank	Fahrtleiter / *Chief Scientist*	AWI
2.	Asendorf, Volker	Lander	MPI
3.	Bauerfeind, Eduard	Sediment traps, moorings	AWI
4.	Bienhold, Christina	Benthic Microbiology	AWI/MPI
5.	Hagemann, Jonas	AUV	AWI
6.	Hasemann, Christiane	Biogeochemistry, MUC	AWI
7.	Hüttich, Daniel	ROV	MARUM
8.	Janssen, Felix	Benthic fluxes, Lander	AWI
9.	Lalande, Catherine	Sediment traps, moorings	AWI
10.	Lehmenhecker, Sascha	AUV	AWI
11.	Lochthofen, Normen	Sediment traps, moorings	AWI
12.	Nowald, Nico	Particle transport	MARUM
13.	Ratmeyer, Volker	ROV	MARUM
14.	Rehage, Ralf	ROV	MARUM
15.	Reuter, Christian	ROV	MARUM
16.	Reuter, Michael	ROV	MARUM
17.	Schewe, Ingo	Biogeochemistry, MUC	AWI
18.	Seiter, Christian	ROV	MARUM
19.	Soltwedel, Thomas	Biogeochemistry, OFOS	AWI
20.	Tardeck, Frederic	Data management, CTD	FIELAX
21.	Wulff, Thorben	AUV	AWI
22.	Zarrouk, Marcel	ROV	MARUM

AWI
Alfred-Wegener Institut Helmholtz-Zentrum für Polar- und Meeresforschung
Am Handelshafen 12
D-27570 Bremerhaven, Germany
http://www.awi-bremerhaven.de

MPI-Bremen
Max-Planck-Institut für Marine Mikrobiologie
Celsiusstr. 1
D-28359 Bremen, Germany
http://www.mpi-bremen.de

MARUM
Zentrum für marine Umweltwissenschaften
Universität Bremen
Loebener Strasse
D-28359 Bremen, Germany
http://www.marum.de

FIELAX
Fielax Gesellschaft für wissenschaftliche Datenverarbeitung mbH
Schleisenstr. 14
D-27568 Bremerhaven, Germany
http://www.fielax.com

Stationsliste

Gear abbreviations:

AUV	Autonomous Underwater Vehicle
CTD/RO	CTD, Rosette water sampler
DT	Drift Trap
HN	Hand net
MOOR	Sediment Trap Mooring
MUC	Multicorer
OFOS	Ocean Floor Observation System
PAC	Particle Camera
ROV	ROV Quest 4000
TVMUC	TV-Multicorer
LANDER	Chamber Lander

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Water depth [m]
MSM29/0423-1	6/25/2013	10:58	CTD/RO	at depth	78° 46.83' N	5° 19.74' E	2456.2
MSM29/0423-2	6/25/2013	11:59	MOR	surface	78° 46.84' N	5° 19.77' E	2450.9
MSM29/0423-3	6/25/2013	16:55	PAC	At working depth	78° 47.77' N	5° 18.48' E	2475.1
MSM29/0424-1	6/26/2013	0:01	CTD/RO	at depth	79° 7.96' N	4° 54.35' E	1506.9
MSM29/0424-2	6/25/2013	23:59	HN	surface	79° 7.96' N	4° 54.36' E	1508.6
MSM29/0424-3	6/26/2013	1:48	TVMUC	put down	79° 7.93' N	4° 54.71' E	1501.5
MSM29/0425-1	6/26/2013	6:04	CTD/RO	at depth	79° 8.03' N	6° 5.55' E	1253.5
MSM29/0425-2	6/26/2013	5:59	HN	surface	79° 8.03' N	6° 5.55' E	1254.9
MSM29/0425-3	6/26/2013	7:10	MUC	at sea bottom	79° 8.00' N	6° 5.55' E	1253.8
MSM29/0426-1	6/26/2013	13:57	ROV	at depth	79° 6.21' N	6° 5.45' E	1256.3
MSM29/0427-1	6/27/2013	0:23	CTD/RO	at depth	79° 1.80' N	7° 0.21' E	1280.3
MSM29/0427-2	6/27/2013	1:28	TVMUC	put down	79° 1.80' N	7° 0.20' E	1276.8
MSM29/0427-3	6/27/2013	2:25	PAC	techn. problems	79° 1.75' N	7° 0.19' E	1273.7
MSM29/0427-4	6/27/2013	4:30	PAC	At working depth	79° 1.75' N	7° 0.20' E	1284
MSM29/0428-1	6/27/2013	8:00	CTD/RO	at depth	78° 58.82' N	9° 31.01' E	225
MSM29/0428-2	6/27/2013	7:57	HN	surface	78° 58.81' N	9° 30.94' E	224.8
MSM29/0428-3	6/27/2013	8:35	TVMUC	bottom view	78° 58.81' N	9° 31.00' E	225.6
MSM29/0429-1	6/27/2013	10:33	TVMUC	put down	79° 1.04' N	10° 47.53' E	351.8
MSM29/0430-1	6/27/2013	11:24	CTD/RO	at depth	79° 1.76' N	11° 5.31' E	285.1
MSM29/0430-2	6/27/2013	11:23	HN	surface	79° 1.76' N	11° 5.31' E	283.6
MSM29/0430-3	6/27/2013	11:54	TVMUC	put down	79° 1.76' N	11° 5.31' E	280.9
MSM29/0431-1	6/27/2013	21:44	CTD/RO	at depth	79° 35.71' N	5° 12.57' E	2721.5
MSM29/0431-2	6/27/2013	21:15	HN	surface	79° 35.71' N	5° 12.57' E	2722.8
MSM29/0431-3	6/27/2013	23:38	TVMUC	put down	79° 35.71' N	5° 12.57' E	2721.9
MSM29/0432-1	6/28/2013	3:28	CTD/RO	at depth	79° 43.11' N	4° 33.88' E	2734.6
MSM29/0432-2	6/28/2013	5:28	TVMUC	put down	79° 43.09' N	4° 33.81' E	2738.1
MSM29/0433-1	6/28/2013	9:34	AUV	AUV in water	79° 42.05' N	4° 26.73' E	2848.7

MSM29/0433-2	6/28/2013	11:58	PAC	At working depth	79° 42.05' N	4° 26.73' E	2850.3
MSM29/0434-1	6/28/2013	16:29	LANDER	surface	79° 43.97' N	5° 41.71' E	1413.9
MSM29/0434-2	6/28/2013	16:42	CTD/RO	at depth	79° 43.97' N	5° 41.71' E	1413.9
MSM29/0434-3	6/28/2013	17:25	AUV	AUV in water	79° 43.98' N	5° 41.69' E	1414.5
MSM29/0434-4	6/29/2013	1:13	LANDER	on Deck	79° 44.32' N	5° 42.36' E	1385.8
MSM29/0435-1	6/29/2013	19:08	LANDER	slipped	78° 46.56' N	5° 3.78' E	2499.4
MSM29/0436-1	6/30/2013	13:03	LANDER	surface	78° 36.47' N	5° 3.78' E	2293.2
MSM29/0437-1	6/30/2013	14:57	CTD/RO	at depth	78° 38.37' N	4° 56.36' E	2326.7
MSM29/0437-2	6/30/2013	15:35	AUV	start launching	78° 38.37' N	4° 56.37' E	2329.4
MSM29/0438-1	6/30/2013	23:42	CTD/RO	at depth	78° 38.77' N	4° 50.20' E	2348
MSM29/0438-2	7/1/2013	0:20	CTD/RO	at depth	78° 39.56' N	4° 48.22' E	2353.2
MSM29/0438-3	7/1/2013	1:02	CTD/RO	at depth	78° 40.07' N	4° 42.50' E	2356.3
MSM29/0438-4	7/1/2013	1:48	CTD/RO	at depth	78° 38.87' N	4° 46.09' E	2351.9
MSM29/0438-5	7/1/2013	2:36	CTD/RO	at depth	78° 37.58' N	4° 46.27' E	2349.3
MSM29/0438-6	7/1/2013	3:15	CTD/RO	at depth	78° 38.15' N	4° 51.25' E	2335.6
MSM29/0438-7	7/1/2013	3:53	CTD/RO	at depth	78° 37.86' N	4° 57.35' E	2325.2
MSM29/0438-8	7/1/2013	4:40	CTD/RO	at depth	78° 38.75' N	4° 53.25' E	2342.9
MSM29/0438-9	7/1/2013	5:24	CTD/RO	at depth	78° 39.88' N	4° 51.60' E	2344
MSM29/0439-1	7/1/2013	7:08	CTD/RO	at depth	78° 37.20' N	5° 1.01' E	2316.7
MSM29/0439-2	7/1/2013	7:36	HN	surface	78° 37.20' N	5° 1.01' E	2316.8
MSM29/0439-3	7/1/2013	8:52	TVMUC	put down	78° 37.20' N	5° 1.03' E	2317.8
MSM29/0439-4	7/1/2013	12:02	PAC	At working depth	78° 37.06' N	5° 1.20' E	2314.9
MSM29/0439-5	7/1/2013	14:00	CTD/RO	at depth	78° 37.06' N	5° 1.20' E	2316.9
MSM29/0439-6	7/1/2013	17:04	TVMUC	put down	78° 37.06' N	5° 1.19' E	2320.2
MSM29/0439-7	7/1/2013	20:10	ROV	surface	78° 37.06' N	5° 1.19' E	2315.7
MSM29/0440-1	7/2/2013	7:52	OFOS	at depth / bottom sight	78° 37.04' N	5° 0.08' E	2316.4
MSM29/0440-2	7/2/2013	12:09	CTD/RO	at depth	78° 37.00' N	5° 8.57' E	2303.2
MSM29/0440-3	7/2/2013	13:00	POSI	start calibration	78° 36.50' N	5° 3.69' E	2295.7
MSM29/0440-4	7/2/2013	16:13	LANDER	on Deck	78° 36.87' N	5° 3.34' E	0
MSM29/0440-5	7/2/2013	19:58	AUV	start launching	78° 42.85' N	5° 9.65' E	2332.3
MSM29/0441-1	7/3/2013	3:36	CTD/RO	at depth	78° 42.81' N	5° 6.86' E	2332.9
MSM29/0441-2	7/3/2013	4:12	CTD/RO	at depth	78° 44.20' N	5° 6.40' E	2350.2
MSM29/0441-3	7/3/2013	4:49	CTD/RO	at depth	78° 45.33' N	5° 5.96' E	2356.4
MSM29/0441-4	7/3/2013	5:24	CTD/RO	at depth	78° 46.59' N	5° 5.59' E	2542.6
MSM29/0441-5	7/3/2013	6:02	CTD/RO	at depth	78° 47.80' N	5° 4.84' E	2626.2
MSM29/0441-6	7/3/2013	6:39	CTD/RO	at depth	78° 47.89' N	5° 10.38' E	2553.9
MSM29/0441-7	7/3/2013	7:13	CTD/RO	at depth	78° 46.61' N	5° 11.22' E	2677.1
MSM29/0441-8	7/3/2013	7:51	CTD/RO	at depth	78° 45.41' N	5° 12.15' E	2352.6
MSM29/0441-9	7/3/2013	8:21	CTD/RO	at depth	78° 44.25' N	5° 12.56' E	2321.8
MSM29/0441-10	7/3/2013	8:55	CTD/RO	at depth	78° 42.88' N	5° 13.26' E	2305.2
MSM29/0442-1	7/3/2013	15:23	ROV	at depth	78° 36.51' N	5° 3.78' E	0
MSM29/0443-1	7/3/2013	20:04	LANDER	on Deck	78° 46.67' N	5° 15.58' E	0
MSM29/0443-2	7/3/2013	20:58	TVMUC	put down	78° 46.67' N	5° 15.59' E	0
MSM29/0444-1	7/4/2013	6:45	LANDER	surface	79° 43.37' N	4° 26.29' E	2686.8
MSM29/0444-2	7/4/2013	11:18	MOR	on the surface	79° 44.53' N	4° 32.19' E	0
MSM29/0444-3	7/4/2013	15:24	TVMUC	put down	79° 44.19' N	4° 29.33' E	2672.1
MSM29/0444-4	7/4/2013	16:33	CTD/RO	at depth	79° 44.19' N	4° 29.33' E	2670.9

MSM29/0444-5	7/4/2013	17:42	TVMUC	put down	79° 44.20' N	4° 29.50' E	2655.7
MSM29/0444-6	7/4/2013	19:16	MOR	surface	79° 44.34' N	4° 30.04' E	2666.1
MSM29/0444-7	7/5/2013	0:34	CTD/RO	at depth	79° 42.97' N	4° 27.52' E	2763.6
MSM29/0444-8	7/5/2013	3:15	LANDER	on Deck	79° 43.51' N	4° 25.64' E	2685.1
MSM29/0445-1	7/5/2013	6:29	OFOS	at depth / bottom sight	79° 35.98' N	5° 9.62' E	2746.5
MSM29/0446-1	7/6/2013	14:04	PAC	At working depth	78° 41.45' N	3° 43.78' E	2320.8
MSM29/0447-1	7/6/2013	16:00	PAC	Surface	78° 39.17' N	4° 21.38' E	2362.7
MSM29/0447-2	7/6/2013	19:21	TVMUC	put down	78° 39.17' N	4° 21.38' E	2363.6
MSM29/0447-3	7/6/2013	21:06	TVMUC	put down	78° 39.17' N	4° 21.38' E	2363.6
MSM29/0448-1	7/7/2013	3:09	LANDER	surface	78° 36.47' N	5° 3.78' E	2294.1
MSM29/0448-2	7/7/2013	6:22	ROV	at depth	78° 35.96' N	5° 4.12' E	2295.1
MSM29/0448-3	7/7/2013	10:54	HN	surface	78° 35.96' N	5° 4.12' E	2295.1
MSM29/0449-1	7/7/2013	21:57	MOR	on the surface	78° 47.04' N	5° 18.18' E	0
MSM29/0449-2	7/8/2013	0:02	DT	surface	78° 47.02' N	5° 19.95' E	2434.1
MSM29/0450-1	7/8/2013	3:14	CTD/RO	at depth	78° 55.01' N	5° 0.30' E	2592.6
MSM29/0451-1	7/8/2013	14:48	LANDER	on Deck	79° 4.46' N	4° 5.05' E	0
MSM29/0452-1	7/8/2013	17:49	MOR	on the surface	79° 0.44' N	4° 19.82' E	0
MSM29/0452-2	7/9/2013	1:25	CTD/RO	at depth	79° 0.45' N	4° 20.39' E	2551.6
MSM29/0452-3	7/9/2013	3:29	PAC	At working depth	79° 0.46' N	4° 20.45' E	2550.6
MSM29/0453-1	7/9/2013	7:16	TVMUC	put down	79° 4.82' N	4° 4.74' E	2464.4
MSM29/0454-1	7/9/2013	11:01	MOR	on the ground	79° 3.76' N	4° 1.81' E	2576.6
MSM29/0455-1	7/9/2013	11:57	LANDER	surface	79° 4.29' N	4° 4.21' E	2506.7
MSM29/0456-1	7/9/2013	14:26	AUV	AUV in water	79° 5.19' N	4° 32.86' E	2158.9
MSM29/0457-1	7/9/2013	19:53	LANDER	on Deck	78° 47.70' N	5° 19.57' E	0
MSM29/0458-1	7/9/2013	21:39	DT	on deck	78° 41.17' N	5° 27.00' E	0
MSM29/0459-1	7/10/2013	0:37	LANDER	on Deck	78° 36.72' N	5° 4.85' E	0