ARK XIX/1

28.02. - 24.04.2003

Bremerhaven - Longyearbyen
WARPS - WINTER ARCTIC POLYNYA STUDY

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1. INTRODUCTION AND ITINERARY

In March and April 2003 Polarstern embarked on a winter expedition in the Arctic for the first time in 10 years. Winter is the time of Arctic sea ice formation - most of it taking place in latent heat polynyas -, which constitutes a momentous interaction between atmosphere, ice and ocean with far-reaching consequences for the circulation in atmosphere and ocean and for chemistry and biota in all three compartments.

"Mr. Spock, take us to WARP ! please!" (Star trek)

According to present knowledge, the Arctic plays a decisive role in our climate system. The radiation budget of the atmosphere is modified by the high albedo (reflectivity) of the ice.
At the same time, sea-ice slows the exchange of heat, moisture and gases between the air and the water. Where there is little ice, owing to wind-caused drifting, the heat flow is much stronger because the temperature difference between water and air can be up to 20 or 30ºC. The wind drives the new ice to the edge of the polynya, breaks it and piles it up. This process is responsible for the generation of most of the thick pack ice of the Arctic. During freezing, the majority of the salt remains in the surrounding water. The associated increase in water density causes the water to sink. Although this process occurs on very small spatial scales, it is part of the motor of a global current pattern, the thermohaline circulation, which distributes heat and substances over great distances. The different ice cover, together with the low insolation in winter also regulates the atmospheric boundary layer from a stable state with a temperature inversion to vigorous convection over a polynya.
Maybe more than elsewhere, in the ice and in ice-covered water of polar regions biological processes are subject to strong seasonality. Observations in winter are therefore crucial to complete our understanding of the Arctic ecosystems. The colonization of newly formed ice is as poorly understood as the onset of biological activity and reproduction and the reforming of the foodweb in and below the pack ice with the return of sun light. Equally unknown is how far the life at the deeper sea floor, the benthos, is also subject to this seasonality.
"WARPS" (Winter Arctic Polynya Study) was an interdisciplinary, international study of the exchange between the atmosphere, ice and ocean and the consequences for biogeochemistry and biological processes in the habitats of ice, water and down to the sea floor. For these studies we chose five specific areas which we considered the least difficult ones to access in winter. However, we had to learn that even a capable ice breaker such as Polarstern meets its limits of maneuverability in Arctic winter.

(S) the latent heat polynya of the Storfjorden
(B) the polar front in the western Barents Sea
(W) the sensible heat polynya north of Svalbard (Whalers Bay)
(C) central pack ice for a two-week ice station
(H) the deep-sea research site "AWI-Hausgarten"

ARKXIX/1 began at 28 February in Bremerhaven. After a one-week transfer in friendly spring conditions we encountered winter and heavy ice south of Svalbard. A tremendous stream of crunched ice composed of a mixture of thick multi-year boulders and newly formed chips moving southwestwards from east of Svalbard made our approach to the latent heat polynya inside the Storfjorden a slow and wiggled exercise. Yet we measured atmosphere, ice and ocean properties, ice-ocean-atmosphere fluxes and chemical and biological parameters along several sections thus getting the distribution along a gradient from heavy ice into the open polynya.
Subsequently, a transect from the Polar Waters south of Svalbard into the Bear Island Trough with its dominance of warm Atlantic Water (B) enabled to investigate the late winter zooplankton and benthos activities in the two different regimes.
On 29 March we arrived in Longyearbyen for an exchange of several participants. With the new group our destination were the waters north of Svalbard where the boundary current of warm Atlantic Water tends to maintain the Whalers Bay open during winter. Wind had, however, closed the sensible heat polynya with thick ice here as well but we measured heat flux from the ocean upwards during a one day ice station. Onboard availability of real-time SSMI images enabled us to find the entrance to one of the structured north-west oriented leads in northern Fram Strait along which we steamed into the pack ice “only” interrupted by a few barriers of ridged ice. Shortly before reaching 82°Nwe chose a suitable floe (C) to set up several masts for 12 days to conduct atmospheric boundary layer measurements in close co-operation with aircraft-based operations from Svalbard and with the Finnish research vessel Aranda which operated at the ice edge further south.
The last activity focussed on the deep-sea benthic in the long-term station “AWI Hausgarten” (H) in Fram Strait. Polarstern returned to Longyearbyen on 24 April 2003.

FS Polarstern
Cruise ARK–XIX/1
Bremerhaven – Longyearbyen
28.02.2003 – 24.04.2003

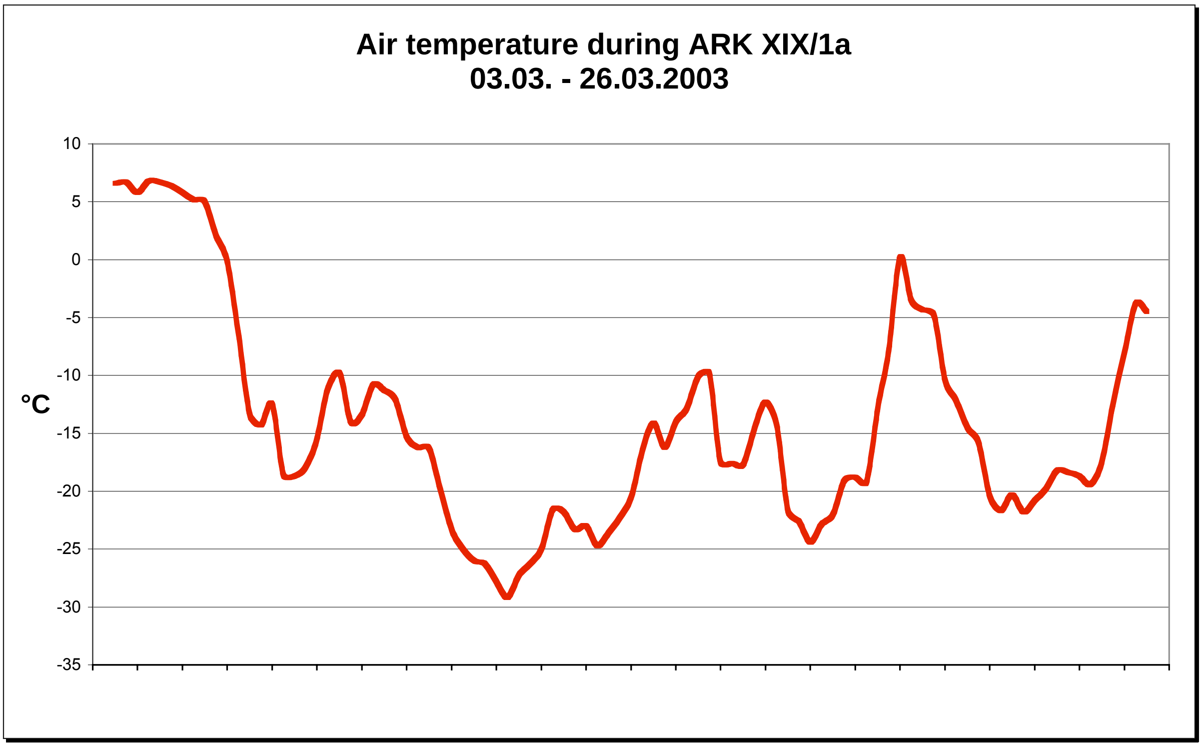
Alfred Wegener Institut for
Polar and Marine Research
D 27515 Bremerhaven

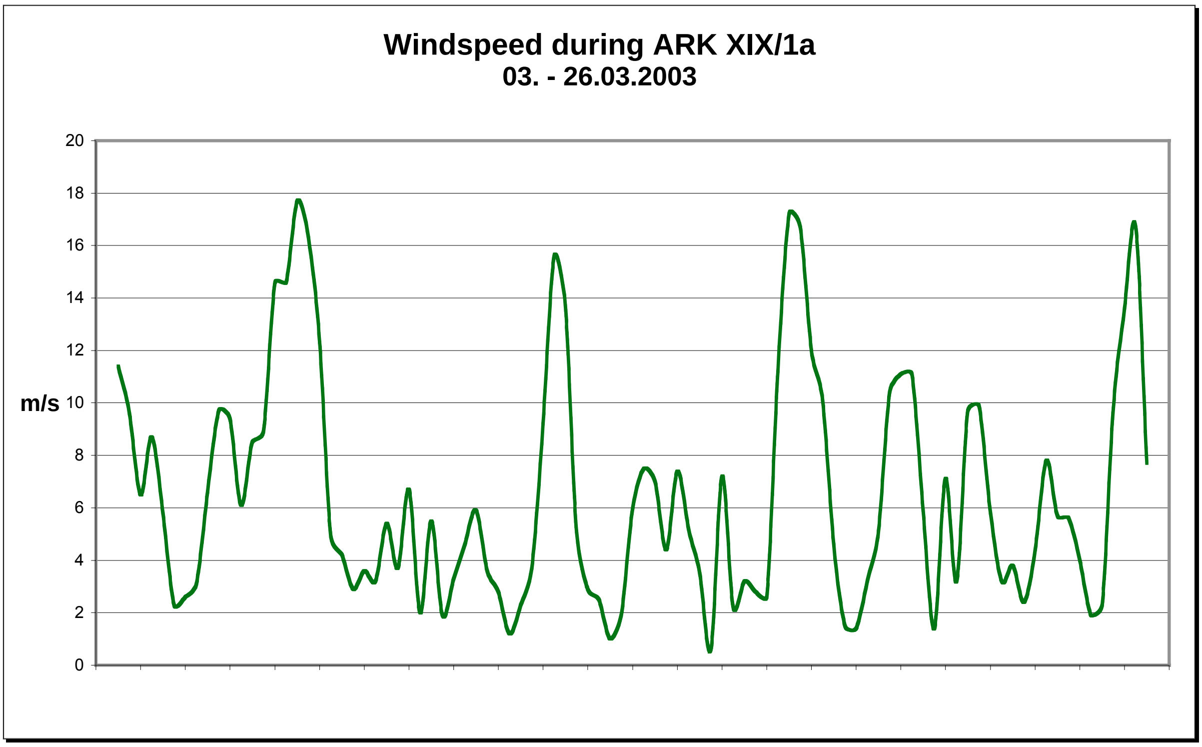
2. WEATHER CONDITIONS

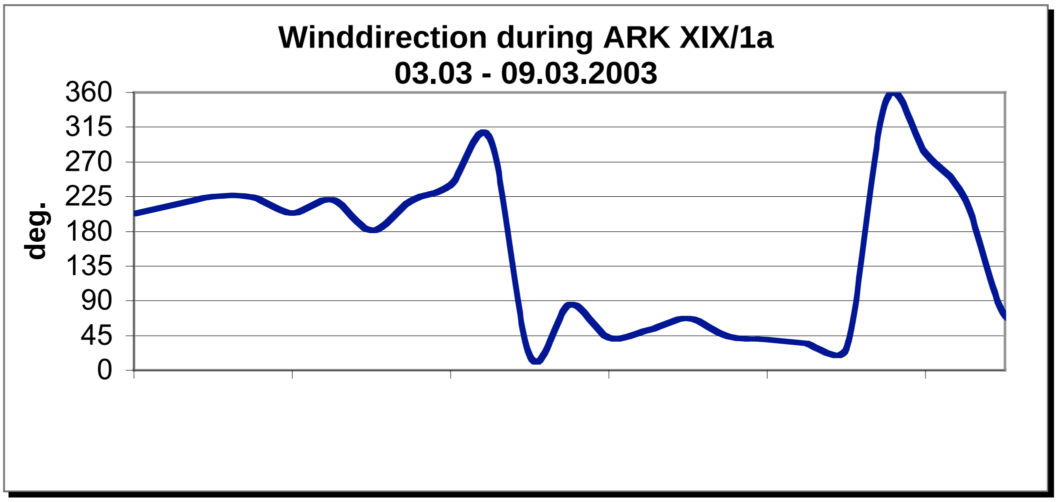
On the 28th of February at about 23 o'clock Polarstern started from Bremerhaven towards Spitsbergen. During the days of the transit to the working-area a stationary high over Russia was dominating the weather in Europe. We had on the whole route a southerly wind between Bft 6 and 8 and temperatures about 6 °C.On the 5th of march Polarstern crossed the border between the mild Atlantic airflow coming from southwest and the polar air from east. The temperatures went down below the freezing-point, on the next day we had already -14 °C with easterly winds and snowdrift. On this day the scientific works began in the area around the Storfjord. Due to the further on stationary Eastern-European high the track of the lows did not change, they went from the area south of Iceland along the Norwegian coast to the Barents-Sea. On the 11th of March an upper trough crossed Western Europe from west to east causing an outbreak of cold air southward to Ireland. In connection with this trough low pressure systems shifted east across Central Europe, later a new high established over the Atlantic, which moved to the North-Sea with pressure about 1045 hPa. Now the Atlantic lows moved from Cape Farvel to Jan Mayen and further on to Bear Island. On the following days the frontal-zone moved further to the north, from 16th of march heavy developments took place near Western Greenland and due to upper troughs crossing Greenland, new lows established over the Greenland-Sea and moved east between Svalbard and the north-cape, developing rapidly from time to time. On 21st of March this circulation-type changed again, as the high over Central-Europe draw back to the south and the track of the lows shifted south again. During the whole cruise in the working-area of Polarstern the wind came predominantly from directions between east and north, so very cold air from the polar-ice arrived the area. Due to this situation the temperatures lay between -20 and -30 °C.Only if the wind came from south or southwest and brought Atlantic air, the temperatures rose up to -5 to -10 °C.Only on 21st of March the temperature reached the freezing-point for a short time. In case of a north-easterly airflow for several times in the southwest of the islands a lee-cyclone was remaining for a time, when a low had crossed in the south. These cyclones got their energy apparently from the temperature-differences between the cold air from the north which became warmed up over the Atlantic water and the extremely cold air coming from east from the polar-ice. On the border-line between these air-masses sometimes “boundary-layer-fronts” were establishing containing mesoscale vortices. On 26th of March Polarstern started towards Longyearbyen,

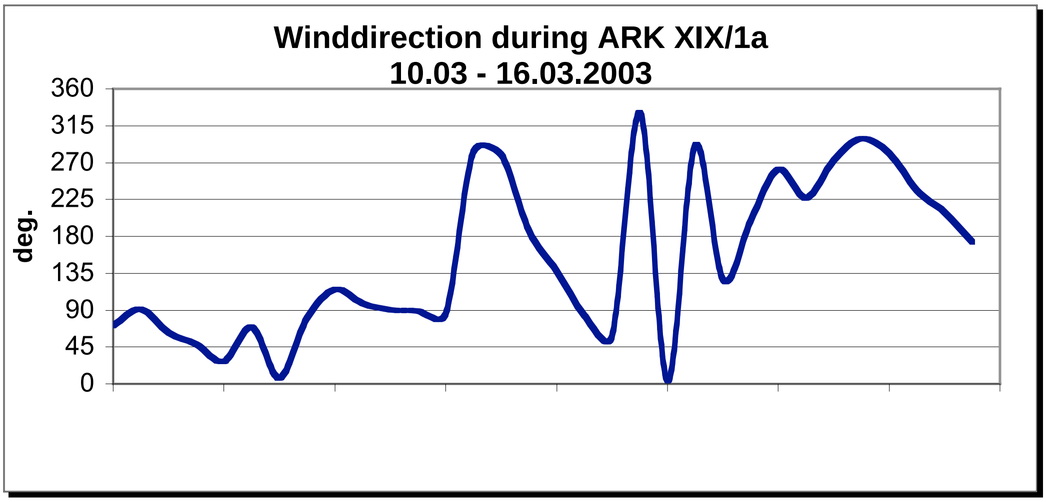
On 30th of March Polarstern left Longyearbyen again in order to reach the polar-ice north-west of Spitsbergen. A enduring northerly wind was blowing between an intensive high over the northern parts of Greenland and low pressure influence near the northern most part of Norway, mostly with wind force 4 to 6 Bft. Over open water it was foggy, over large areas covered with ice the visibility was fairly good.
On 6th of April the weather changed. A trough over Greenland migrated northeastward and lows moved along the eastern coast of Greenland in direction of Polarstern, which arrived at its destination on 82 °N.During the following ten days various lows passed along Polarstern. Wind speed und wind direction, visibility and ceiling varied over a long range, but frequently the wind blew from the south, accompanied by bad visibility. There was also intermediate high pressure influence with quite good flight weather.

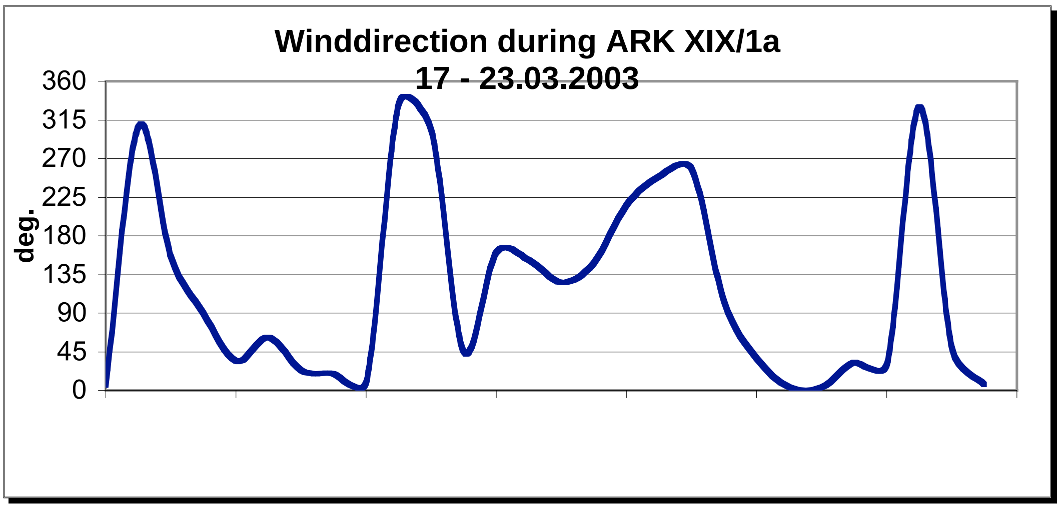
Behind a cyclone, that intensified in the Fram Strait and in lee of Svalbard, the wind blew with 7 Bft from northerly directions and again the temperature sank below –24C.Leaving the ice Polarstern had an intermediate stop in Hausgarten in open water and the wind speed decreased to 4 to 5 Bft. Polarstern reached Isfjorden near Longyearbyen on 24th of April.






Winddirection during ARK XIX/1a
03.03 - 09.03.2003
deg.
360
315
270
225
180
135
90
45
0


Winddirection during ARK XIX/1a
10.03 - 16.03.2003
deg.
360
315
270
225
180
135
90
45
0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17 - 23.03.2003
deg.
360
315
270
225
180
135
90
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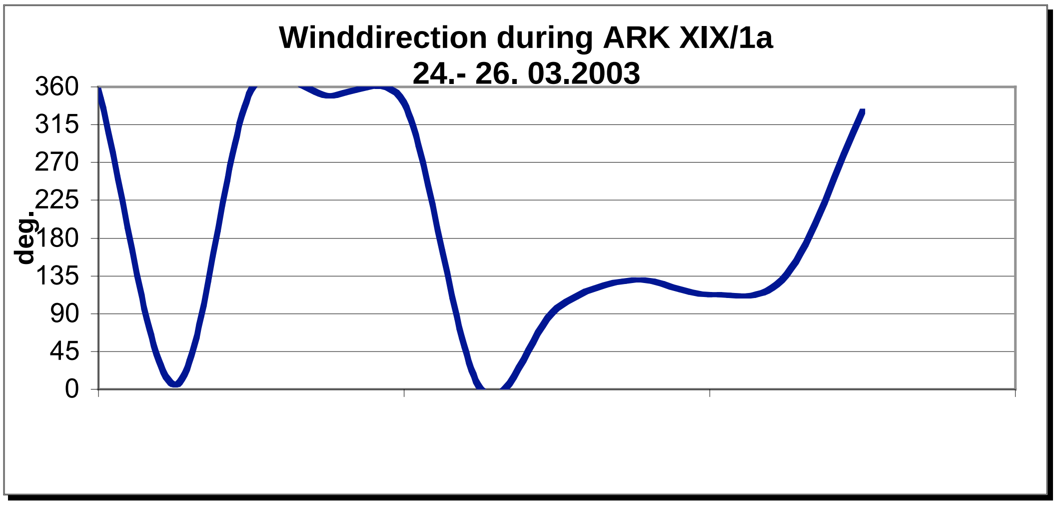
0



3. SEA ICE PHYSICS AND CHEMISTRY

3.1 Ice thickness determination using flexural gravity waves
Doble (SAMS)

1. Introduction

The cruise represents the first field experiment of the GreenICE project (Greenland Arctic Shelf Ice and Climate Experiment); an EU-funded three-year programme with six partner institutes, co-ordinated by SAMS. The project aims to measure the changes in the structure and dynamics of sea ice that have occurred in a critical region of the Arctic Ocean as a result of a switch in Arctic atmospheric circulation due to the Arctic Oscillation, and to examine whether we can relate these to the long-term (>2000 year) record of variability in the same region retrieved from sediment cores. The project's main experiment will be an ice camp in the Lincoln Sea, north of Greenland, during April 2004.

The Polarstern experiment is a pilot study for this ice camp, allowing extensive in situ testing and optimisation of innovative ice thickness measuring drifters. These are a development of the electronics systems deployed during Polarstern's ANT-XVII/3 cruise leg in the Weddell Sea, modified to investigate the diagnostic use of long-period flexural gravity waves to determine area-averaged ice thickness.

3.1.2. Ice thickness measurement using flexural-gravity waves

The theory was developed by A.P. Nagurny (Nagurny et al, in press). A continuous ice cover floating on water can be considered as an elastic plate. A wave propagating through it both flexes the ice cover and travels as a gravity wave in the water beneath. This coupled system is known as a flexural gravity wave. A sufficiently long wave (l_∞) propagates as if there were no ice cover, and there is also a “critical” or “resonant” wavelength which also travels without hindrance: the internal elastic forces in the plate balance the hydrodynamic and Archimedean forces. Since these waves are attenuated less than other frequencies, the spectrum of the “ice swell” will reflect this critical value, giving a long period peak.

The critical frequency depends on the D, the cylindrical density, of the ice, whose formulation includes the ice thickness (cubed) as well as Young’s modulus and Poisson’s ratio. The aim of the method is to extract the thickness information without having to determine these hard-to-measure mechanical parameters. This is done by identifying the frequency of purely elastic waves in the ice, excited by impulse events such as ridging or crack formation. Substituting these second wave parameters for the mechanical terms gives a fifth-order non-linear equation in terms of the ice swell (wr) and elastic wave (ws) frequencies. This can only be solved numerically, to give the wave number of the resonant wave. This value is then substituted into an expression which contains only wave-derived and density terms, to give area-averaged ice thickness.

Determination of the ice swell peak is a simple matter of FFTs, whereas the elastic wave frequency can be determined by looking at impulse events such as ridging, formation of cracks etc. This can be difficult if the event is close to the recording site, and requires at least 2 km of intervening ice to damp the non-linear forced vibrations and determine the ‘free-vibration’ frequency of interest reliably. Identifying these events and generating a reliable elastic wave frequency is the main challenge to developing a remote buoy system.

The scale over which the method averages ice thickness is currently unknown, and an extensive ground-truthing campaign, using both drilling and remote-sensing tools, is necessary.

3.1. 3 Instruments

The waves propagating through the ice cover can be measured using several types of instruments.

The passage of the waves induces a tilt in the ice surface, and this can be measured with sensitive tilt-meters, which can resolve events of less than 1 microradian. Tiltmeters are perhaps the easiest instruments to use, requiring only an initial levelling on the ice surface, once it has been cleared of snow.

The waves also induce a strain in the ice, proportional to the second spatial derivative of surface elevation, which can be measured with strainmeters. These are fixed into the ice surface at each of two ends, and the change in length across the gauge length of the instrument measured by a sensitive linear variable differential transformer (LVDT). The SAMS instruments incorporate a mechanical lever system to increase their sensitivity, and can resolve strains of 10-12. Though they are time-consuming to install, they have the advantage of also detecting purely compressional events in the ice and are more sensitive than available tiltmeters. A motor-driven re-zeroing system allows a large dynamic range at this very high sensitivity. The units are identical to those used in previous campaigns by the Scott Polar Research Institute [REF], though they have been updated with modern electronics, particularly microprocessor-driven stepper motors in place of the DC motors of the older devices, allowing automatic reconstruction of the data across a re-zero step.

Accelerometers are less useful in this application, as the long periods of the waves in question result in very small vertical accelerations of the ice surface, and are not used here.

The tilt and strain sensors are deployed in arrays of two, orthogonal, and three, 120o separated, devices respectively. The sensors are logged to an embedded microprocessor system, which also controls re-zeroing and communications, at 2 Hz.

3.1.4. Measurement programme

Data were gathered at each of the four 24-hour ice stations in the Størfjorden area. The area did not provide the necessary conditions for the Nagurny method (which assumes deep water, i.e. kh>>1, where k is wavenumber and h is water depth) but valuable experience was gained with the instruments, enabling them to be fully operational for the long drift station later. Several mechanical problems were encountered with the equipment in the very low prevailing temperatures (c.-30oC), but these were gradually overcome.

Long period swell waves were observed in each case, with periods ranging from 14 s to 20 s. Most records clearly showed ‘beating’, from the interaction of closely-spaced frequency components which tended to arrive from entirely separate directions. The spectral coherence of these arrivals was high (>0.6), giving confidence in the derived propagation directions. Wave energy was observed to build and/or decay during the course of three of these ice stations.

Ice Station Two (16/3/03) displayed an initially high amplitude, long period (18 s), peak which decayed at midnight to a largely red-noise character. This less coherent form remained for approximately six hours before the peak was re-established. The six-hour period suggests a tidal interaction with wave propagation into the pack. Though this is not a documented phenomenon, the area is subject to extremely strong tidal flows and further investigation will be carried out on our return.

Ice Station Three (23/3/03) initially took place under relatively-high amplitude wave action – a 15s swell was visible on board ship - and the experimental floe developed several large cracks before midday. Measured wave amplitude then dropped two orders of magnitude, and the floe did not develop any further damage. The beating nature of the time series was not evident in this latter period, with consistently unidirectional wave arrival vectors.

Ice Station Four (1/4/03) was the reverse case, initially being a low-amplitude regime which increased in energy throughout the night. The strains are particularly revealing, showing rapidly increasing elongation in the north-south direction. The instruments were removed at 0700Z, an hour before the floe finally failed less than 10m from the instrument site. The crack rapidly widened to a significant lead, running east-west as might be expected from the strains, allowing recovery of the ‘tomato’ by going alongside with the ship and using the ship’s aft crane.

The Longyearbyen transfer (28/3/03) gave an opportunity to calibrate the strainmeters prior to the long drift station. This had not been possible during the previous ice stations, since the relatively high-amplitude wave regimes did not allow the instruments to settle sufficiently. The SAMS team were able to calibrate one of the two systems during the day, though several problems occurred in the second system. Having one calibrated system at least allowed reliable wave propagation directions to be established during the drift station, in order to direct aircraft operations.

On the long drift station, the two units were initially deployed in poor weather conditions side-by-side to cross-verify measurements between systems. Drilling and sledge EM measurements around the units established the ice thickness there as 3.2 m. The units were run for three days while several iterations of code were tested, primarily to establish robust re-zeroing behaviour in the strainmeters and to establish radio and Iridium communications with the ship-based modems.

Sledge EM surveys by the AWI group had meanwhile established that the central area of the floe was approximately 2 m thickness, and one unit was redeployed to this area (c.1.5 km from the ship) on 12/4/03, while the other logged the original deployment site. Two SeaBird CTD units (courtesy of the Hamburg IfM group) were deployed into the thermocline (c.80 m) in order to measure any internal waves that may couple to the ice. The second unit was then moved to a similar thickness ice patch approximately 1 km from the first.

Validation of the thickness measured by the Nagurny technique was done in a nested scheme at several scales. A dense grid of direct thickness measurements was taken round the first unit, using the SAMS hot water drill, covering a 50 m grid at 2.5 m spacing. Drilling was later expanded to the diagonals of a 250 m grid, at 10 m spacing. The same area was then covered with the sledge EM, on a 10 m spacing grid. Overflights by the heli-EM covered the entire experimental floe and for c.100 km from the ship. The same area was covered by a Twin Otter flying from Longyearbyen, carrying a swath laser profilometer (300 m swath width) and downward looking radar. Co-incident flights were done with the heli-EM around the area, and the Twin Otter also flew up-wave to the open water, to characterise the complete wave propagation path.

The second unit was moved to a large area of thin ice (h = 15 cm) for the last two days of the drift, using the ship's helicopter, to examine the effect of such a dramatic local thickness change on the measurements. The unit radioed its position back to the ship at three-hourly intervals, and a large radar reflector was also set up to ensure the unit could be retrieved. This was successfully done on 18/4/03 during a small weather window in the otherwise unflyable conditions.

References

Nagurny, A.P., V.G.Korostelev, O.M.Johannessen & P.Wadhams, in press. Multiyear variability of sea ice thickness in the Arctic Basin measured by elastic-gravity waves on the ice surface.

3.2 Synthetic Aperture Radar (SAR) images.

Alexandrov, Haas, Lieser (NIERSC, AWI)

For the implementation of the ARK-XIX/1 expedition SAR images from different satellites have been ordered: ENVISAT, RADARSAT, and ERS SAR. Some of these images have been acquired and archived at the Tromsoe Satellite Station (TSS), and some of them have been acquired in near-real time and transmitted to "Polarstern" via INMARSAT and IRIDIUM communication systems. Onboard "Polarstern" SAR images were used both for navigation purposes and planning field work. Radar signatures of different sea ice types and features have been investigated by means of comparison with subsatellite sea ice observations. ERS SAR scenes cover areas of 100 x 100 km with a resolution of 25 m.
Five ERS-2 SAR scenes were acquired onboard "Polarstern" during the first leg of the expedition. The first two images, dated February 27 and March 2, covering the area of Storfjord, were used for estimating sea ice conditions. The first ENVISAT ASAR image, covering Storfjord area, was received on April 14. This image was immediately used for navigation purposes and planning field work. This image is shown in Fig.3.1.A

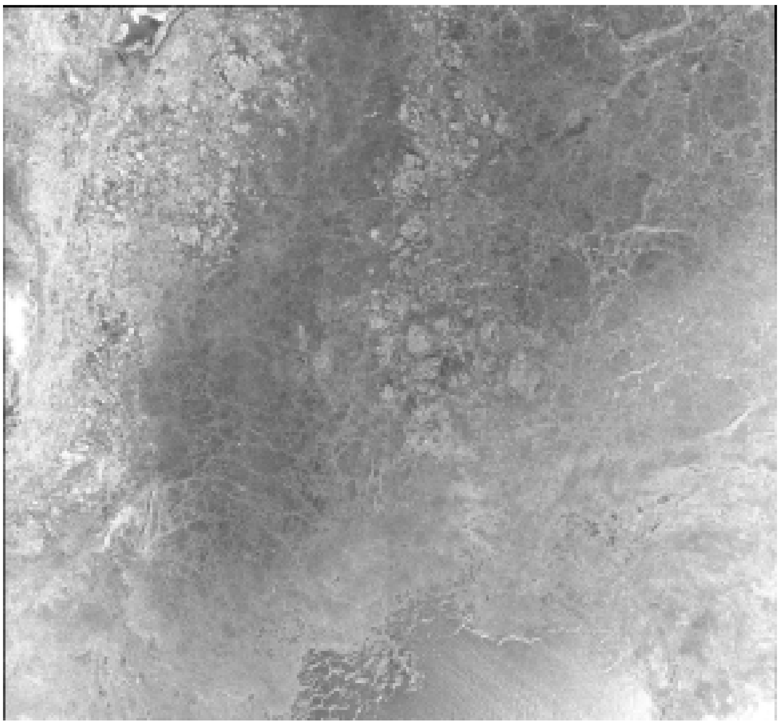


Fig.3.1A ENVISAT ASAR image for March 14, covering the area south and east of Storfjorden.

Ice edge position can be seen in the lower right part of this image (area A). The multiyear sea ice, which is imported from the central Arctic is evident in two areas, marked by B, with light tone, and rather level first-year ice located between these two areas is shown with dark tone. Rather bright image tone in Storfjorden (area C) is due to significant surface roughness.
Three ERS-2 SAR images, acquired on April 16,18, and 19 for the Storfjorden and eastward of it in the Barents Sea, were used for estimating sea ice conditions in this are, as well as ENVISAR ASAR image, dated March 20. Another ASAR for the same date covered Storfjorden and area west of Svalbard. The area west of Svalbard was also covered with ENVISAT image for March 25. In both these images a stripe of ice along the coast of Svalbard is clearly evident as well as young ice in Isfjorden and ice edge position north of the archipelago. From ASAR image for March 26 ice edge position in the northwestern part of the Barents Sea and Storfjorden can be easily determined. The ENVISAT ASAR image for March 28 covered Svalbard and area westward of it in the time, when "Polarstern" approached Isfjorden. Near simultaneous in situ sea ice observations were compared with signatures of different new and young ice types in Isfjorden, and also in the area west of it.
After March 29 the second leg of the cruise to the north of Svalbard began. This area is characterized with significantly more complicated sea ice conditions, than in the Barents Sea and remote sensing data were particularly important. ENVISAT ASAR image for March 30 covered this area and provided a possibility to estimate sea ice conditions there to plan how we can approach the needed area. This image is shown in Figure 3.1.B

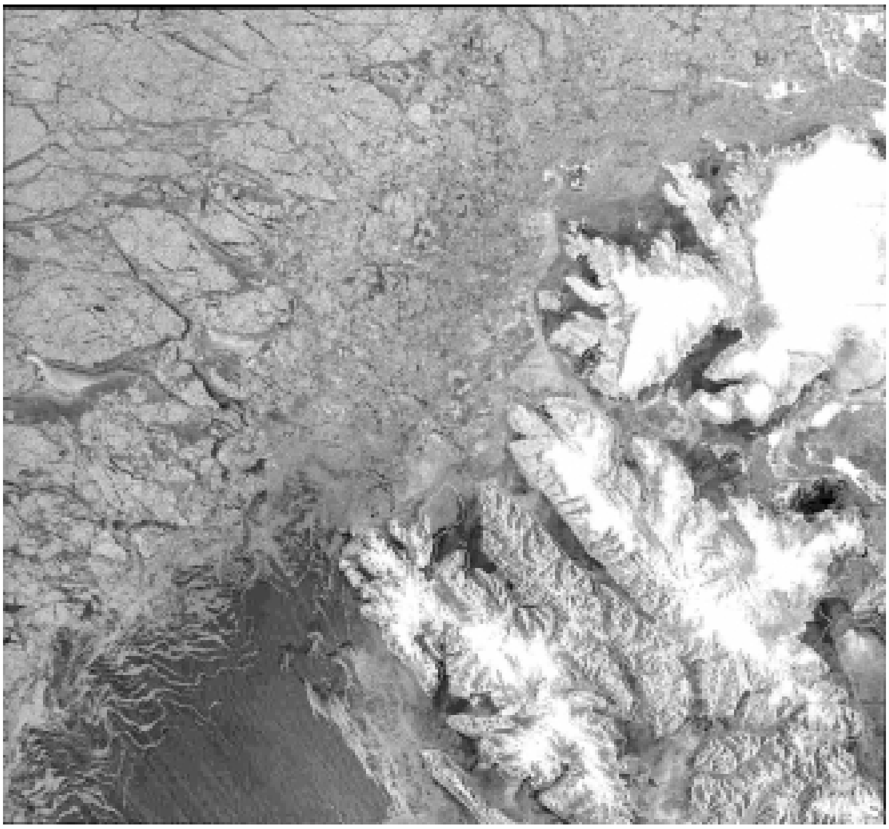


Figure 3.1.B. ENVISAT ASAR image for March 30, covering sea ice northward of Svalbard.

A diffused ice edge is evident in area A. A mixture of first-year and multiyear ice persists in the transient area between ice edge and multiyear ice to the north. A number of giant multiyear ice floes is located to the north of Svalbard, and one of these floes is marked with B. They are shown with relatively bright tone, caused by volume scattering of radar signal in upper layer of multiyear ice, which is saturated with air bubbles. Fractures of different width, covered with new or young ice, are situated between these ice floes (in area C, for example). Their tone can vary from dark to bright, but in any case they could be detected among surrounding ice. Using these fractures a further route of the expedition was chosen. During the drifting stage SAR images have not been received onboard the "Polarstern" due to communication problems. Only in the final stage one SAR images was used for selecting return way.

4. ATMOSPHERE

4.1 Energy exchange between the atmosphere and the sea ice covered ocean during Arctic winter

L□pkes, Hartmann, Birnbaum, Cohrs (AWI), Yelland, Pascal (SAMS), Spieß, Buschmann (TUB)

In Arctic sea ice covered regions the surface temperature is characterized during winter by strong spatial differences. The surface of leads and polynyas can be 30 degrees warmer than the surface of multi year sea ice floes. Such differences generate strong atmospheric convection which penetrates into the stably stratified atmospheric boundary layer (ABL) over sea ice. This process has a strong influence on the exchange of energy, humidity and momentum between the atmosphere, ocean and sea ice. Due to the surface cooling of open water new ice can be formed. With standard parameterization schemes as used in global and regional climate and weather prediction models these processes cannot be taken into account adequately.

During the cruise different systems were run to measure the turbulent fluxes of energy and momentum. On Polarstern, sonic anemometers were installed at different masts for the observation of surface fluxes. Three instruments were used permanently, others were additionally run only during ship stations in polynyas or leads. A portable mast was deployed on ice during stations. The upper boundary layer fluxes were measured with the helicopter borne turbulence measuring system Helipod.

4.1.1. Helicopter borne measurements of the ABL over leads and polynyas

The primary aim of the Helipod flights was to measure to what degree leads in the mainly closed sea ice cover influence the boundary layer structure by their heat release. The flights have been carried out in order to study how plumes of heat emanating from the leads are distributed in the BL by turbulent motion. We were interested in the penetration height of the plumes depending on the boundary layer and on lead parameters. How would the lead size and the temperature difference between lead surface and the air affect the convection? Would small leads have an overproportional effect in heat transfer as some studies suggested? And, would parameterisations of convective boundary layers over homogeneous surfaces as e.g.

that of Gryanik and Hartmann (2002) be applicable to lead driven convection over sea ice? To answer these questions the Helipod turbulence probe was used during both parts of the cruise under a range of various atmospheric and lead conditions.

The Helipod probe

Helipod is a 5 m long probe carried by a helicopter on a 15 m long rope. It measures at 100 Hz sampling frequency the 3-dimensional wind vector, the surface and air temperatures and the humidity. Furthermore, it records its position, ground speed, height, orientation and attitude by inertial and GPS system. Further details are described in Bange et al. (2002), Figure A shows the Helipod in operation.

Flight patterns

A total number of 18 Helipod flights were carried out during both parts of the ARKXIX/1 cruise in the Storfjorden area, as well as north of Svalbard. Figure 4.1.B. shows a summary of the positions of these flights.

The main flight pattern consisted of vertically stacked legs of some 10 NM length parallel to the wind. The flights were arranged over a variety of leads ranging in size from a few metres to several kilometres. The boundary layer conditions were always unstable over the lead and both stable and unstable over the adjoining ice. Additionally, several vertical soundings were flown at both ends of the legs. To verify and monitor the consistency and accuracy of the system some calibration patterns have also been flown. Table 1 lists a summary of the flights.

Table 1: Helipod flights

date	latitude	longitude	legs
03-03-09	76.63	19.33	4
03-03-10	76.77	19.33	5
03-03-12	76.8	21.17	5
03-03-15	77.42	20.67	6
03-03-16	77.42	20.45	4
03-03-17	77.47	20.42	4
03-03-19	77.38	20.5	7
03-03-22	76.38	22.06	9
03-03-23	76.22	23.67	8
03-03-24	75.92	25.5	8
03-04-02	80.33	11.67	14 (2 flights)
03-04-03	80.68	13.33	8
03-04-04	81.46	10.17	8
03-04-09	81.82	9.75	8
03-04-10	81.75	9.67	12
03-04-14	81.80	10.5	12
03-04-19	81.27	10.67	10

Flight on 3rd April 2003

As an example of a typical flight pattern, the measurements of the 3rd April, 2003 are shown. The flight was conducted over two elongated leads, both of the same surface temperature, and both oriented orthogonal to the mean boundary layer wind direction. The leads differed only by their width, the upstream one was 1 km wide,

while the 5 km further downwind situated lead had a width of 2 km. At both ends of the horizontal flight sections several vertical soundings were flown. Figure 4.1.C. shows the average potential temperature of five soundings together with the mean values resulting from the horizontal flight legs. A well mixed boundary layer of 140 m height can clearly be detected. From Figure 4.1.C. the levels of the horizontal flights with respect to the boundary layer height can also be seen. 6 legs cover the lower two-thirds of the boundary layer, one is at the inversion base and an eighth level well above the boundary layer. The near surface air temperature as well as the surface temperature of the snow-covered ice was –29 □C,while the surface temperature of the leads was -1.8 □C at the upwind side and slightly lower at the downwind side.
The plumes of turbulent heat flux emanating from both leads is visualised in Figure 4.1.D.. It shows for the stacked horizontal flight legs the low-pass filtered covariance of the fluctuations of the vertical wind velocity and the potential temperature, multiplied by the air density ra and the specific heat of air at constant pressure cp (thick line in Figure 4.1.D.). The integral of this curve is proportional to the turbulent heat flux. The legs have been flown top to bottom. The abscissa in Figure 4.1.D. is based on geographic coordinates, the moving position of the leads is due to the ice drift during the flight. The airflow is from left to right. In the same graphs the leads are indicated by plotting ra cp v(Ta – Ts) (v = measured wind velocity, Ta,s = temperature at the flight level and at the surface, respectively) representing the bulk parameterization of the heat flux if we assume for simplicity a transfer coefficient Ch = 1.

Figure 4.1.D. clearly shows the turbulent heat flux generated by the leads and the advection of plumes towards the leeward side. In case of the smaller lead, near the surface the results of the bulk assumption and of the eddy correlation measurement agree well. In the higher flight legs, the eddy flux decreases rapidly with height over the smaller lead and it nearly vanishes at 88 m (roughly 0.6 zi). Over the larger lead, however, the eddy flux near the surface is considerably larger than that resulting from the bulk assumption with Ch = 1 indicating a much larger transfer coefficient. And, in contrast to the measured flux over the smaller lead, at 88 m the heat flux still corresponds to the surface flux in magnitude. At the base of the inversion the eddy flux over both leads is vanished.

Results

A more detailed analysis of the large dataset collected is needed in order to draw final conclusions. However, a preliminary inspection of some cases of the measurements, as the one described above, suggests that leads being small with respect to the boundary layer height do not produce a significant plume that is able to rise through the entire BL. Plumes from small leads seem to disappear without much influence on the BL. Plumes from leads that have an extension in the dimension parallel to the wind of several times the boundary layer height are able to fill the entire BL. The averaged turbulent heat flux per unit area of lead surface appears to be larger for large leads than for small leads. The characteristic size that separates small leads from large leads amounts to approximately 10 times the boundary layer height.

4.1.2. Surface fluxes over leads and polynyas

The ship based measurements aimed to quantify the effect of leads and polynyas on the surface layer fluxes in sea ice covered regions. Based on these data, parameterization assumptions such as the relation between the transfer coefficients for heat and momentum or the fetch dependence of fluxes should be investigated. Another important goal was to investigate the dependence of heat fluxes on the thickness of new ice usually formed very quickly in leads. Moreover, some studies were carried out in combination with Helipod flights with the possibility to compare the results of both measuring systems.

Equipment used

The AWI turbulence measuring system TMS (Garbrecht et al., 1999, 2002; Garbrecht, 2002) installed permanently on Polarstern consists of a mast at the ship's bow crane which is usually equipped with METEK sonic anemometers and temperature sensors in 5 different heights between 3 m and 20 m above the surface. The mast can be installed in different horizontal distances from the ship´s bow. The sonic anemometers measure with a frequency of 17 Hz, temperatures are obtained from PT-100 sensors with 1 Hz. From the sonic anemometer measurements turbulent fluxes of momentum and sensible heat can be derived. Additionally, three masts with sonic anemometers have been installed permanently by SOC: these will be described in the next section. Due to the extremely low temperatures the TMS mast could not be operated with all its sensors in each experiment. For the last measurement only one sonic was used which was installed at the tip of the bow crane (Figure 4.1.H).

Two KT15 radiation thermometers were used in different positions at the ship to register permanently the surface temperature close to the ship. The absolute humidity was measured permanently by a dew point mirror at 10 minute intervals.

The fluxes obtained from the TMS are usually calculated with the eddy correlation method and those from the SOC permanent masts by the dissipation method. A comparison of these different calculation methods is shown in section 3.

Measurements performed

Figure 4.1.E. shows the positions of stations with flux measurements carried out from the ship. Measurements over leads or polynyas where performed in the Storfjorden area and in the Barents Sea at five positions (March 15th, 17th, 19th, 22nd, 24th). In the Fram Strait, north of Svalbard two experiments followed (April, 2nd and 19th) with measurements over leads. Typically, the lead experiments consisted of measurements at one or several positions over sea ice on the downwind side of a lead and in measurements during very slow drift across the lead with stops in a distance of about 500 m to each other. At the end of each experiment measurements over sea ice at the upwind side of the lead were performed to obtain the inflow conditions. The typical duration of stops within the polynya and the measuring periods over ice amounted to 20 minutes. A 3.5 m mast, described in the next section, was installed on the ice at the upwind side of the lead for the entire duration of the experiment.

Drift on 24th of March

One of the drift stations was performed on the 24th of March over the Barents Sea. It is described in the following. Figure 4.1.F contains a photo of the lead which was covered by Nilas of 7.5 cm thickness. The lead was crossed twice by Polarstern, results are shown in Figure 4.1.G for the first drift (circles). Helipod measurements were carried out during two flight legs across the lead at 14 m height (solid lines) when Polarstern had crossed one half of the lead. In Figure 4.1.G the downwind side of the lead is at x = 0 m, the upwind end of the lead is at x = -950 m. The effect of the lead is clearly visible in the results of both measuring systems (results of the SOC turbulence sensors are shown in Figure 4.1.I). There is a strong increase of the friction velocity (u), of the heat fluxes and of the drag coefficients. The maximum values of heat fluxes measured by the TMS amount to 75 W/m2 which is about 20 W/m2 lower than in the result of the second Helipod flight. However, this difference might be due to the fact that Helipod crossed the channel, Polarstern made in the thin ice cover of the lead. There is also a good agreement between the friction velocities measured by both systems which show an increase from 0.15 m/s over ice on the upwind end of the lead to about 0.3 m/s at its downwind end. Furthermore, the wind velocities obtained from the Helipod and the TMS differ only slightly. Drag coefficients, referring to the measuring height (not stability corrected) shown here for the TMS only, increase also strongly over the lead due to the convective conditions.

Results

As a (preliminary) result of the surface layer measurements we found that the strength of convection over leads depends not only on meteorological parameters but also on the thickness of the new ice formed on leads. Strong convection may still occur over 10 cm ice thickness, whereas a 35 cm ice thickness suppresses heat transport from the ocean to the atmosphere very efficiently. On the other hand, turbulent plumes are advected over the downwind side of the leads by several hundreds of metres which often results also over thick ice in strong heat fluxes directed upward. Due to this effect we measured at a distance of about 300 m from the lead fluxes of sensible heat of still 150 W/m2.

The measured data can be used for the validation of small scale models and for comparison with parameterizations of surface fluxes over ice covered regions.

4.1.3. Continuous measurements of fluxes

Aims

The Southampton Oceanography Centre (SOC) instrumented the Polarstern prior to the ship leaving Bremerhaven in order to make continuous measurements of the air-sea-ice fluxes of momentum, heat and moisture in addition to various mean meteorological parameters (up- and down-welling short wave radiation, downwelling long wave radiation, air temperature and humidity, surface temperature, air pressure, mean wind speed and direction). As well as contributing to the lead/Polynya studies described above the data obtained during the cruise will be used to:

a) examine the behaviour of the turbulent fluxes over the wide range of sea-ice concentrations/types and weather conditions encountered.

b) examine the performance of the inertial dissipation method in unfavourable, i.e. strongly convective conditions.

c) verify model results of the air flow over the Polarstern (Berry et. al., 2001) and thus quantify and remove any biases in the flux results obtained from the ship-borne sensors.

d) extend a separate study into the parameterisation of downwelling long-wave radiation in terms of visual cloud observations (Josey et al., 2002).

Instrumentation

The instruments used for the flux measurements are listed in Table 1 and those used for the mean meteorological measurements are listed in Table 2 along with their location on the ship, the parameter measured and an estimate of the measurement accuracy. Figure 4.1.H shows a schematic of the positions of the masts installed on the ship. All sensors were de-iced daily or as often as required. The ship's navigation data were logged in order to obtain the true wind speed and direction. Sea surface temperature data were obtained from the ship's weather station data and the two thermosalinographs. All data were logged in real time using the AutoFlux system (AutoFlux group, 1996). A webcam was installed on the bridge and digital images of the sea-ice conditions ahead of the ship were obtained every 10 minutes throughout the cruise.

In addition to the ship-borne sensors the SOC group also deployed an on-ice system during the long ice stations as well as during some of the Polynya studies. The on-ice system consisted of a 3.5 m mast which was equipped with a fourth Solent sonic anemometer, a Vaisala sensor for mean air temperature and humidity and a PRT probe for surface temperature. Surface temperatures were also obtained using a hand-held IR sensor. The system was battery-powered and recorded continuous 20 Hz data internally. Table 3 lists the deployment periods of this system..

At the end of the cruise the fast response hygrometer and the two anemometers on the bow/crane masts were removed. In order to obtain additional open-ocean fluxes, the remaining sensors (i.e. the bridge-top anemometer and all the mean meteorological sensors) were left in place and the AutoFlux system configured to operate autonomously for the subsequent cruise from Longyearbyen to Bremerhaven.

Sensor	Manufacturer	Sensor position	Parameter	Sampling rate
R3 Solent sonic anemometer	Gill Instruments Ltd., U.K	6 m mast on bridge	momentum and heat fluxes	20 Hz
R3 Solent sonic anemometer	Gill Instruments Ltd., U.K	2 m crane mast / 6 m bow mast	momentum and heat fluxes	20 Hz
R2 Solent sonic anemometer	Gill Instruments Ltd., U.K	6 m bow mast / 2 m crane mast	momentum flux	20 Hz
IFM hygrometer	KNMI, The Netherlands	6 m bow mast / 2 m crane mast	moisture flux	10 Hz

Table 2: The fast response sensors used to measure the turbulent fluxes.

Sensor	Manufacturer	Sensor position	Parameter	Accuracy
R3 Solent sonic anemometer	Gill	6m mast on bridge	Mean wind and direction	1 %
R3 Solent sonic anemometer	Gill	2 m crane mast / 6 m bow mast	Mean wind and direction	1 %
R2 Solent sonic anemometer	Gill	6 m bow mast / 2 m crane mast	Mean wind and direction	1 %
Psychrometer	SOC	bridge mast, 2m above deck	Air temperature, humidity	0.05 ℃
Psychrometer	SOC			0.05 ℃
Humicap	Vaisala	bridge mast, 2m above deck	Air temperature	0.1 ℃
Humicap	Vaisala		Relative humidity	2%
Radiometer	Epply	2m mast, on stbd side bridge	Downwelling long wave radiation	5 W/m2
Radiometer	Epply			5 W/m2
Solarimeter x 2	Kipp and Zonen	boomed out, port side above bridge	Up- and down-welling shortwave	< 3%
Solarimeter x 2	Kipp and Zonen	boomed out, stbd side above bridge	Up- and down-welling shortwave	< 3%
Solarimeter x 1	Kipp and Zonen	2m mast, on stbd side bridge	Down-welling shortwave radiation	< 3%
Barometer	Vaisala	observation ally	Air pressure	0.5 mb
IR radiometer	Tasco	Stbd side foredeck	Surface and sky temperature	0.5 ℃

Table 3: The mean meteorological or “slow response” sensors. The columns show, from left to right; sensor type, manufacturer, position on ship, the parameter measured and instrument accuracy. The slow response instruments were all sampled at 0.1 Hz.

Method

Fluxes were obtained using the inertial dissipation (ID) method rather than the eddy correlation (EC) method. Although the ID method is less direct than the EC it has the advantage of using only the high (> 2 Hz) frequency part of the variance spectrum. This means that; 1) the method can be easily employed on a moving ship (Yelland et al., 1994, 1996), and 2) the sampling period required is relatively short (< 1 minute). In addition, the flux measurements can be corrected for the effects of the disturbance to the air flow reaching the sensors caused by the presence of the ship (Yelland et al., 1998, 2002). On the other hand, the eddy correlation method has less restrictive assumptions, but can only be applied on stable platforms (stationary ship). Hence both methods complement each other.

Results

Initial results from the ship-borne system show good agreement in the heat and momentum fluxes obtained from the various anemometer. Figure 4.1.I shows a time series of the preliminary flux results obtained during the 24th March (day 083), the same day which is already described in the previous section. It should be noted that the averaging periods vary for the different sensors and the results are sensitive to the exact period used, but the agreement between them is good nevertheless. The heat fluxes were low (about 20 W/m2) in the morning as the ship approached a nilas-covered Polynya from the downwind side, then increased up to 100 W/m2 as the ship performed two transects of the Polynya during the rest of the day.

Date/month	Start jday and time (GMT)	End jday and time (GMT)	Comment
12/03	071 10:00	072 13:20	24 hr ice station
15/03	074 16:00	074 22:00	Polynya study
16/03	075 16:00	076 12:30	24 hr ice station
22/03	081 16:00	081 20:00	Polynya study
23/03	082 11:30	082 16:10	12 hrs ice station
24/03	083 10:00	083 16:00	Polynya study
01/04	091 11:00	092 08:00	24 hr ice station
07/04	097 11:30	099 10:15	10 day drift station
09/04	099 10:40	103 16:20	moved system to Hamburg site
13/04	103 16:59	106 11:20	moved closer to Hamburg masts
16/04	106 11:20	107 12:33	mast rotated for better alignment with wind
19/04	109 10:50	109 20:00	Polynya study

Table 4: Deployments of the on-ice flux system.

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Josey, S. A., R. W. Pascal, P. K. Taylor and M. J. Yelland, 2003: A new formula for determining the atmospheric longwave flux at the ocean surface at mid-high latitudes. JGR-Oceans, 108 (C4), 3108,doi:101029/2002 JC001418
Yelland, M. J., B. I. Moat, R. W. Pascal and D. I Berry, 2002: CFD model estimates of the airflow distortion over research ships and the impact on momentum flux measurements. J. Atmos. & Oceanic Tech., 19 (10), 1477-1499
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Yelland, M. J., P. K. Taylor, I. E. Consterdine and M. H. Smith, 1994: The use of the inertial dissipation technique for shipboard wind stress determination. Journal of Atm. Ocean Tech, 11(4), 1093 - 1108.

Figure4.1 A: Helipod in operation.

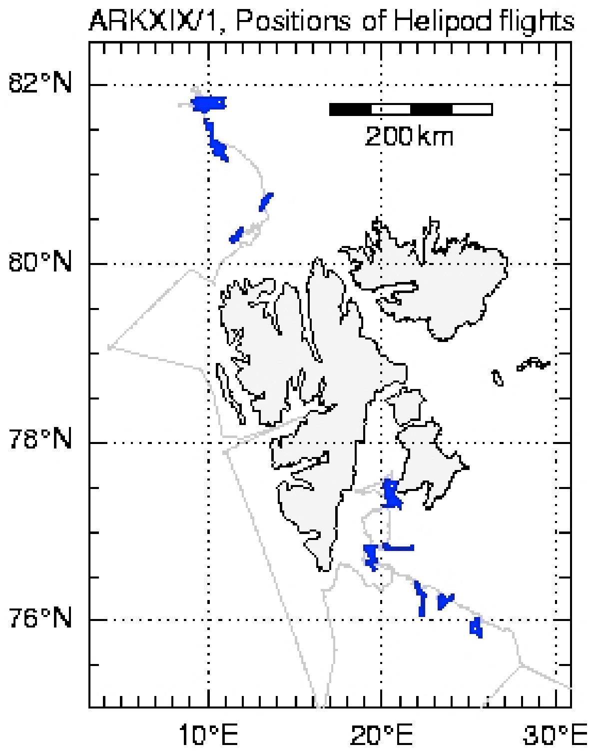


Figure 4.1B: Positions of Helipod measurements during ARK19

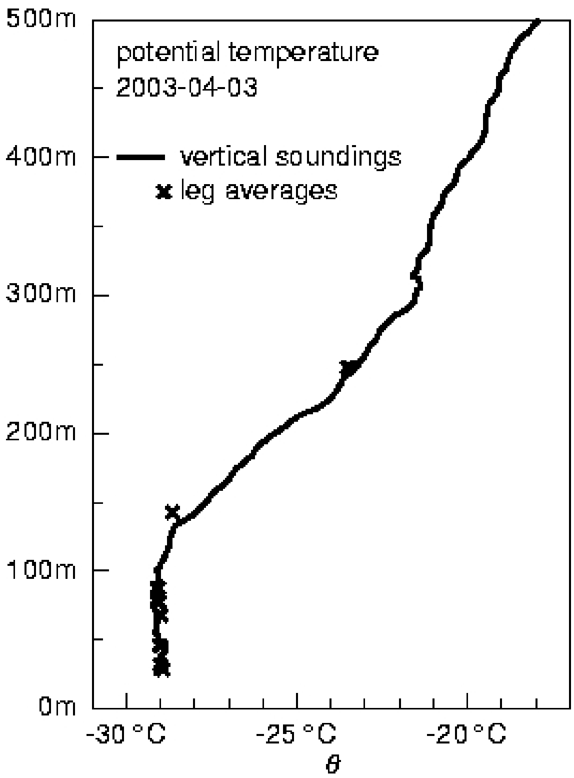


Figure 4.1.C: Profile of potential temperature (average over 5 soundings) and mean values of horizontal flight legs.

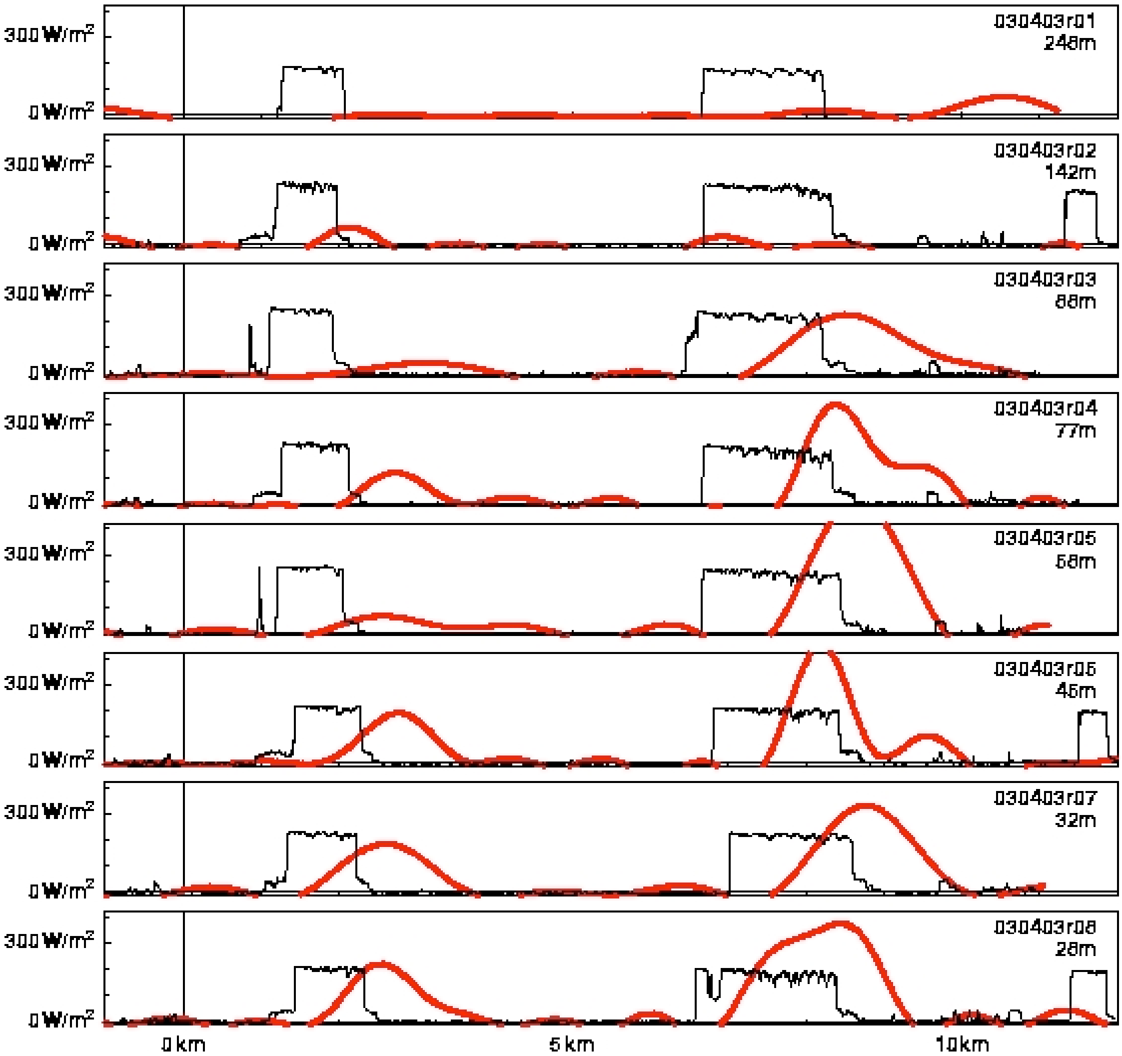


Figure 4.1 D: Low-pass filtered covariance of the fluctuations of the vertical wind velocity and the potential temperature multiplied by the air density and the specific heat of air at constant pressure (thick line). The thin line represents the result of the bulk parameterization of heat fluxes (see text).

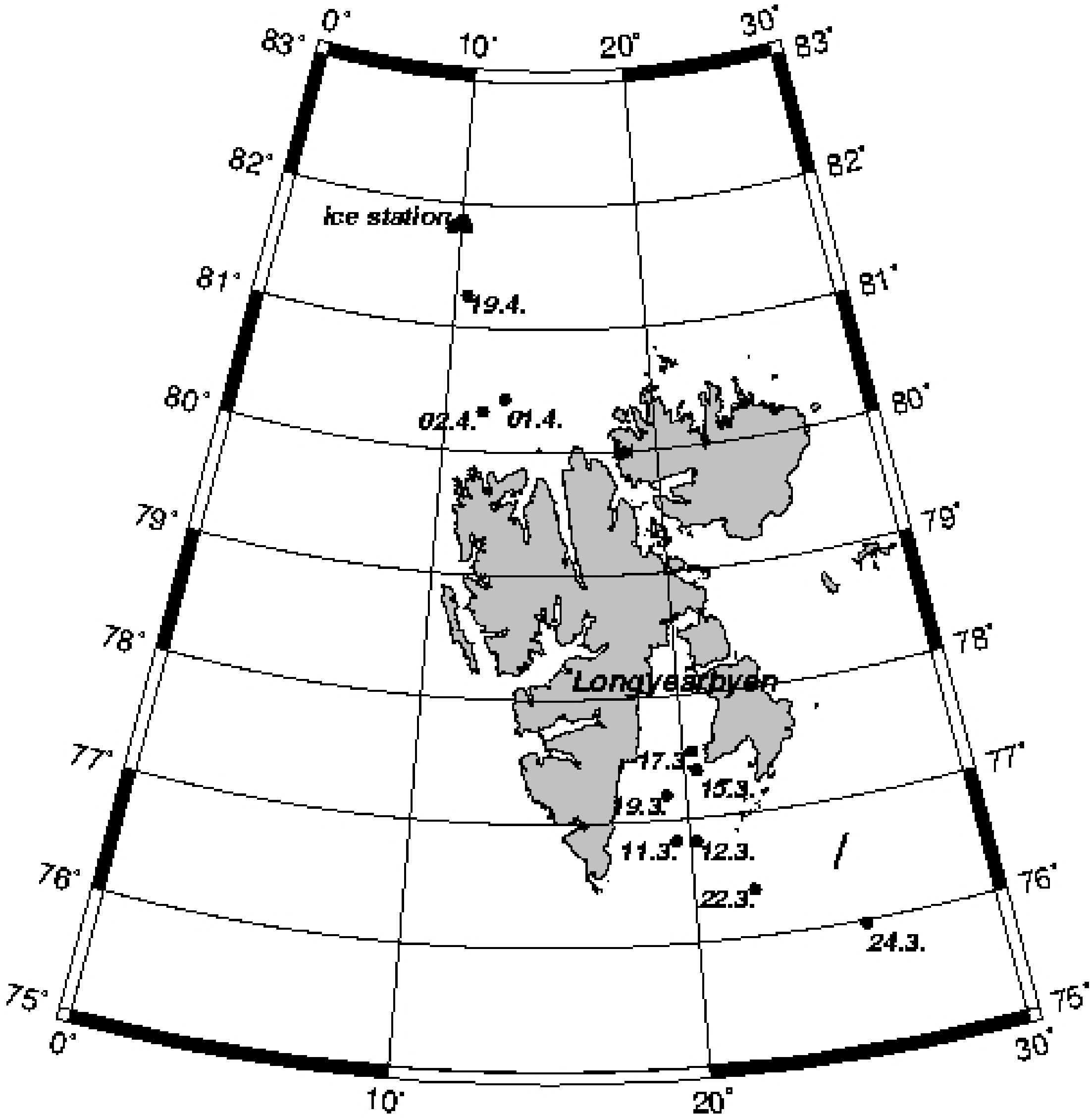


Figure 4.1. E: Positions of stations with flux measurements carried out from the ship. Measurements over leads or polynyas where performed in the Storfjorden area and in the Barents Sea at five positions and in the Fram Strait at two positions.

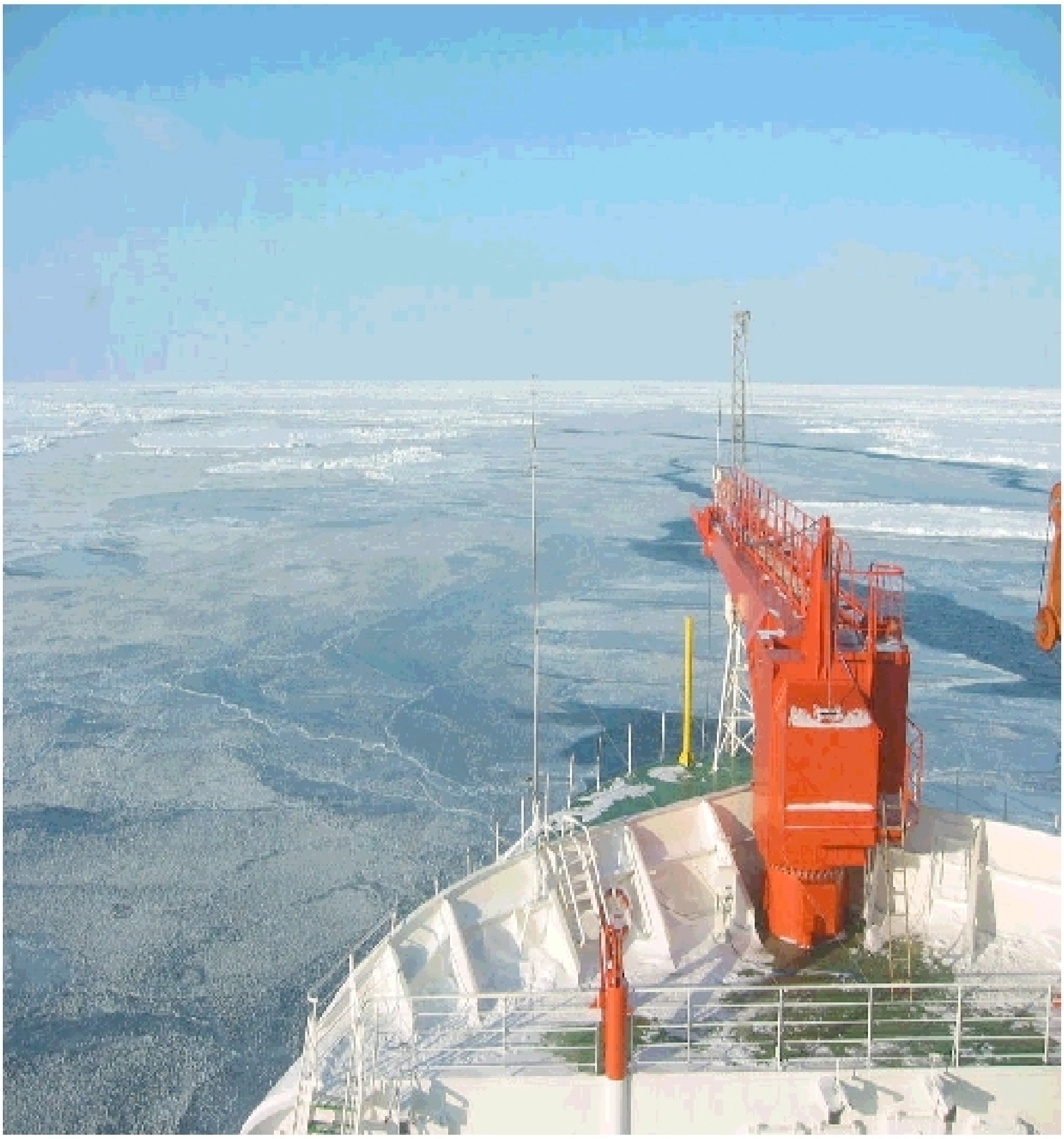


Figure 4.1. F: View from Polarstern during the drift station performed on the 24th of March.

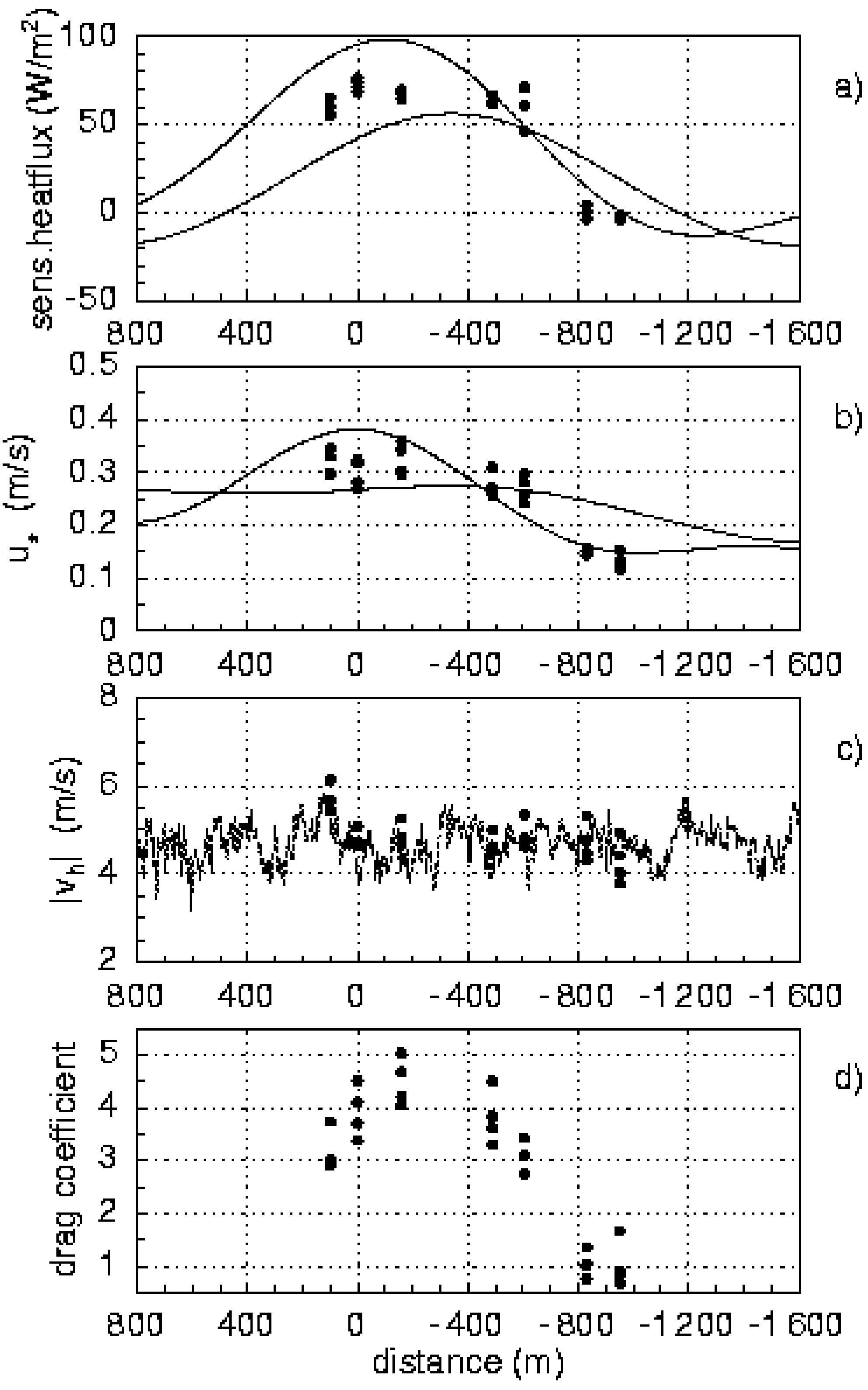


Figure 4.1 G: Results of the TMS measurements obtained from the drift on 24th March.

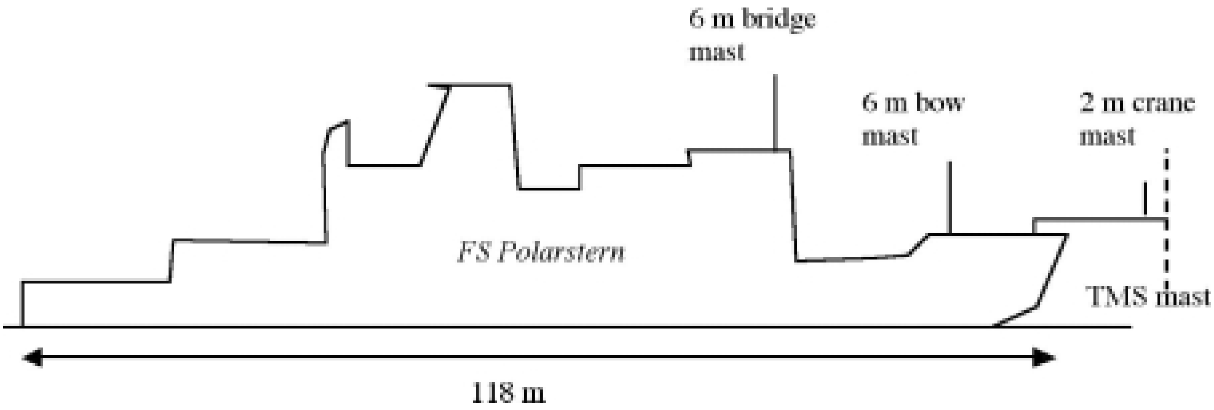


Figure 4.1. H: Location of the masts for measuring turbulent fluxes on the Polars tern.

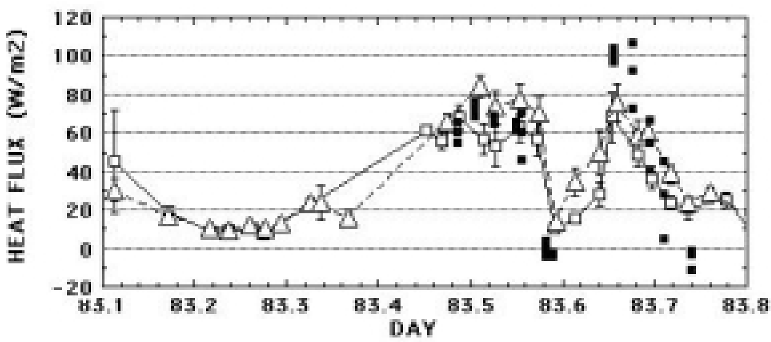


Figure 4.1. I: Time series of (top) friction velocity (square root of the kinematic momentum flux) and (bottom) the heat flux for the 24th March. The open symbols show 30 minutes averaged results from the R3 Solent sonics on the bridge (solid line) and the bow (dashed line). The solid squares show the results from the METEK anemometers on the TMS mast, averaged over the station durations of 15 to 25 minutes.

4.2 Arctic Boundary Layer and Sea Ice Interaction Study (ABSIS)

Kirchgäßner, Eriksson (MIH, FIMR)

The goal of the measurements during ARKXIX/1b (29.3.2003 – 24.4.2003) was to contribute to a comprehensive data set of simultaneous measurements in the Arctic atmospheric boundary layer, at the air-ice interface, in the sea ice and the underlying ocean. This data set will be used to analyse and quantify the complex interaction processes between Arctic temperature inversions, atmospheric boundary layer and sea ice and thus the dynamic and thermodynamic forcing to the sea ice. This knowledge is necessary to validate and improve the ability to simulate these interaction processes in atmosphere-sea ice-ocean models.

The measurements on board of the RV Polarstern and during the ice drift station on 'Tomato Island' are a contribution to the ABSIS Project (Arctic Boundary and Sea ice Interaction Study). It also includes simultaneous measurements on board the Finnish research vessel Aranda (FIMR, Helsinki, Finland), aircraft measurements of the research aircraft Falcon (DLR, Oberpfaffenhofen, Germany) operating from Longyearbyen and measurements of altogether 11 ARGOS ice buoys. Nine of the 11 buoys (type CALIB: Compact Air Launched Ice Beacon) were deployed by aircraft before the start of the campaign on March 27th and two buoys (type AWS: automatic weather station) were deployed via helicopter from board of RV Polarstern. All buoys are equipped with pressure and temperature sensors. The resulting surface pressure field allows to calculate the geostrophic wind, the tracing of the buoys gives the ice drift. The AWS buoys are additionally equipped with sensors for wind speed and wind direction and thus give information about the influence of the local wind on the ice drift. On April 4th the first AWS buoy was deployed at a position of 81°51.25' N and 17°57,29' E. The second AWS buoy was deployed on April 5th at 81°30,07 N and 12°04,19 E and could be recovered after the end of the ice drift station on April 19th at a position of 81° 27,88' N and 13° 03,96' E.

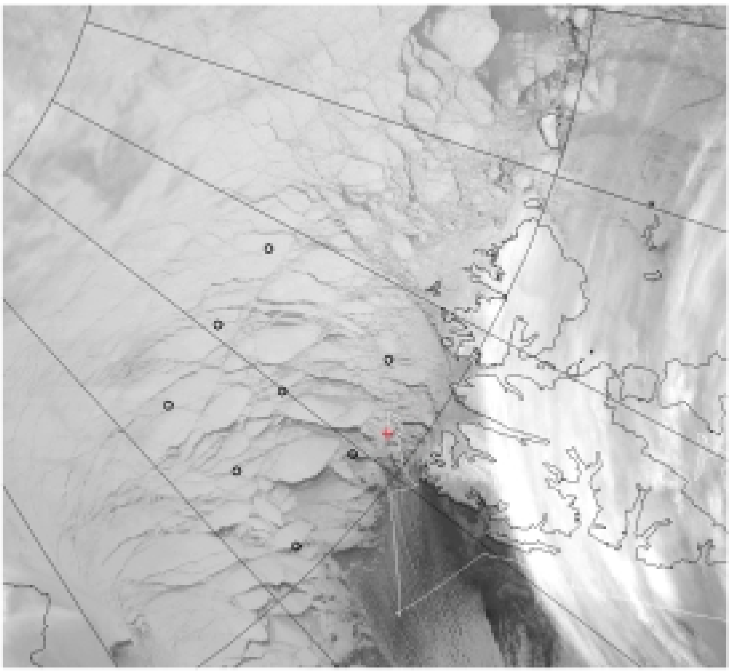


Figure 4.2.A: Position of ice drift buoys and RV Polarstern on April 2nd 2003, 9.31 UTC.

Beginning on March 30th hourly observations of meteorological parameters, ice and clouds (type and cover) were carried out and radiosondes were started twice a day at 09.30 UTC and 21.30 UTC. During the period from April 3rd to April 18th radio soundings were carried out every three hours. Afterwards till the end of the cruise radiosondes were launched again twice a day. Radio soundings deliver the vertical profile of air pressure, temperature, relative humidity, wind speed and wind direction between the surface and 15 to 20 km height with a vertical resolution of approximately 20 – 50 m dependent on the ascent rate. These vertical profiles are especially important for the analysis of the structure and the temporal variability of the temperature inversion in the Arctic boundary layer.

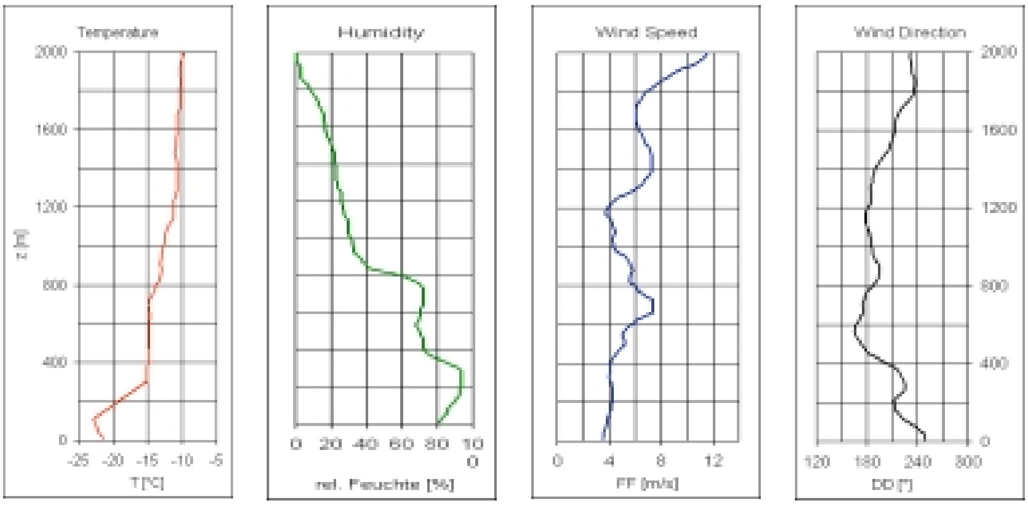


Figure 4.2.B: Example of a vertical radiosonde profile of air temperature T, relative humidity RH, wind speed FF and direction DD in the lower atmosphere (up to 2km) measured on April 7th at 09.43 UTC.

Figure 4.2.C: The surface layer measurement and instrumentation site on during the ice drift station. From left to right: 9m-mast and 2m-mast with Sonics, basic meteorological mast, in the background RV Polarstern, between them the 10m profile mast of FIMR, yellow boxes for electricity supply and data storage, precipitation gauge, frame with radiation instruments and tomato for storage of boxes, spades, fuel tanks and other equipment.

After arrival at the planned latitude in the pack ice a proper ice floe and a proper measurement site on it was chosen north of the ship in a distance of approximately 300m. Putting up instruments started on April 7th and was continued on April 8th. Measurements consisted of a meteorological mast, a radiation frame and two sonic instruments (METEK) installed on masts of 2m and 9m height respectively to measure turbulent fluxes. Basic meteorological measurements at the site included temperature of snow and ice at depths of 1cm, 2cm, 5cm and 10cm, surface temperature, air temperature, pressure, humidity, wind speed and direction at a height of 2m. The actual depth of the thermometers below the surface (compared to the initial depth) was observed daily. The radiation frame was equipped with upward and downward looking sensors for long-wave (Eppley) and short-wave radiation (Kipp & Zonen).

Figure 4.2..D Frame with the four radiation instruments. From left to right: upward looking long wave radiometer, downward looking long wave radiometer, short wave downward and short wave upward looking radiometer.

The Finnish Institute of Marine Research (FIMR) contributed to the meteorological measurements with a 10 m high profile mast. Wind speed was measured at 5 levels with cup anemometers (Aanderaa Instruments Co.) at heights of 10.10, 4.80, 2.20, 0.95 and 0.40 m above the snow surface. The air temperature was measured at 3 levels (10.10, 2.20, 0.40 m) with platinum film resistor type thermometers (Aanderaa Instruments Co.). Furthermore the wind direction was measured at the top level and the relative humidity at the 4.8 m level. The profile gradients from the mast allow to calculate the fluxes of momentum and sensible heat by the means of a level difference method (LDM). This demands an accurate calibration of the sensors as well as precise knowledge of measuring heights. From the profile data we are able to calculate the aerodynamic roughness length for the surrounding terrain, in this case a ridged sea ice field, and can, together with additional high-quality roughness data, be implemented for modelling parameterisation.

Electricity for all devices except for the profile mast was supplied by a generator. Due to icing by snow drift the generator broke down and had to be replaced by another one on April 8th. Meteorological mast and radiation station data were sampled as 1-minute mean values, sonic turbulence data were measured at a rate of 20 Hz and accumulated to mean values over five-minute intervals.
Radiation measurements ended on April 16th in the early afternoon. The remaining sensors and equipment were removed from the measurement site in the morning of April 17th, the final day of the ice drift station.

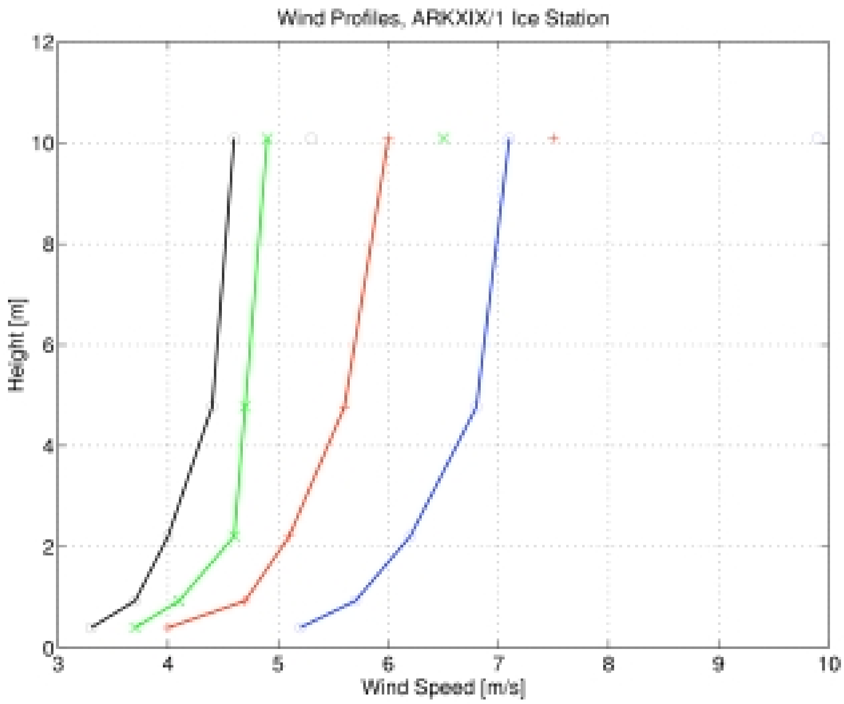


Figure 4.2.E: Examples of wind speed profiles for different wind speeds during the period 10-15.04.2003 measured at the FIMR 10m profile mast. The single data points at the 10-meter level represent gust wind speeds.

5. WATER MASSES AND CIRCULATION

5.1 The hydrographic conditions in Storfjorden, Storfjordrenna and Storfjordbanken in winter 2003

Fer, Harms, Martin, Pisarev, Rudels, Schauer, Sirevaag (GIUB, IfMH, AWI, RAS, FIMR)

1. Introduction

On the continental shelves of the Arctic Ocean, coastal polynyas which are formed and maintained by various processes, e.g., advection of ice by off-shore winds and currents, melting of ice by upwelling warm water, lead to rapid, persistent, and repetitive ice formation through intense heat-exchange between the ocean and the atmosphere. Brine rejection associated with this ice formation results in brine-enriched shelf waters (BSW), which can maintain the cold upper halocline in deep Arctic basins. Such dense shelf waters accumulate near the bottom and eventually spill towards the deep sea while they entrain overlying waters and change their temperature and salinity characteristics.

Storfjorden in the southeastern Svalbard Archipelago (Figure 5.1.A) is one of the few areas in the Barents Sea where BSW have been frequently observed and it is estimated to supply 5-10% of the newly formed waters of the Arctic Ocean. Quantification of the deepwater production in the Storfjord is not a trivial task due to the presence of several different water types (e.g., BSW, Atlantic Water, Svalbardbank Water, Arctic Water and fresh coastal water) which exhibit strong seasonal and interannual variability. Under WARPS (Winter ARctic Polynya Study), the dense water formation in Storfjorden was studied by means of densely spaced hydrographical stations carried out in winter from the R.V. Polarstern during the ARK19/1 cruise.

2. Site and measurements

Storfjorden located in the southeastern Svalbard Archipelago is approximately 110 km long and 190 m deep at its maximum depth and is enclosed by Spitsbergen, Barentsøya, and Edgeøya and limited by a shallow bank, Storfjordbanken, in the southeast and a 120 m deep sill at about 76∞ 50' N in the south. The basin (defined as north of the sill) covers an area of about 13x103 km2 with an approximate volume of 8.5x1011 m3.

A total number of 71 CTD (conductivity, temperature, depth) stations were occupied using a SBE911plus system which was lowered at a rate of about 0.7 m s-1 as close as 2-m to the bottom. For determining the distance to the bottom a ???? altimeter model ???? was used. The sensor accuracies of the CTD instrument are provided by the manufacturer as 1 dbar, 1x10-3 ∞C, and 3x10-4 Siemens m-1 for pressure, temperature and conductivity, respectively. Three moorings, named 'Ursel', 'Ingo', and 'Andreas' were deployed over 167, 177, and 100-m isobaths, respectively. The details concerning the moorings are summarized in Table 1. Figure 5.1.A. shows the locations of the moorings and all the stations made during ARK19/1 together with the bathymetry of the area.

Table 1. Mooring properties. Instrument depths are nominal. Here, hab denotes height above bottom.

Mooring	Position		Water Depth (m)	Instrument	Instrument depth (m)	Instrument hab (m)	Deployed Date/ UTC
Ursel	76° 50'N	19° 24.8'E	167	Microcat	161	6	11.03.03 / 07:19
				RCM8	160	7	
				T-chain	158-78	9-89	
				Microcat	151	16	
				RCM4	67	100	
Ingo	77° 12.1'N	19°17.34'E	177	RCM5	78	99	19.03.03 / 20:06
				Microcat	162	15	
				T-chain	170-120	7-57	
				RCM7	172	5	
				Microcat	173	4	
Andreas	77° 16'N	20° 17.95'E	100	Seacat	95	5	19.03.03 / 07:14
				RCM7	94	6	
				Microcat	51	49	
				RCM4	50	50	

3. Observations

Distributions of potential temperature, q, salinity, S, and sq derived for all sections are presented in Figures 5.1.B-H. The fjord was observed to lack the saline BSW which could be dense enough to contribute to the Norwegian Sea Deep Water. At its deepest parts (stations 48 and 62 of section E and D, respectively), the bottom salinities were between 34.8 - 35 with temperatures close to the freezing point. At section C (Figure 5.1.D), at the sill, and further downstream of the path of the Storfjord outflow, at section B (Figure 5.1.C), the weak outflow was observed to penetrate underneath the Atlantic Water (AW) of comparable salinity, due to its low temperature (note the dense layer leaning on the sloping side at section B, stations 16-20). The core of AW observed at section A is associated with temperatures in excess of 3 ∞C and salinity reaching 35. On its cyclonic circulation, roughly following the 150-m isobaths, it mixes with the Svalbardbank waters (see stations 70-72 in section I, Figure 5.1.H) of S = 34.5 with temperature at freezing point to produce the waters entering the fjord at the sill level. Here, the product water manifests itself as a temperature maximum in q-S property plots and has a signature in both sections D and E (e.g., see relatively warm cores between 50-100 m depth observed at stations 62 and 49).

The most saline water in the basin with temperatures at freezing point was observed in the polynya region (section P, Figure 5.1.I), on the southwest shelf of Edgeøya. Salinity of the upper 80-m of the water column gradually increases from station 47, close to the center of the fjord, proceeding towards the shelf. Temperature drops, accordingly, compensating for the freezing point required for higher salinities. Observed polynya is a good candidate to supply dense bottom water observed at station 48, however, similar polynyas on the northern shelf of the basin might contribute, albeit not resolved during this survey.

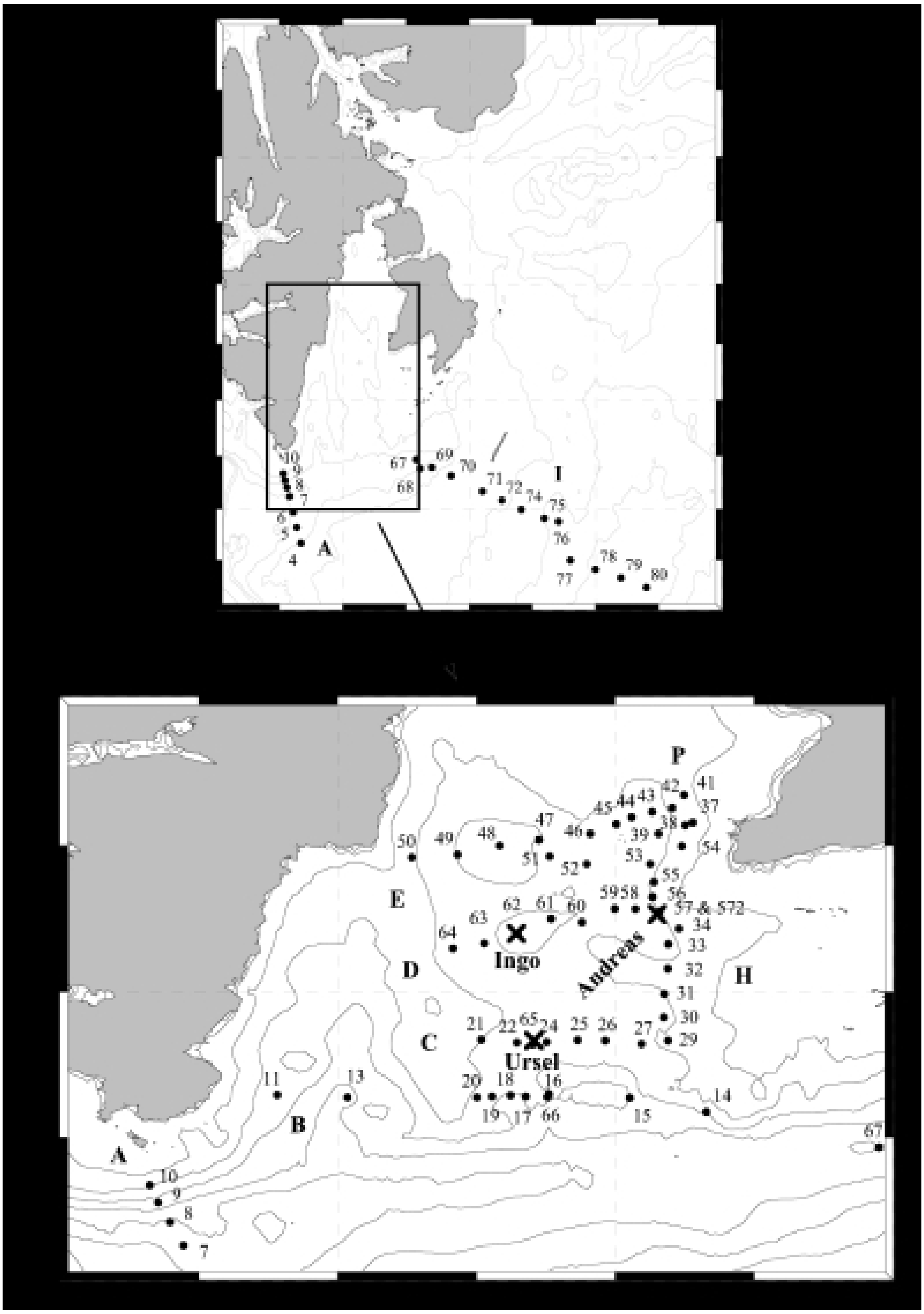


Figure 5.1.A. Bathymetry of the working area with locations of the CTD stations (dots with stations numbers indicated) and the moorings (crosses). The inset is shown in detail for clarity. Isobaths are drawn at 100-m and 50-m intervals for the upper and lower panel, respectively. Sections are labeled A to I, with P denoting the polynya section

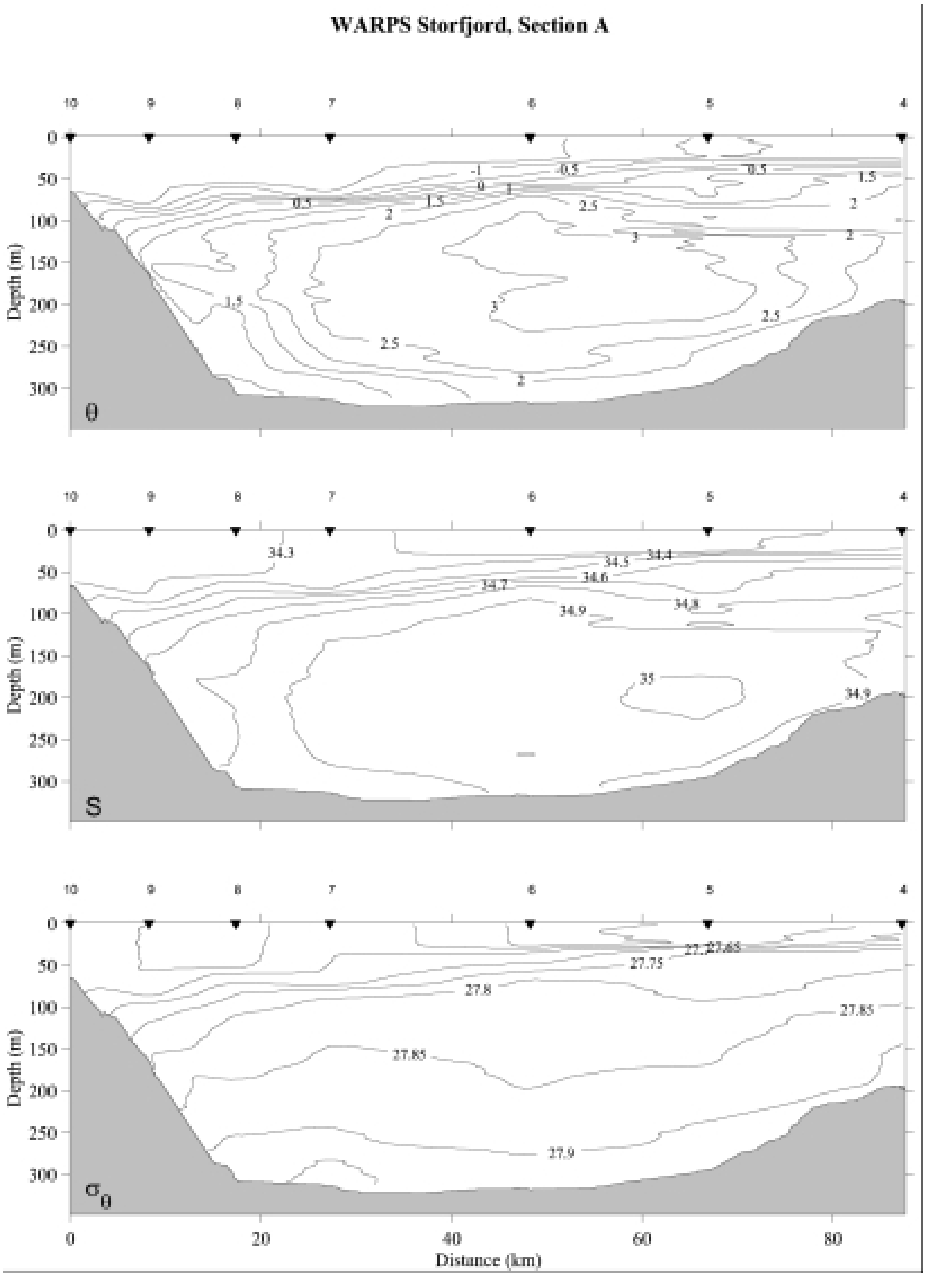


Figure 5.1.B. Distribution of potential temperature, q, salinity, S, and s_q at section A. Contours are drawn at 0.5 °C, 0.1 psu, and 0.05 s_q units, respectively. Station numbers are indicated above each panel. Bathymetry is derived from the ship's echo sounder after correcting for section averaged sound velocity.

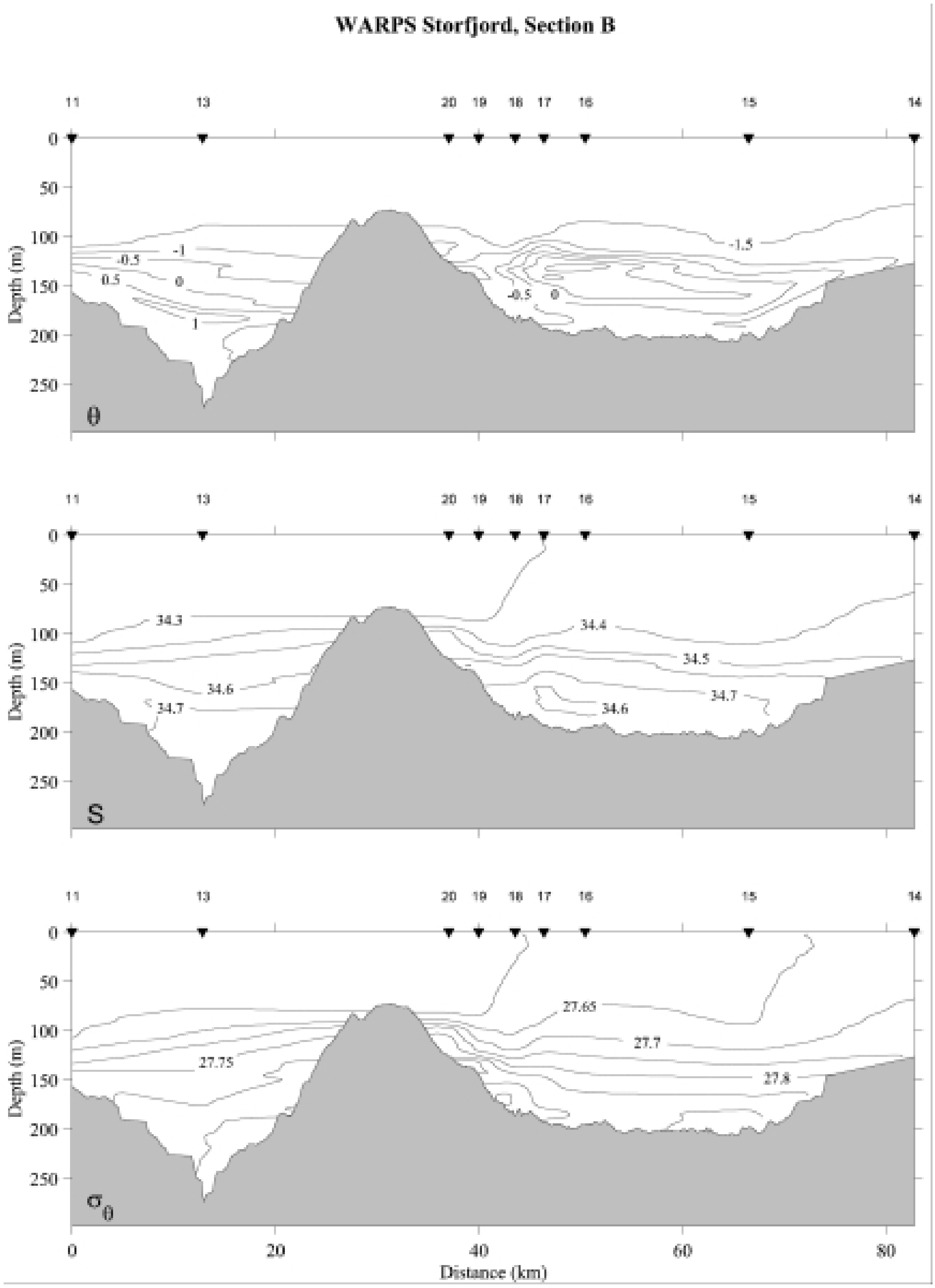


Figure 5.1.C. Same as Figure 5.1.B, but for section B.

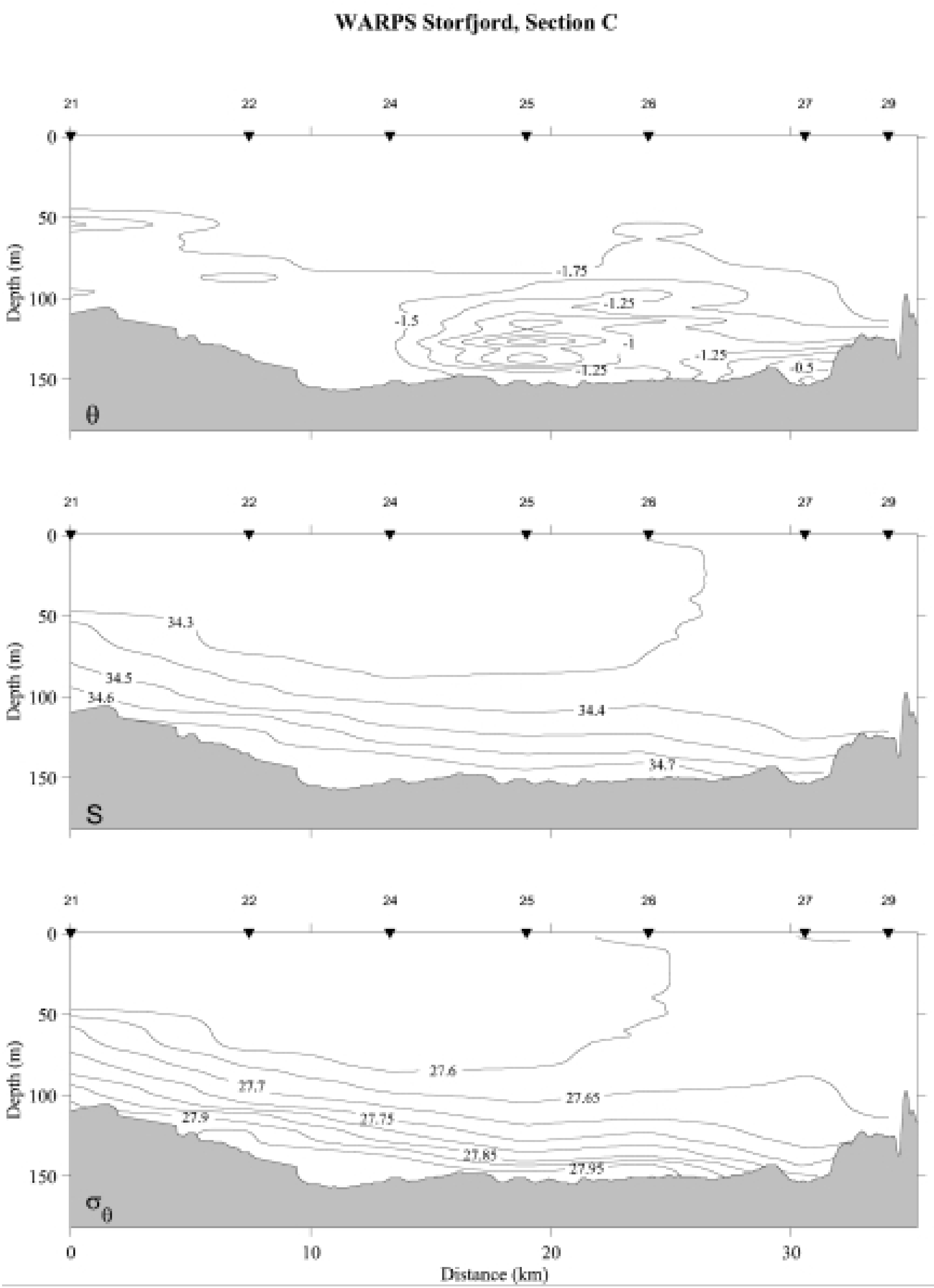


Figure 5.1.D. Same as Figure 5.1.B, but for section C. Here, isotherms are drawn every 0.25 °C.

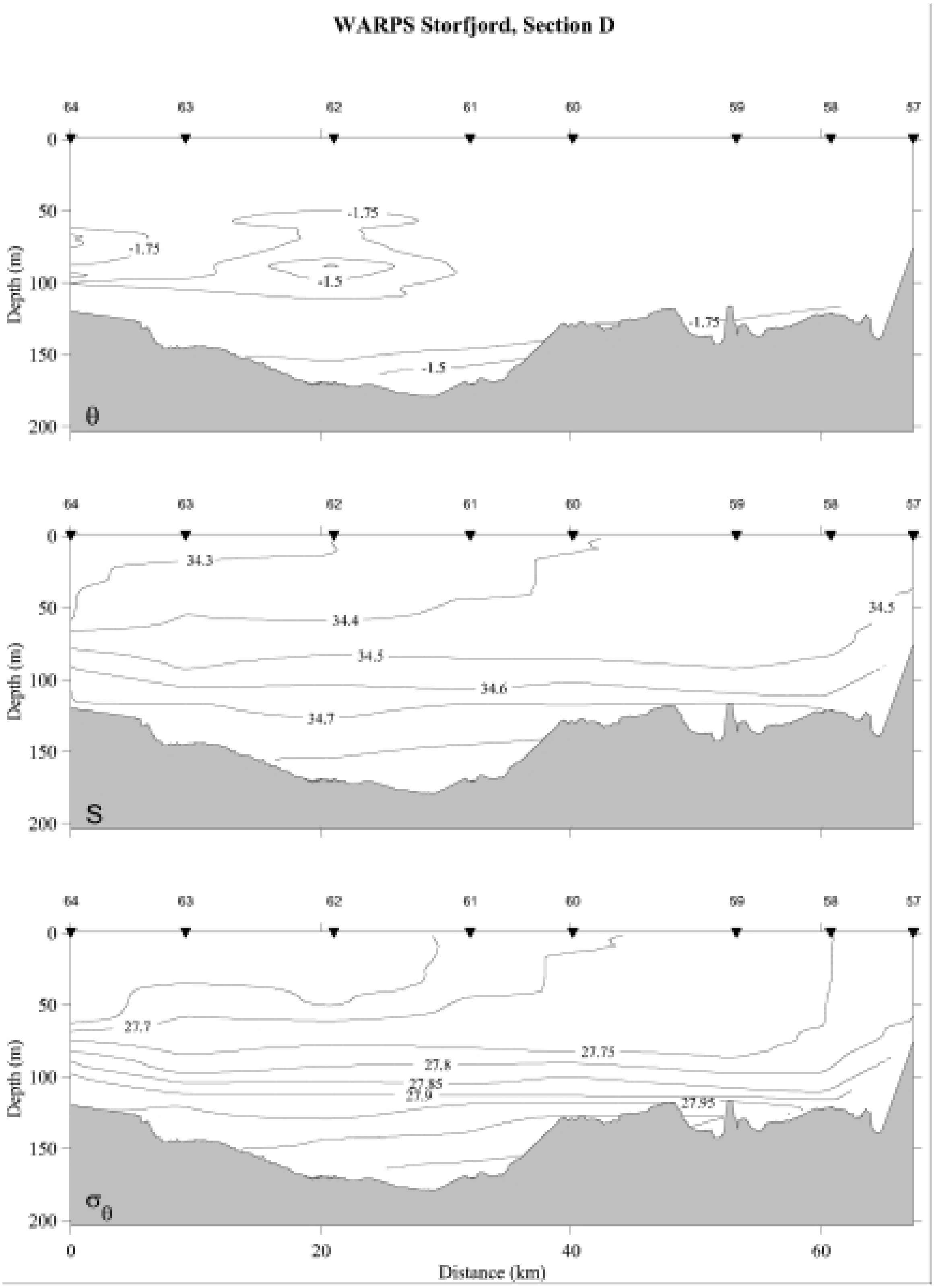


Figure 5.1.E. Same as Figure 5.1.B but for section D with 0.25 °C contour intervals in q.

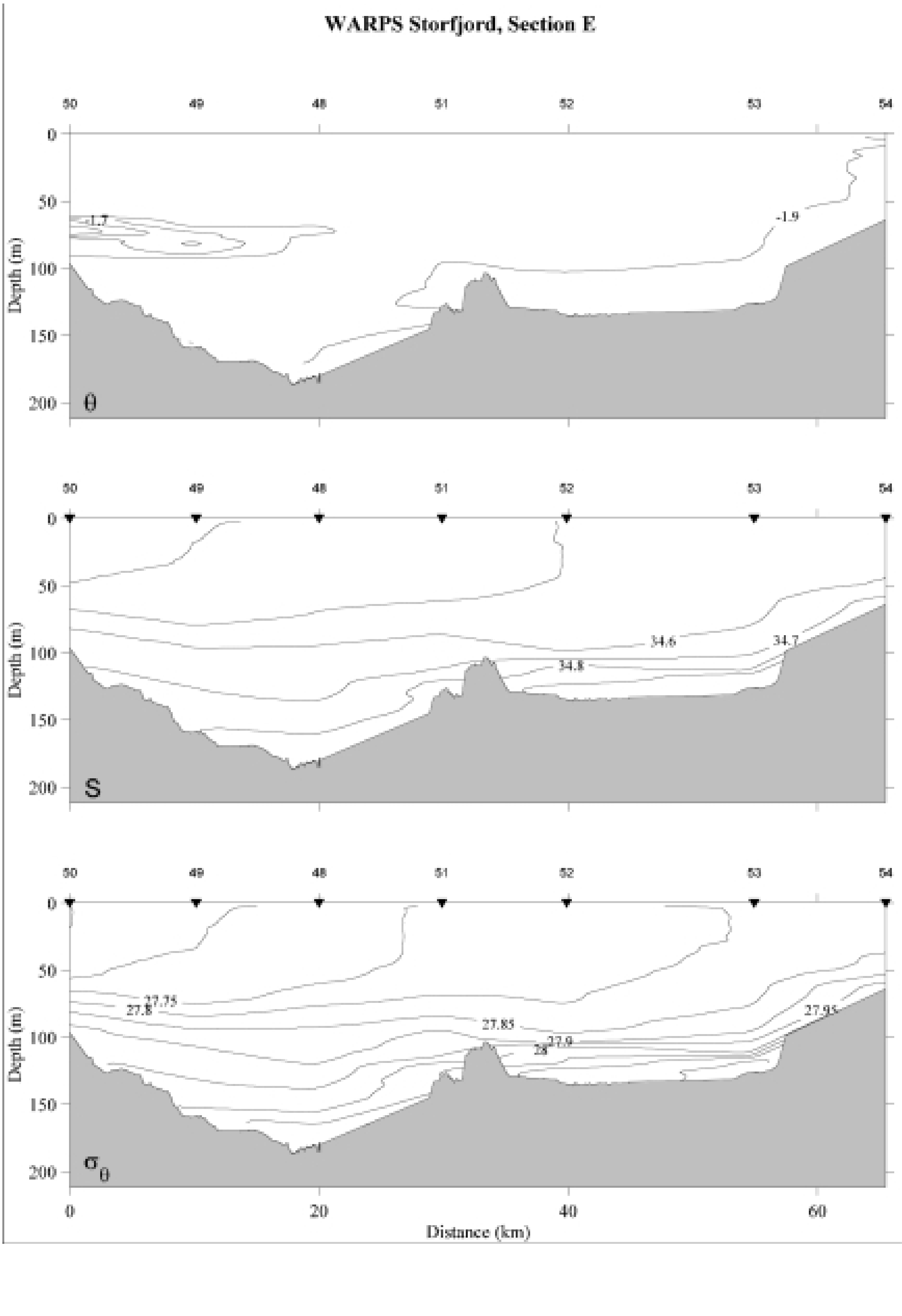


Figure 5.1.F. Same as Figure 5.2. B but for section E. Isotherms are every 0.1 °C.

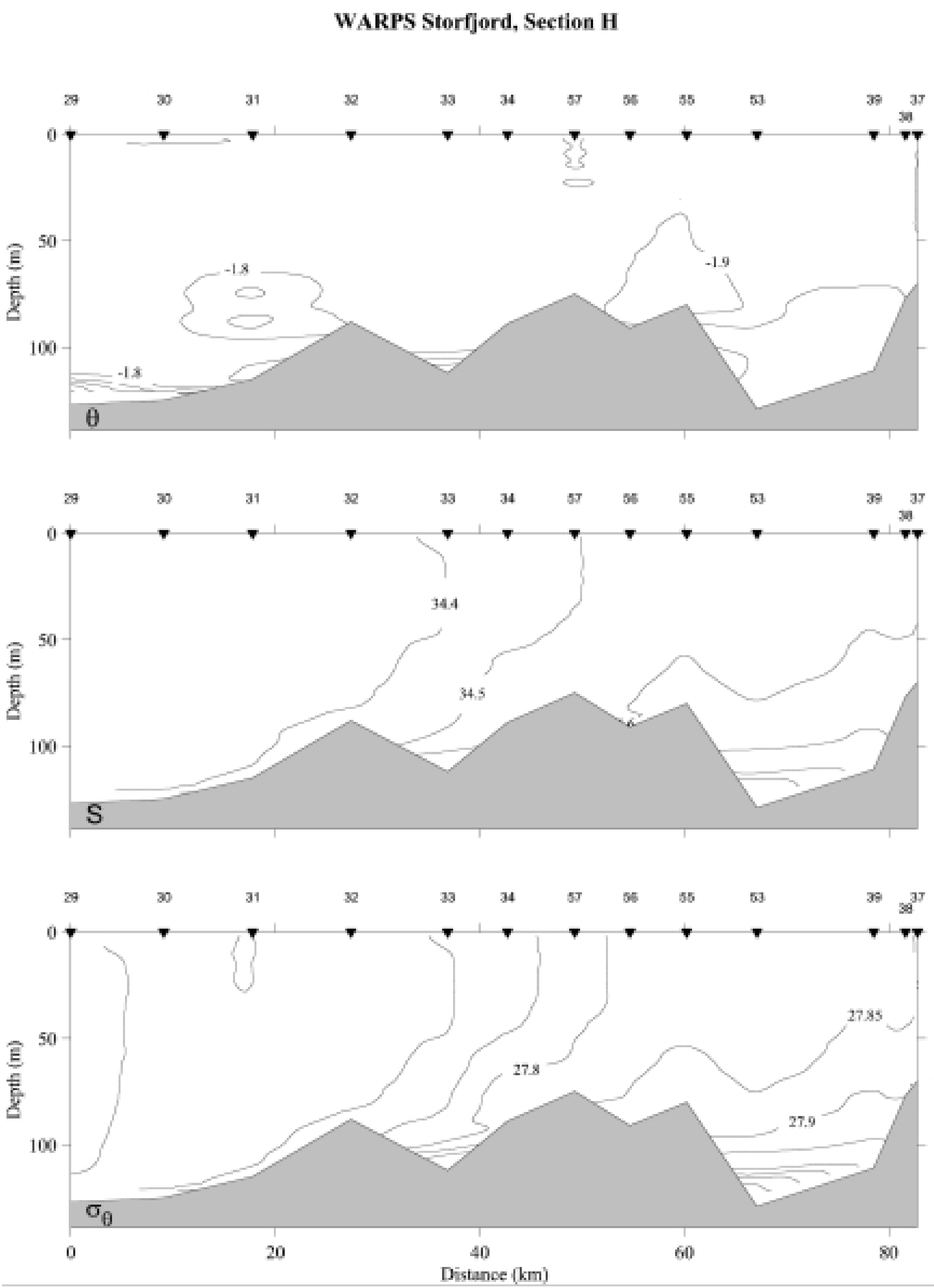


Figure 5.1.G. Same as Figure 5.1.B but for section H. Isotherms are every 0.1 ° C. Echo sounder derived bathymetry is not available for this section.

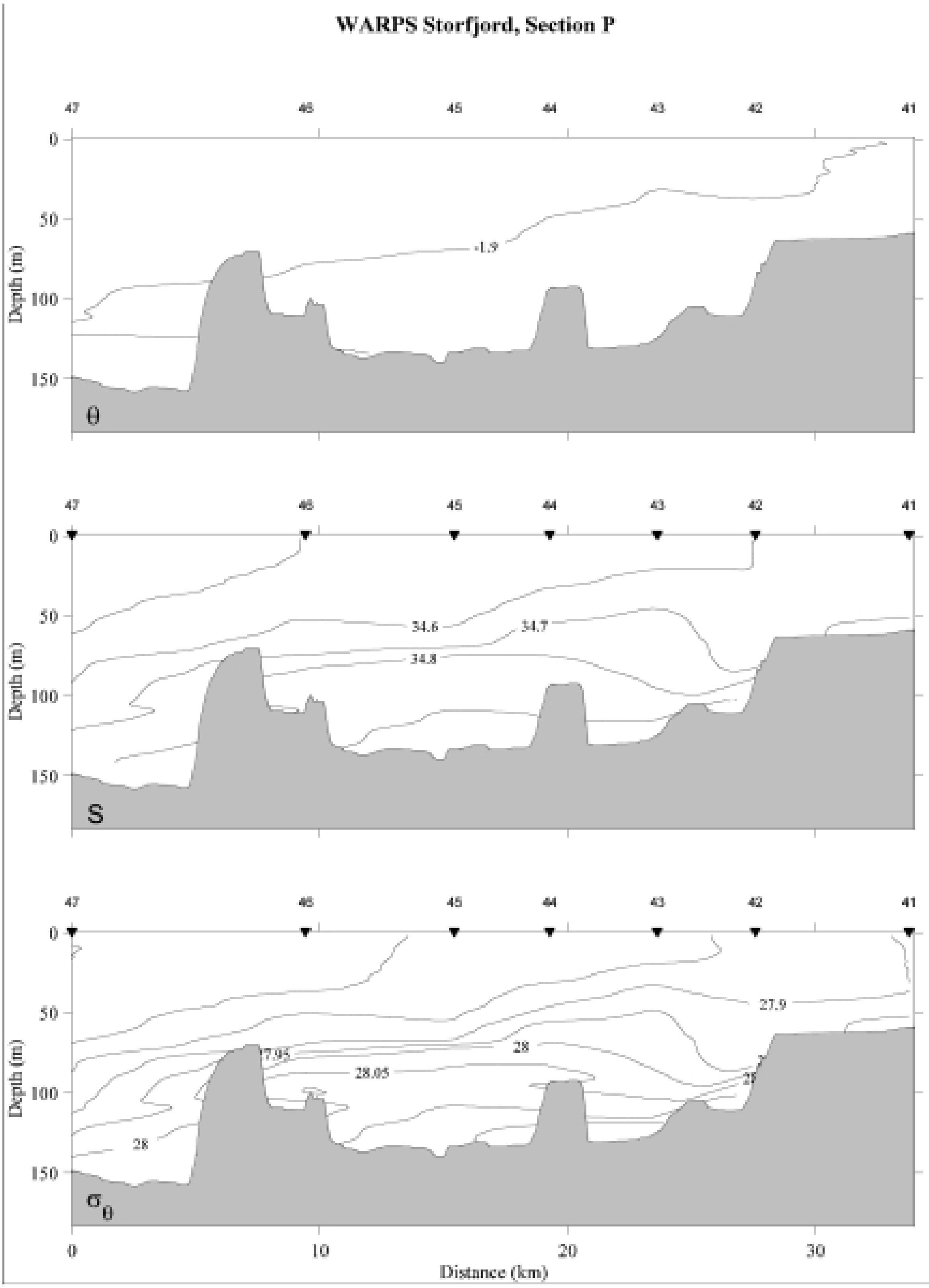


Figure 5.1.H. Same as Figure 5.1.B but for section P. Isotherms are every 0.1 °C

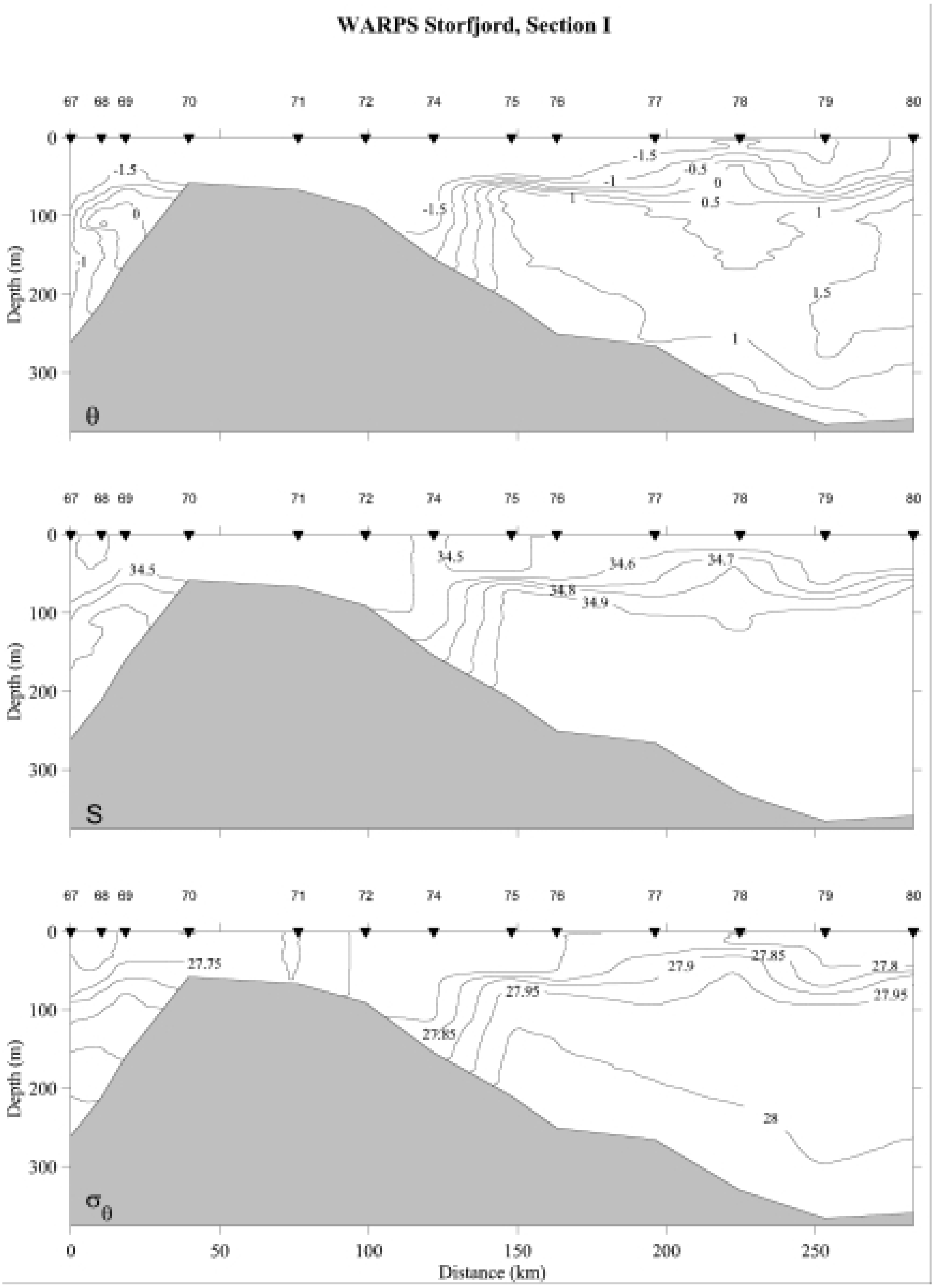


Figure 5.1.I. Same as Figure 5.1.B but for section I. Echo sounder derived bathymetry is not available for this section.

5.2 Mixed layer turbulence

The purpose of the turbulence mast project was to measure turbulent fluxes of momentum, salt and heat under different conditions and on different locations. Different locations gives different processes and fluxes of different orders when it comes to freezing or melting and during the ARK XIX cruise on Polarstern we had the opportunity to deploy the instruments in very different settings.

5.2.1 Instruments

The turbulence mast consists of two turbulence instrument clusters (TIC) placed 4m apart on a 6m vertical mast. Each cluster comprises a Sontek ADVOcean 5 Mhz acoustic Doppler current meter to measure 3 dimensional velocities together with sensitive temperature and conductivity sensors from Sea-Bird. One of the clusters is equipped with a Sea-Bird micro conductivity sensor to measure rapid changes in salinity. A sketch of the mast is given in figure 5.2.A.

The mast was deployed by hand winch through a hole in the ice, giving a stable platform for measurements under sea ice, preferably 200-300 m away from the ship to avoid disturbance from the hull of the ship.

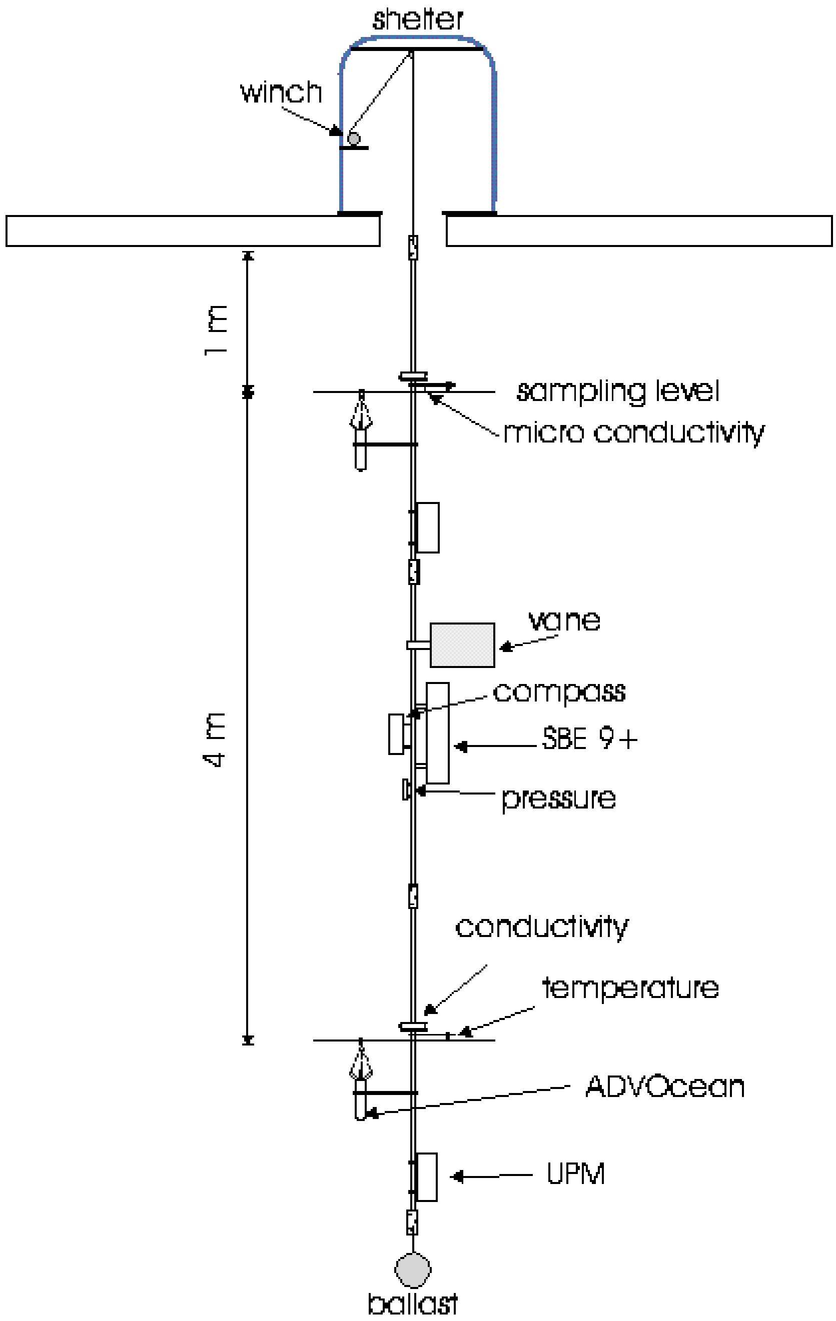


Figure 5.2.A. Sketch of the turbulence mast. The mast consists of to clusters, measuring at two different levels. Each TIC consist of a Sontek ADVOcean acoustic current meter, a SBE3 thermometer, a SBE4 conductivity sensor and a SBE7 micro conductivity sensor for the upper cluster. All instruments are aligned to measure in the same plane, with the conductivity sensors 18 cm above the sampling plane. Both ADV's are equipped with an under water processing unit (UPM) and all the data are processed through the SBE9+ to a deck unit on the ice and recorded on a laptop. A compass and a pressure sensor on the middle mast provides direction and right depth.

5.2.2 Measurements

During the ARK XIX cruise, the mast was deployed at 5 different ice stations, the three first were in fjord conditions in Storfjorden, the fourth close to Whaler's bay north of Spitsbergen while the fifth was a long drift station around 82N 9E. Time series recorded at each location are listed in table 1, some minor technical problems every now and then and growing experience during the cruise are reasons for some of the differences in file durations.
At station 4 and station C there were also taken ice cores to measure temperature gradients and salinity in the ice to compare with heat and salinity fluxes measured under the ice.

Table 1. Stations.

Station			**record length (hours)**
Station 1	(28)	76°49'N20°50'E	8
Station 2	(39)	77°32'N20°19'E	8.5
Station 3	(70)	76°17'N23°15'E	4.2
Station 4	(93)	80°25'N12°47'E	13.8
Station C	(111)	81°50'N20°E	133

The conditions on station 1,2 and 3 were quite equal with a mixed layer of approximately 100m depth with water temperatures close to freezing point and typical velocities in the range 6-8 cm/s. One example of vertical heat flux calculated from data obtained on station 2 is shown in figure 2, calculations are preliminary since processing will be continued after the cruise. As an example of the very different conditions experienced during the cruise, preliminary calculations from data from station 4 shows heat fluxes of a magnitude of 50-100 times fluxes from station 2. This is probably due to higher temperatures in and below a mixed layer of only approximately 30m depth and higher current velocities close to the ice.

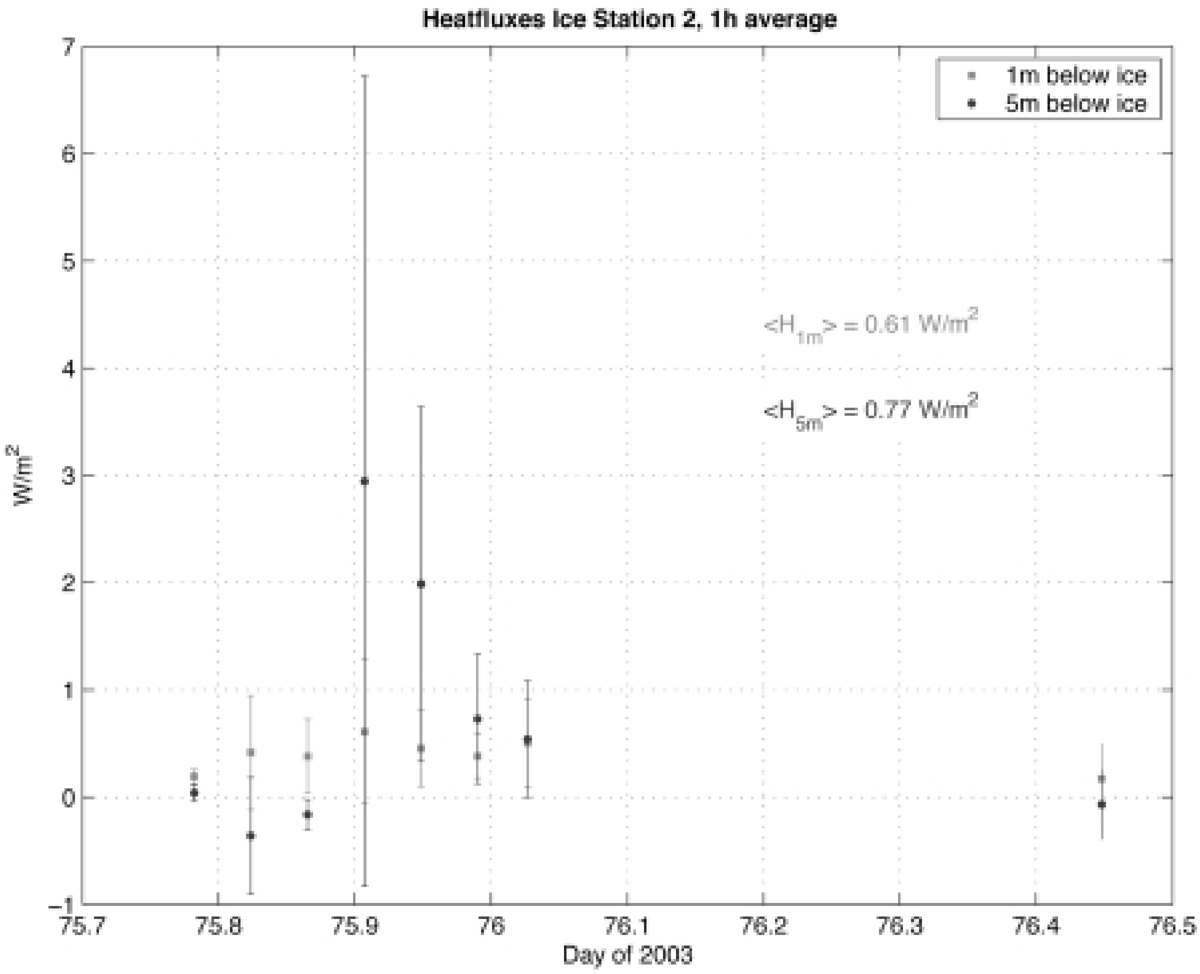


Figure 5.2.B Calculated vertical heat fluxes from ice station 2.

5.3. Technetium measurements

Karcher (AWI)

99Tc is a highly soluble, beta-emitting man-made radionuclide. The main sources of 99Tc are global fallout from nuclear weapons testing and discharges from reprocessing plants for spent nuclear fuel in North-Western Europe. Radioactive wastes have been discharged from the reprocessing plants at Sellafield (UK) into the Irish Sea and at La Hague (France) into the English Channel since 1952 and 1966 respectively. The discharges from Sellafield increased in the first quarter of 1994 when a new waste treatment plant, the Enhanced Actinide Removal Plant (EARP), began operation. EARP reduces the discharges of plutonium and americium, allowing the processing of stored Medium Active Concentrate (MAC), but does not significantly remove 99Tc. Due to the increased throughput of material for treatment the quantities released of this radionuclide have increased greatly since the commencement of EARP.

99Tc behaves conservatively in seawater and is transported from the Irish Sea into the North Sea via the Scottish Coastal Current, which eventually merges with water flowing through the English Channel, labeled with radionuclides from the French nuclear reprocessing plant at La Hague, in Danish waters near the entrance of the Skagerrak. This water becomes incorporated with the Baltic Sea outflow and forms the Norwegian Coastal Current (NwCC). Atlantic Water (AW) of the North Atlantic Current (NAC) - which has crossed the gaps between Iceland, Faeroes and Scotland from the North Atlantic into the Nordic Seas - continues northward as the Norwegian Atlantic Current (NwAC), and its eastern branch runs parallel to the NwCC. It progressively mixes with the NwCC bearing the radiotracer signal. Near the northernmost end of the Norwegian coast at the western boundary of the Barents Sea (~ 70oN) the NwAC splits into two currents: the northwards flowing West Spitsbergen Current (WSC) and the eastwards flowing North Cape Current (NCC). At present, 99Tc can be detected along the NwCC and further north, for example in the Barents Sea and in the WSC, a pattern that was observed in earlier years for 137Cs following enhanced discharges of this radionuclide in the 1970s.
The measurements of 99Tc on the POLARSTERN cruise ARK XIX/1 have the purpose to monitor the spreading of the 1990s peak of this radionuclide with the Atlantic derived water masses in the Nordic Seas and into the Arctic Ocean. They are a contribution to the project RADNOR (Radioactive dose assessment improvements for the Nordic marine environment: Evaluation of realistic pathways for potential radionuclide releases) and will be used for the validation and improvement of the NRPA box model for radioactive dose assessment and the coupled ice-ocean circulation model NAOSIM of the Alfred Wegener Institute.
Due to the limited analysis capacity only 10 samples could be taken during the cruise. The sampling strategy on ARK XIX/1 followed the idea to reveal the basic horizontal structure of 99Tc north of Svalbard while at the same time to distinguish between Atlantic Water entering the Arctic with the WSC and Polar surface water which overlays the Atlantic Water while moving south. This made it necessary to sample at the surface and at about 200 m depth. The 10 samples (40 bottles of 25 l each) collected on board are shipped to the NRPA laboratories in Oslo and analysed there.

6. BIOLOGY IN THE SEA-ICE, IN THE WATER COLUMN AND AT THE SEA FLOOR

6.1 Arctic sea-ice biology in winter

Kiko, Scheltz, Schünemann, Werner (IPÖ)

During this cruise measurements of chemical, physical and biological properties in and under different types of pack ice in winter have been conducted. The results will complement our already available data from other seasons. Virtually nothing has been known yet about the abiotic and biotic conditions, e.g. the availability of food sources, in Arctic sea ice of this region in winter, although most of the sympagic species have been believed to live in the ice year-round. Our measurements characterize the ice environment of different ice types and thicknesses in respect to salinity, temperature, inorganic nutrients (PO_4, NH_4, SiO_2) and organic carbon

(POC) in the ice and the under-ice water layer. Biological investigations included samples for the determination of species diversity, distribution, abundance and biomass of sympagic (=ice-associated) bacteria, algae and metazoans.
Complete sampling programmes were carried out on three long ice stations in the Storfjorden-Barents Sea area (12.3., 17.3., 23.3.), on one ice station in the West Spitsbergen Current (1.4.), and during the ice-drift station north of Spitsbergen (7.4.–16.4.). This 10-day-station was also used for a study of the spatial and temporal variability of biological sea-ice properties (algal biomass, abundance of organisms).

The Arctic sea-ice environment in winter
The brine channel system of Arctic pack ice is inhabited by the specialized sympagic community. Bacteria, algae, protozoans and metazoans build up a complex food web within this system, which is so far poorly understood. Our biological investigations concentrated on the qualitative and quantitative determination of the meiofaunal community (here: metazoans > 20µm) which will be set into relation to other parameters like salinity, temperature, chlorophyll a content, nutrients and volume of the brine channel system. During the cruise ARK XIX-1 a total of roughly 160 ice cores for biological investigations were drilled at 14 ship- and helicopter-based stations as well as during the ice-drift-station. Ice cores were taken with a SIPRE ice corer (7.5 cm diameter), and temperatures were measured every 5 to 15 cm with a digital thermometer inside the cores immediately after drilling. The same cores were then cut into 1 to 20 cm segments and, after melting in the dark at 4 °C, analysed for salinity, chlorophyll a and phaeopigment contents. Additional ice cores were taken for measurements of inorganic nutrients as well as for the study of species diversity, abundance and biomass of ice algae and heterotrophic protists, which will be conducted by our Finnish cooperation partners (FIMR). For investigations on sea-ice meiofauna three cores were drilled at the same site and cut into 1 to 20 cm segments. These segments were melted in an excess of 0.2 µm filtered sea water in order to avoid osmotic stress to the organisms. After complete melting, the samples were concentrated over a 20 µm sieve and fixed with Bouin's solution (4% final concentration). They will be used for meiofauna investigations (abundances, biomass) and taxonomic studies in the home laboratories. In order to estimate the bacterial concentration subsamples were taken and stained with DAPI. All subsamples were filtered on polycarbonate filters and frozen at –30 °C. Determination of total bacterial numbers will be conducted at home by using epifluorescence microscopical techniques. Furthermore numerous ice undersides were melted and sorted for meiofauna organisms. During the ice-drift-station several cores were taken in order to gain information about the presumably patchy distribution of sympagic meiofauna organisms within one floe.
All temperature measurements in the ice showed similar profiles with lowest temperatures down to - 21 °C at the upper part of the cores and highest values up to –2,5 °C at the lower surface (Fig. 6.1.1H). These temperature profiles are typical for the winter situation within Arctic sea ice. Together with the resulting high brine salinities and small brine volumes, the sea ice therefore represent an extreme habitat during winter. Algal biomass was always very low and did rarely exceed values of 1 µg l-1 (Fig.6.1.2H) indicating no or just beginning primary production in the ice at the end of the study period. However, concentrations in the ice were still one order of magnitude higher than in the underlying water column. All ice cores inspected for meiofauna organisms already onboard showed extremely low abundances. Only single nematods, rotifers and nauplii were observed. This result, which is significantly

different from summer observations, seems to be typical for the winter situation within the Arctic sea ice.

The Arctic under-ice environment in winter

The boundary layer between sea ice and the water column is a unique habitat with special abiotic (e.g. temperature, salinity) and biotic (e.g. food resources) factors, which also vary with season and region. This habitat is colonized by (1) autochthonous under-ice amphipods (Apherusa glacialis, Onisimus spp., Gammarus wilkitzkii), which live directly at the ice underside and complete their entire life-cycle here, and (2) allochthonous sub-ice fauna, means organisms originating either from the ice interior or the pelagic realm, which are found in this boundary layer temporarily, e.g. for feeding or during certain life stages. Aim of this winter cruise was to characterize the environmental conditions of this habitat in winter, and to study the seasonal dynamics and adaptations of the under-ice fauna.

For this purpose, under-ice video, under-ice pumps, several nets and probes were deployed. Life amphipods for experiments (respiration-, excretion rates) were additionally collected from zooplankton nets and baited traps deployed from ice floes.

Temperature and salinity profiles were measured in the first 5 metres below the ice on all ice stations (Fig. 6.1.3H). In the Storfjorden-Barents Sea area, the under-ice water was always at the freezing point (e.g. stn 76) representing the expected winter condition, whereas the temperature below the ice in the West Spitsbergen Current (stn 91) was clearly warmer, indicating melting at the ice underside. This observation can be supported from the under-ice video images at this station which showed an ice underside structured like a typical summer floe, with smooth undulations, bulges and depressions. In the under-ice water below the drift-ice-station (e.g. stn 106), a slight stratification in the uppermost metre was observed (Fig. 6.1.3H), however probably not pronounced enough to indicate melting conditions here.

Regarding algal biomass, which is a major food source for many organisms in the under-ice habitat, the expected winter situation with very low values was found. Concentrations of chlorophyll a in the under-ice water were very low everywhere (0.02–0.05 µg l-1). In the lowermost 2 cm of the ice, which is also a feeding ground for the under-ice fauna, concentrations ranged between 0.60–1.02 µg l-1 (Storfjorden), 0.13 µg l-1 (West Spitsbergen Current), and 0.15–3.37 µg l-1 (drift-ice-station), with the higher values occurring to the end of the sampling period. This may indicate the begin of the ice-algal spring bloom, although no significant snow melt had commenced yet.

All four species of the autochthonous under-ice amphipods Apherusa glacialis, Onisimus glacialis, O. nanseni and Gammarus wilkitzkii occurred below the ice in all study areas during the cruise. This is the first record of A. glacialis and O. glacialis in this region in winter, proofing the assumption that these species live in the under-ice habitat year-round. Abundances will be determined by analysis of under-ice video recordings, first estimations point to values not different from summer. The question of how the amphipods survive the winter with limited food sources will be solved by biochemical analysis of lipid content and lipid classes. The hypothesis is that the more herbivorous species (A. glacialis, O. glacialis) thrive on high amounts of storage lipids which have been accumulated during the summer feeding period. The predominantly omnivorous-carnivorous species O. nanseni and G. wilkitzkii are most probably feeding on zooplankton and detritus also during winter, as indicated by faecal pellet production of the collected animals. One egg-bearing female G. wilkitzkii was caught, from which 20 juveniles of 2-3 mm length hatched during rearing onboard. At one ice station over shallow water (50 m depth) in Storfjorden, high concentrations of a benthic amphipod (species unknown) were observed directly below the ice. Specimens of this amphipod were recorded on the under-ice video and caught by the under-ice pump but above all by a baited trap (33 individuals) deployed at the ice underside. Determination of gut contents and lipid composition will hopefully show whether these amphipods have been feeding from ice-produced food sources, pointing to the very interesting process of bentho-sympagic coupling. Respiration measurements which have been successfully conducted with all four species of under-ice amphipods as well as with this benthic species will give some insights in the metabolic activity during winter as compared to already available summer data. Altogether, these studies will deliver new information on the over wintering strategies of the Arctic under-ice amphipods.

First inspections of the sub-ice fauna suspended in the water layer directly below the ice (0–5 m depth) showed a very reduced species diversity as compared to other seasons. Mainly small copepods (Oithona simil Pseudocalanus spp.) were observed as well as copepod nauplii. Both, typical representatives of the larger epipelagic mesozooplankton (Calanus spp.) and of the sympagic copepod species (Halectinosoma spp., Cyclopina schneiderii, Tisbe spp.) which occur in this habitat in summer and autumn, seem to be absent or present only in low numbers in this habitat during winter. Later analysis of species and stage composition in the quantitative under-ice pump samples will deliver a more thorough view of the winter composition in this community and, in comparison with existing data from spring, summer and autumn, on the seasonal dynamics of the respective species.

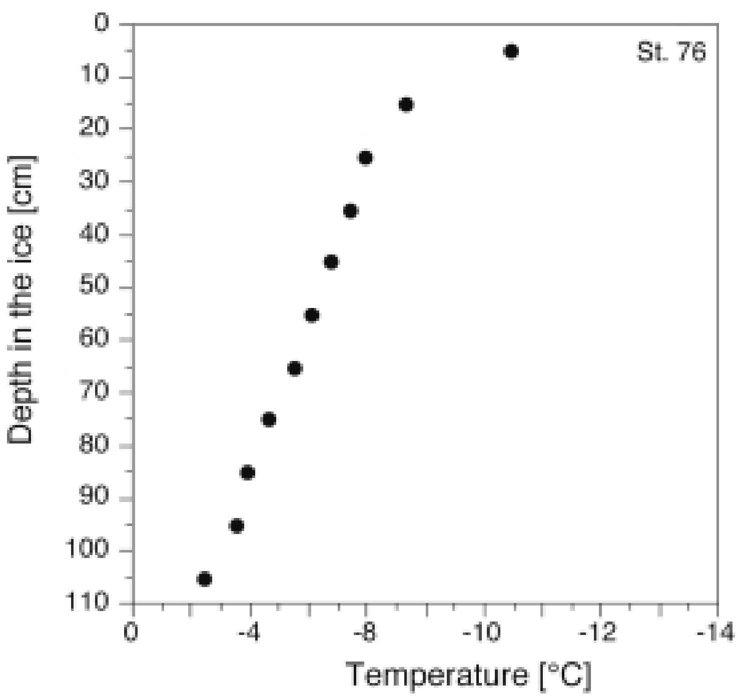


Fig.6.1. 1H: Temperature profile inside the ice at station 76 (Station number = day of the year 2003).

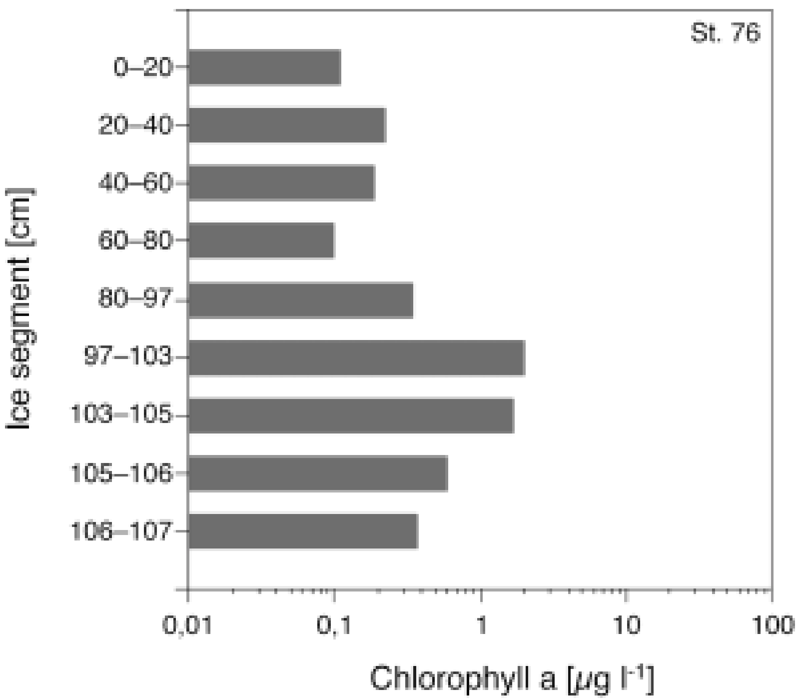


Fig. 6.2.2H: Chlorophyll a profile inside the ice at station 76 (Station number = day of the year 2003).

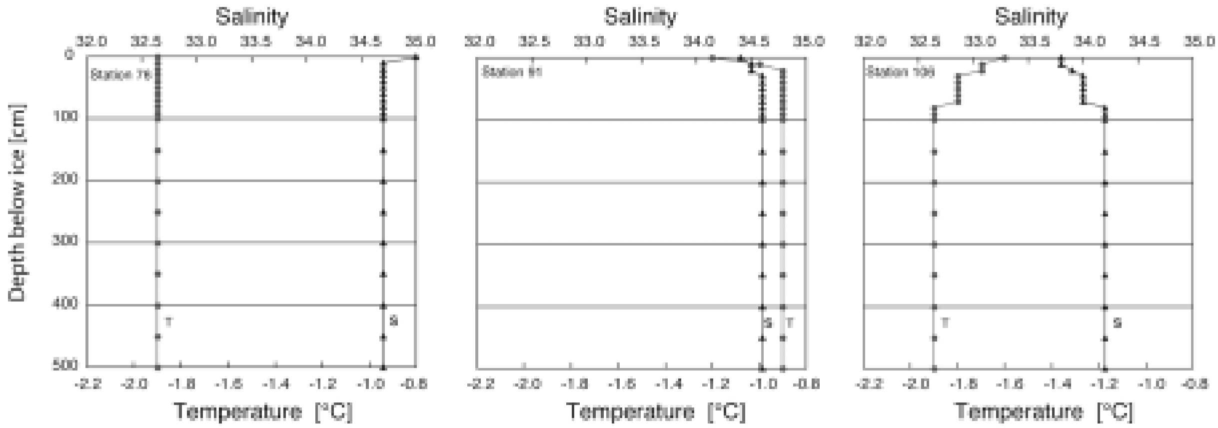


Fig.6.1.3H: Temperature and salinity profiles in the under-ice water (0–5 m depth, starting at the ice underside) in Storfjorden (station 76), in the West Spitsbergeb Current (station 91) and at the ice-drift-station (station 106). Station numbers = days of the year 2003.

6.2 Cryo-pelagic coupling in Arctic winter

Auel, (UB)

During the expedition ARK XIX/ 1a & b cryo-pelagic coupling processes were studied under winter conditions (i) in Storfjorden, (ii) in permanent multi-year ice over the Yermak Plateau (central Arctic Ocean), and (iii) in the Marginal Ice Zone of Fram Strait.

A total of 16 multiple opening/closing net hauls (Multinet, mesh size 150 µm) were conducted during the cruise. Most hauls covered the upper 100 m of the water column in high resolution (100-75-50-25-10-0 m). In Storfjorden Multinet samples were collected down to the seafloor. Sampling concentrated on two sections: One transect including five stations from the southern entrance of Storfjorden northward into the central basin of the fjord. Another major section started in heavy multi-year ice at ice station "Tomato Island" on the Yermak Plateau (81° 59' N) and crossed the Marginal Ice Zone on its way southward via seven stations. In addition, Multinet samples were collected at every ice station for comparison to the pelagic under-ice fauna sampled by an under-ice pumping system at the ice/water interface and at five metres depth below the ice. The AWI "Hausgarten" area was sampled twice during the cruise, on March 30th and on April 21st/22nd in order to study the transition from late winter to spring. Strong changes in the vertical distribution of the dominant copepod Calanus hyperboreus were observed within these three weeks.

Larger and more mobile species, especially the hyperiid amphipods Themisto libellula and T. abyssorum were sampled by Rectangular Midwater Trawl (RMT 8, mouth opening: 8 m2, mesh size: 4.5 mm) at four stations. Usually, RMT 8 hauls covered the upper 30 m of the water column, since we were interested in the diet composition of little auks and this is the maximum diving depth of this seabird species. In the "Hausgarten" (stn. 124) two successive RMT 8 hauls were collected: one shallow and one 200 m deep.

The zooplankton community in Storfjorden was dominated by polar species, including the copepods Calanus glacialis and Pareuchaeta glacialis, the amphipod Themisto libellula and the pteropods Clione limacina and Limacina helicina. These indicator species showed that Arctic water masses originating from the northern Barents Sea and East Spitsbergen Current predominated in Storfjorden during the study period. This observation is in contrast to previous studies which showed that at other times species of Atlantic origin, such as Calanus finmarchicus, Pareuchaeta norvegica and Themisto abyssorum, are imported into Storfjorden by a branch of the warm West Spitsbergen Current. The zooplankton community of Storfjorden is apparently very variable and subject to dynamic changes depending on the hydrographic regime. Many females of T. libellula caught in Storfjorden carried hatchlings in their brood pouches. Some females released their offspring within a few days after the sampling, and juvenile T. libellula of 2-3 mm body length were collected frequently in surface waters during the second half of the expedition. These findings confirm the already established theory that this amphipod species reproduces in winter.

The abundance and distribution pattern of seabirds were studied by standardised sighting intervals of 10 min duration from the bridge. In comparison to previous summer cruises seabird abundance in the investigation area was rather low.

Especially in the central part of Storfjorden and during the long-term ice station over the Yermak Plateau only few birds were sighted. Higher abundances of black guillemots, Brünnich's guillemots and little auks, as well as ivory gulls occurred in the marginal ice zone of Fram Strait during the end of the cruise. Little auks were the most abundant seabirds in this region.

Seal sightings were recorded during the seabird survey and during several helicopter flights. Ringed seals were spotted regularly in northern Storfjorden and over the Yermak Plateau. Walruses were present in the shallow areas of northern Storfjorden and close to Moffen island. In contrast to previous cruises in summer and autumn, no seals were sighted in the Marginal Ice Zone of Fram Strait. During other seasons highest concentrations of harp and hooded seals were recorded in this region. One possible explanation for the low seal abundance in this area during the present cruise is that adult individuals of both species gather on the breeding grounds near Jan Mayen during this time of the year. In addition, poor visibility due to sea smoke and strong winds during the only short passage through the Marginal Ice Zone of Fram Strait at the end of the cruise may have contributed to low sighting frequencies in this area.

Narwhals and bowhead whales were sighted several times in open leads in the northern part of the investigation area. They seemed to follow open leads northward and penetrated far into areas permanently covered by heavy sea ice. In one of the leads an adult white whale was seen together with a calf.

Table 1: List of stations with plankton nets.

Station	Date	Time [UTC]	Position Lat.	Position Lon.	Bottom depth [m]	Net type	Max. sampling depth [m]
15	08.03.	20:28	76° 38,12' N	20° 9,48' E	209	Multine	195
28	12.03.	14:00	76° 48,19' N	20° 14,89'	176	Multine	150
36	16.03.	04:34	77° 29,08' N	20° 16,09'	125	RMT 8	31
39	17.03.	01:47	77° 32,01' N	20° 18,94'	111	Multine	100
48	18.03.	07:02	77° 29,90' N	19° 8,84' E	189	Multine	165
62	19.03.	21:19	77° 12,00' N	19° 16,26'	178	Multine	160
85	30.03.	16:55	79° 3.93' N	4° 17.86' E	2409	Bongo	1500
85	30.03.	13:00	79° 4.46' N	4° 19.31' E	2338	Multine	2300
85	30.03.	18:43	79° 2.38' N	4° 17.97' E	2540	RMT 8	33
93	02.04.	10:07	80° 21.45' N	12° 14.90'	184	Multine	173
105	04.04.	10:56	81° 20.89' N	10° 32.21'	1940	Multine	100
111	08.04.	10:37	81° 58.89' N	9° 25.51' E	840	Multine	100
112	18.04.	16:51	81° 41.96' N	9° 55.37' E	1208	Multine	100
114	19.04.	01:24	81° 25.06' N	10° 18.81'	1836	Multine	100
115	19.04.	13:14	81° 16.35' N	10° 39.48'	2028	RMT 8	31
116	19.04.	23:44	81° 4.66' N	10° 27.13'	1968	Multine	100
118	20.04.	03:20	80° 44.50' N	10° 22.34'	1415	Multine	100
119	20.04.	10:10	80° 24.69' N	10° 0.43' E	700	Multine	100
120	20.04.	21:27	80° 7.30' N	7° 26.15' E	542	Multine	100
124	21.04.	14:10	79° 4.21' N	4° 14.99' E	2406	RMT 8	31
124	21.04.	14:41	79° 4.58' N	4° 11.06' E	2436	RMT 8	200
133	22.04.	13:43	78° 59.69' N	4° 27.52' E	2574	Multine	1500

6.3 Reproductive biology of calanoid copepods

Niehoff, Herrmann (AWI)

During ARK XIX/1, three long-term experiments of 2 –3 weeks were carried out focusing on the reproductive biology of the three copepod species, Calanus finmarchicus, C. glacialis and C. hyperboreus, which dominate the zooplankton communities of the northern seas. These copepods overwinter in great depths in a diapause. During late winter they ascend to the surface and start feeding. The winter-spring transition is an important period in the life cycle, however, our knowledge on the physiological processes during the onset of feeding and reproduction is limited.

In order to fill in these gaps, up to 1000 females of each species were sorted immediately after capture from Bongo net hauls taken vertically from 500m (C. finmarchicus, C. glacialis) or 1500m (C. hypberboreus) to the surface. C. finmarchicus females were placed in Plexiglas cylinders, suspended in beakers, with net false bottoms to separate females and eggs. C. glacialis and C. hyperboreus females were transferred in four 50 L containers. Half of the females were fed with algal suspension, the other half was kept in sea-water from below 100m without food. Every day, C. finmarchicus females were placed in fresh solutions and the eggs were counted. From each of the large containers, 24 female C. glacialis and C. hyperboreus were sorted daily and transferred to cell wells (25ml). Their egg production was monitored in 8h intervals in order to reduce the influence of cannibalism. Every 2 or 3 days, the gonad maturity of 24 to 48 females was determined and these females were deep frozen for later analysis of enzyme activity and carbon/nitrogen content. Once a week, 40 to 60 females were deep frozen for lipid analysis. At start and at the end of each of the three experiments, females were preserved in glutaraldehyde/paraformaldehyde buffered with sodium caccodylate (0.1 M) for histological examination of the oocytes. The biochemical and histological analysis will be performed later at the University of Bremen and at the AWI.

During the experiments, starving C. finmarchicus females spawned continuously at low rates (1-2 eggs female-1 d-1) whereas the egg production increased to maximum rates of up to 15 eggs female-1 d-1 within 24hrs in feeding females. Starving C. glacialis females laid eggs only occasionally. At feeding, egg production increased slowly within 11 d to approx. 20 eggs female-1 d-1. In both species, all feeding females were mature at the end of the experiment whereas the gonad stage of starving females did not change considerably. When C. hyperboreus females were captured for the experiment, they were still located in 1500-500m water depth where food is absent or scarce. At the beginning of the experiment, females produced large clutches of up to 323 eggs. Spawning frequency, however, was low, and over the course of the experiment egg production decreased considerably. No difference, neither in egg production rate nor in gonad development stage, was apparent between starving and feeding females although the later ones ingested the algae provided as they produced 20-40 fecal pellets 1 d-1.

6.4 The pelagic larvae of the invertebrate macrofauna in the Storfjorden and the adjacent Barents Sea

Fetzer (AWI)

Introduction

Stability and dynamics of benthic invertebrate communities depend mainly on the recruitment of larvae and juveniles into the community. Only the permanent replacement of old individuals by young ones ensures the survival of a species within the group. For understanding the formation and the variability of benthic communities the understanding of the reproduction modes of bottom living animals is of high importance.

Most species in temperate areas reproduce via pelagic larvae since this ensures a wide distribution and a fast exploitation of new territories (see Fig. 6.4.A). Moreover the planktonic stages are able to enter the euphotic zone and directly utilise the primary production of the upper water layers. Since the pelagic stages are not provided by any energy reserves they very much depend on existing phytoplankton so the timing of their release by the adults is of major importance. Additionally they have to undergo metamorphosis from free-swimming larvae to ready-to-settle juveniles, which make them usually very slow developing.

The second mode of reproduction among benthic animals is to leave out a larval phase and directly produce postlarvae that look like small copies of their adults. Usually this animals of this reproduction type produce few, large, yolky eggs and very often show brooding of the eggs until the small ones hatch. These larvae are normally rather big and well developed when released from their eggs. Since they have no pelagic stage they usually settle in the vicinity of their adults. This ensures that the offspring is not drifted away by prevailing currents but makes it impossible for the species to occupy new favourable sites.

The period of primary production in the Arctic is limited to only a short time in summer, which constrains the feeding period for meroplankters enormously. This and the fact of a long development time needed for pelagic larvae lead to the suggestion that direct development is favoured in high latitudes.
Recent discoveries of an increasing quantity of pelagic larvae in Arctic and Antarctic waters created problems with this generalisation and shows how little is known on the ecology of meroplankton in high latitudes. Until now very little is known about the reproductive adaptation of benthic invertebrates with respect to the temperatures especially of arctic species.

The aim of this study is to investigate the meroplankton composition and spatial distribution of benthic invertebrate larvae during late winter in Storfjorden and the adjacent Barents Sea.

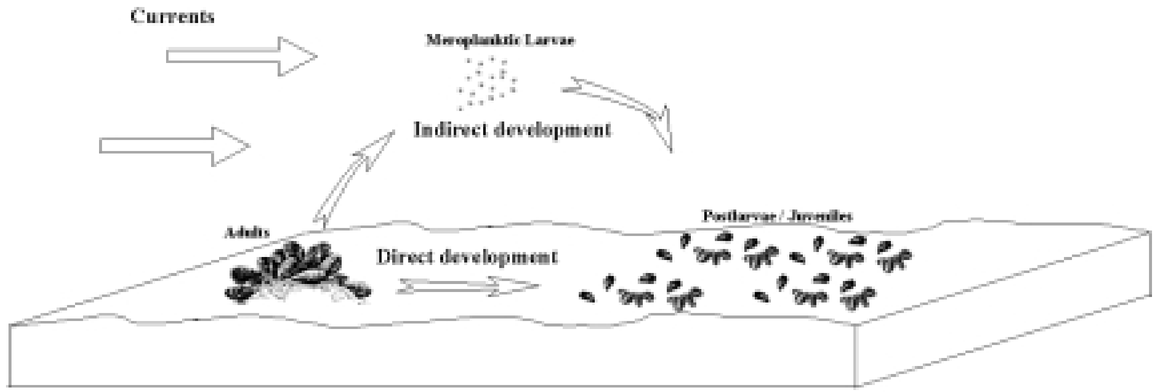


Figure 6.4.A: Reproduction modes of benthic invertebrates

Material and Methods

Larval plankton was collected with a Nansen Closing Net (NCN) with 55µm mesh size at a hauling speed of 0.3 m/sec at 11 Stations (Tab. 1). All of this samples were sorted directly onboard since the identification is much enhanced in living material. For species that could not be identified properly digital image were taken with camera mounted to a microscope. To gather information about the spatial occurrence of the larvae in the water column additional Multinet (MN) samples were taken. At stations less 100m depth exclusively NN were taken. All samples were stored in 4% Borax buffered Formaline until further treatment in the laboratory.

Table 1: Overview of meroplankton sampling stations, date, station depth and gear used (MN=Multinet, NN=Nansen Closing Net)

Station	**Date**	**Lat**	**Lon**	**Depth [m]**	**Gear**	
006	06.03.03	75° 58.16' N	17° 1.01' E	326.2	MN	NN
015	08.03.03	76° 38.21' N	20° 7.33' E	211.1	MN	NN
025	11.03.03	76° 50.12' N	19° 43.62' E	165.8		NN
048	18.03.03	77° 29.90' N	19° 8.84' E	188.8	MN	NN
062	19.03.03	77° 11.91' N	19° 16.66' E	176.6	MN	
069	22.03.03	76° 23.20' N	22° 29.31' E	158.7	MN	NN
071	24.03.03	76° 10.11' N	24° 27.95' E	67.4		NN
072	24.03.03	76° 4.93' N	25° 19.24' E	94.9		NN
074	24.03.03	75° 59.54' N	26° 3.70' E	164.7	MN	NN
075	25.03.03	75° 54.79' N	26° 58.97' E	220.1	MN	NN
076	25.03.03	75° 52.69' N	27° 31.47' E	258.4	MN	NN

Results and Discussion

In the Nansen Net samples larvae of Gastropoda, Bryozoa, Polychaeta and Bivalves were present although in low numbers. In average about 5-7 individuals were found

in each single catch. Larvae of Gastropoda were present at all stations (fig. 6.4.B). Here Dendronotus sp., a Nudibranchia, was the most numerous. But also the gastropod Diaphana minuta was found especially at the inner parts of the Storfjord. Of the Bivalva not more than one individual was found within a haul. They most probably belong to Mya truncata from which the adults are known to be abundant in this area and reproduce the whole year round. All of the found specimens were very small (~100µm) indicating that they have spawned only recently. Of Polychaeta only larvae of the spionid Prionospio malmgreni were present. Interestingly they were only present in the deeper parts of Spitsbergen Bank. Here either very young larvae (~300µm) with only three body segments were found or older much bigger ones having up to 18 segments and a size 1300µm were detected. Seemingly this two size classes belong to different releasing events.
Bryozoans (most probably Membranipora pilorum) were restricted to the inner Fjord parts and the deeper open Barents Sea.

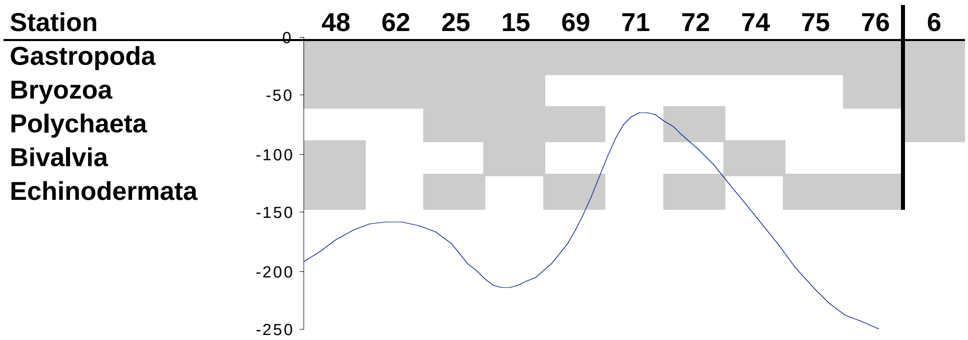


Fig. 6.4.B Presence of larvae of Gastropoda, Bryozoa, Polychaeta, Bivalvia and Echinodermata along a transect following from Station 48 within Storfjord south eastwards to the open Barents Sea. The thin line sketches the depth profile of the transect. Station 6 is excluded since it was located further south outside the transect.

Of the Echinodermata rather big larvae of Asterias sp., the Common Sea star, were found within the Storfjord. Further outside they were exchanged by juvenile Ophiuroida (Brittle Stars). They were already fully-grown and did not possess any larval features anymore. Most seemingly were ready to settle soon. Since they were already full developed they have been released by the adults already a long time ago. Of some species of this group it is known that the larvae stay in the water column for up to six months. In the most south-eastern stations of the Barents Sea very young individuals of Brittle Stars have been found, released recently. Only very few larvae were found at the shallow stations of Spitsbergen Bank were the depth were less than 70 meters. But probably here strong prevailing currents may be the causes for such low abundances. Coarse sill at the bottom indicates the presence of strong currents.

6.5 Ocean Optics

Schwarz (AWI)

Aims

1a. No visible-wavelength spaceborne sensors, used for detecting algal biomass in surface waters, have sufficient spatial resolution to ‚see' between ice floes, and no measurements at all are made during the Arctic winter since these sensors are passive, requiring sunlight. This means that attempts to calculate geochemical fluxes or fields from optical remote sensing data lack any input for the winter and early spring periods. The aim of the ocean optics work during the first leg of this cruise was to measure ‚winter situation' optical properties in the surface waters of the Barents Sea, coastal waters of Svalbard and the Fram Strait. Where logistically possible, ice cores were requested from the IP□ biology group for the measurement of pigment concentrations in the lower 10cm of the ice cores, as well as for taxonomy samples.

1b. The long ice drift station presented a good opportunity for more intensive sampling of ice algae pigments and taxonomy with little time restraint for gathering cores. The spring bloom was expected to begin during this leg of the cruise, and measurements of all optical parameters were planned in surface waters. If temperatures rose above –10□C,deployment of the Trios optical radiometers above the bridge was planned.

Measurements

Phytoplankton Pigments

Samples from the CTD bottles at 10 and ~1.5m depth or from the flow-through supply were stored in opaque bottles. Occasional profiles were taken from the CTD at 0, 10, 20, 30, 50, 70 and 100m depth. Between 750ml and 8 litre aliquots were filtered through 25mm GF/F filters, which were blotted immediately after filtration was complete, and stored in a liquid nitrogen dewar in 2ml cryovials. Duplicate samples were stored in separate dewars. The samples were returned to Bremerhaven for analysis using HPLC.

Absorption by Phytoplankton Pigments

Samples were treated as for phytoplankton pigments. The filters were placed in 27mm diameter tissue capsules and stored in a liquid nitrogen dewar.

Absorption by Coloured, Dissolved Organic Matter and Dissolved Organic Carbon Concentrations.

Samples were collected as for phytoplankton pigments. Using a ‚contact free' 47mm glass filtration unit (Sartorius), an initial 250ml aliquot of sample was filtered through a fresh 0.2um membrane filter and the sample collection flask rinsed and emptied. A second 250ml aliquot of sample was filtered and used firstly to rinse twice and then to fill a 50ml brown glass sample bottle. Samples were stored at 0□Cin a darkened container. During leg 1b, samples were also collected for measurement of DOC concentrations. The filtration strategy was adjusted to include two full rinses of the filtration equipment using 300 or 500ml of water, and 3 rinses of the sample bottles. DOC samples were stored at –10□C.

Concentration of Suspended Particulate Matter (Organic/Inorganic)
Samples were collected as for phytoplankton pigments. Between 1 and 15 litre aliquots were filtered through precombusted and weighed 47mm GF/F filters. After filtration, the filters were stored at –20°C.

Particle Size Distribution
Samples were collected as for phytoplankton pigments. Aliquots of 250ml were stored in brown glass bottles, conserved with Lugol's iodine, at room temperature.

Taxonomy
Samples were collected as for phytoplankton pigments. Aliquots of 100 or 250ml were preserved with Lugol's iodine and stored at 0°C. Some samples of neat, thawed ice cores were stored in 50ml brown glass bottles and preserved with Lugol's iodine.

All samples will be analysed at the home laboratory.

Station List.
Table 1 shows the stations at which samples were collected. A 'x' indicates a sample of a given parameter was taken. Abbreviations used:

HPLC: high performance liquid chromatography, for phytoplankton pigment concentrations,
APHY: absorption by phytoplankton pigments,
ACDM: absorption by coloured, dissolved organic matter,
DOC: concentration of dissolved, organic carbon,
SPM: concentration of suspended, particulate matter (organic/inorganic),
TAX: phytoplankton taxonomy,
PSD: particle size distribution,
POC: concentration of particulate, organic carbon.

Date	Station	Depth (m)	HPLC	APHY	ACDOM	DOC	SPM	TAX	PSD	POC
3.3.03	test	1	x							
		10	x							
		30	x							
		50	x							
6.3.03	5	2	x	x	x		x			
		10	x	x	x		x			
	7	10	x	x	x		x			
		240					x			x
		280					x			x
		308					x			x
8.3.03		Ice core	x							
9.3.03	16	1	x	x	x		x			
		10	x	x	x		x			
		102	x				x			x
		187	x				x			x
		Ice core	x							
10.3.03	21	Ice core	x							
	22	120	x				x			x
12.3.03	28	Ice core	x					x		
14.3.03	30	1.5	x	x	x		x			x
15.3.03		Ice core	x				x			x
		Ice core			x			x		

Date	Station	Depth (m)	HPLC	APHY	ACDOM	DOC	SPM	TAX	PSD	POC
16.3.03		Ice core	x				x			x
		Ice core			x			x		
17.3.03		Ice core	0-1cm	x				x		
			1-2cm	x				x		
			2-3cm	x				x		
			3-4cm	x				x		
			4-5cm	x				x		
			5-7cm	x				x		
			7-10cm	x				x		
		Water 0m below ice	x							
		Water 5m below ice	x							
	41	2	x	x	x		x	x	x	x
		58	x	x	x		x	x	x	
18.3.03	45	2	x	x	x		x	x	x	x
		35	x	x	x		x	x	x	x
		80	x		x		x	x	x	x
		131	x		x		x	x	x	x
	47	2	x	x			x	x	x	x
		101	x		x		x	x	x	x
		144	x		x		x	x	x	x
	49	131	x		x		x			x
		155	x		x		x	x	x	x
	52	1.5	x	x	x		x	x	x	x
		bottom	x		x		x	x	x	x
19.3.03	58	2	x	x	x		x	x	x	x
		10	x	x	x		x	x	x	
		120	x		x		x	x	x	x
	60	2	x	x	x		x	x		
		100	x		x		x	x		x
		129	x		x		x	x		x
	62	1.5	x	x	x		x	x		x
		Bottom	x		x		x	x		x
	64	1.7	x	x	x		x			
	65	1	x	x	x		x	x		
		100	x		x		x	x		x
		152	x		x		x	x		x
		Ice core	x					x		
	66	2	x	x	x		x	x		
		187	x		x		x	x		x
22.3.03	67	1.5	x	x	x		x	x		
		bottom	x		x		x	x		x
	Icecore	0-1cm	x					x		
		1-2cm	x					x		
		2-3cm	x					x		
		3-4cm	x					x		
		4-5cm	x					x		
		5-7cm	x					x		
		7-10cm	x					x		
	69	1.5	x	x	x		x	x		
		36	x		x					
23.3.03	70	1.5	xxx	x		x	x			
	71	Ice core	x					x		
		Water 0m below ice	x							
		Water 5m below ice	x							
24.3.03	71	1.5	x		x			x		
	72	1.5	x		x			x		
		Ice core	x		x			x		
	74	1.5	x		x					

Date	Station	Depth (m)	HPLC	APHY	ACDOM	DOC	SPM	TAX	PSD	POC
	75	1.5	x		x					
	76	1.5	x		x			x		
	78	1.5	x		x			x		
	79	1.5	x		x					
26.3.03	80	1.5	x		x			x		
		Surface snow								x
30.3.03	83	1.5	x		x		x	x		
	85	1.5	x		x		x	x		x
	86	1.5	x	x	x		x	x		
	87	1.5	x							
	88	1.5	x	x	x		x			
	89	1.4	x							
	90	1.5	x	x	x		x			
1.4.03	91	1.5	x	x	x		x	x		
	92	1.4	x							
	93	Ice core	x					x		
2.4.03		1.5	x		x		x			
3.4.03	95	1.5	x	x	x		x	x		
	96	1.5	x	x	x		x	x		x
	97	1.5	x	x	x		x	x		
	98	2	x	x	x		x			
	99	1.1	x	x	x		x	x		
		95.4	x		x		x	x		
	100	1.5	x	x	x		x	x		
4.4.03	101	1.5	x	x	x		x	x		
	103	1.5	x	x	x		x			
	105	1.4	x	x	x		x			
	107	2.2	x	x	x		x	x		
5.4.03	109	1.5	x	x	x		x	x		
	110	1.5	x	x	x		x	x		
	111	Drift Station:								
7.4.03		Subsurface snow					x			x
		Surface snow								x
	111-4	1.5	x	x	x	x	x	x		
8.4.03	111-7	1.5	x	x	x	x	x	x		
		9.9	x							
		19.9	x							
		30	x							
		40	x							
		50	x							
		70	x							
		100	x							
		0m below ice	x							
		5m below ice	x							
		Ice core	x					x		
9.4.03	111-8	1.5	x	x	x	x	x	x		
10.4.03		Ice core	x							
11.4.03		Subsurface snow					x			x
		10.7m flo-thru	x	x	x	x	x			
16.4.03		Snow: 8-13cm								x
		Snow: 13-18cm								x
17.4.03		10.7m flo-thru	x	x	x	x	x	x		
18.4.03	112	1.5	x	x	x	x	x	x		
		10	x							
		20	x							
		30	x							
		50	x							
		70	x							

Date	Station	Depth (m)	HPLC	APHY	ACDOM	DOC	SPM	TAX	PSD	POC
		100	x							
19.4.03	114	1.5	x	x	x	x	x	x		
		10	x							
		20	x							
		30	x							
		50	x							
		70	x							
		100	x							
	116	1.5	x	x	x	x	x	x		
20.4.03	119	1.5	x	x	x	x	x	x		
		10	x							
		20	x							
		30	x							
		50	x							
		70	x							
		100	x							
	120	1.5	x	x	x	x	x	x		x
21.4.03	128	1.5	x	x	x	x	x	x		x
		10	x							
		20	x							
		30	x							
		50	x							
		70	x							
		100	x							
22.4.03	129	1.5	x	x	x	x	x	x		
	133	1.5	x	x	x	x	x	x		x
		10	x							
		20	x							
		30	x							
		50	x							
	134	1.5	x	x	x	x	x	x		x
		10	x							
		30	x							
	135	1.5	x	x	x	x	x	x		x
		10	x							
		20	x							

6.6 Ecophysiology

Satoris (AWI)

In the extremely cold waters of the polar regions, where temperature ranges between 0 and -1.9 ˚C with only little seasonal variation, crustaceans with low extra cellular magnesium levels ($[Mg^{2+}]_e$) like the natant decapoda, amphipoda and isopoda dominate in the crustacean fauna. The capacity to regulate extra cellular magnesium concentrations is likely to be crucial in determining the lower thermal limits of decapod crustaceans. $[Mg^{2+}]_e$ increases with falling temperatures in most crustaceans and, in addition, available evidence suggests that the anaesthetic potency of magnesium increases with decreasing temperature. We therefore propose that the biogeography of marine crustaceans in cold oceans is related to the combined effects of [Mg2+]e and low temperature. There is only one major exception to the general rule of an inverse correlation between [Mg2+]e and activity level. The highly active cephalopod molluscs do not regulate [Mg2+]e at all, however, the haemolymph of cephalopods is characterised by elevated K+ - levels. One could hypothesise that magnesium excretion in molluscs has never developed to the extent required for an effective reduction of extra cellular levels and that cephalopod molluscs have overcome this constraint by slightly increasing the extra cellular potassium concentration ([K+]e).

Up to now no experiments have been carried out related to the effects of extra cellular potassium on activity levels of antarctic crustaceans. During this cruise measurements of respiration rate of a benthic ampipod and the benthic shrimp Sclerocrangon were performed to test the hypothesis that the activity level of antarctic crustaceans is a function of [Mg2+]e and could be modulated by increasing the extra cellular potassium concentration.

We obtained benthic amphipods and benthic shrimps (Sclerocrangon) from various bottom trawls (AGT) in the Store Fjord. They were initially kept at –0.2 ± 0.5 °C in normal sea water containing about 50 mmol Mg++/l and 10 mmol K+/l and were given several days to acclimatise. After acclimatisation, oxygen consumption of 8 individuals was measured in a closed system (Amphipods) or in a flow through system (Sclerocrangon) by optical oxygen microsensors. After measurement the animals were transferred into a different aquarium which contained normal sea water plus 50 mmol Mg++/l and were kept for 24 hours. Afterwards, oxygen consumption was measured as described above. After this treatment, animals were transferred to aquaria with additional 3 mmol K+/l and they were kept for another 24 hours and tested afterwards. Following this experimental day, they were given 24h in normal sea water to recover and were once again tested under control conditions. This was done to exclude any effect of decreasing condition on the outcome of the experiment. During the experiments, no mortality occurs. After all experimental tests, body length (amphipods) or fresh weight (Sclerocrangon) of the eight individuals was measured.

Preliminary results

The increase of magnesium up to a level usually found in reptant decapod crustaceans had a pronounced effect on respiration rate of both species. In both species oxygen consumption decreases. This results strengthens our hypothesis that the biogeography of marine crustaceans in cold oceans is related to the combined effects of [Mg2+]e and low temperature. An increase of the Potassium concentration had an stimulating effect on oxygen consumption in both species although control levels were not reached. This results show that an increase in extra cellular potassium has a stimulating effect under the conditions of high extra cellular magnesium not only in molluscs but also in crustaceans. Further experiments concerning the role of extra cellular ion concentrations will be carried out at the AWI with the crustacean species caught during this cruise.

6.7 Benthos activities during winter

Deubel (AWI)

Benthic organisms are an important component of aquatic ecosystems. Compared to the most phytoplankton, zooplankton as well as smaller benthic taxa like bacteria, nanofauna and meiofauna, the macrofaunal organisms tend to become relatively old.

Thus, they are integrating indicators of the environmental conditions and seasonal variabilities. From this point of view macrobenthic organisms are an important link within the processes in the water column and the sea bottom. All sea floor living organisms are dependent on sinking flux of organic matter from the surface waters of the oceans. As there are no fresh plant food resources available at the floor of Arctic seas during the dark winter season, it is anticipated that benthos activities may be lower than in summer. While there is an abundant literature describing benthic nutrient fluxes, most studies have been conducted in either temperate areas or in the summerly ice free shallow environments of the arctic marginal seas. Natural respiration rates of benthic communities in permanent ice covered arctic ecosystems or during wintertime with the strong seasonally sea ice cover are still poorly known. This lack of information constrains our understanding of the functioning and dynamics of benthic marine ecosystems in the Arctic. The final objective of the benthological program was to calculate the benthos activities during wintertime measuring the benthic fluxes of total oxygen uptake rates. To investigate these activities, a multicorer was used to collect cores of sediment in the Barents Sea and Svalbard waters. The samples were taken at 24 stations in water depths ranging from 60 to 267 m. On board two sediment cores of the X were placed in a dark temperature-controlled container (≈ 0°C)and incubated for 24 to 80h. The cores were closed with lids with 3 to 34 cm of ambient overlaying circulated bottom water. Oxygen concentrations in the near-bottom water were measured at least before beginning and after finishing the experiments. The benthic respiration rates were calculated as the decrease of the constituent concentration versus time. The oxygen measurements were carried out by using optodes (Microx). After the incubation the macrofauna was separated from the sediment by sieving with a 250µm screen and preserved in 7% formaldehyde solution, buffered with borax.

Additional information about macro-zoobenthos activity and reproduction conditions were obtained from Agassiz Trawls (AGT). The macrofauna from the AGTs were pre-sorted in larger taxonomical levels and preserved in formalin. The species identification as well as the lipid and gonads investigations will be done in the home laboratory in Bremerhaven. The characters of the benthos assemblages sampled by the AGTs inhabitat typical soft bottom communities. The Storfjord was occupied by bottom communities, which were dominated by actinian covered gastropods and larger shrimp like crustacea. Additional higher amounts of Ciliatocardium ciliatum (bivalvia), Ctenodiscus crispatus (asteroidea) were found. In the Barents Sea most remarkable objects are Echinodermata like Uasterias linkii, Ctenodiscus crispatus and different species of ophiuroids.

Tab 1. Benthological stations during the Polarstern expedition WARPS

Station	Date	Latitude	Longitude	Depth [m]	MUC	AGT
PS64/004-2	06.03.03	75° 40.05' N	17° 18.98' E	203.6	X	
PS64/010-2	07.03.03	76° 20.01' N	16° 35.68' E	63.7	X	
PS64/013-2	07.03.03	76° 38.21' N	18° 3.78' E	247.3	X	
PS64/014-2	08.03.03	76° 35.40' N	20° 38.59' E	116.9	X	
PS64/015-8	08.03.03	76° 38.10' N	20° 9.61' E	206.8	X	
PS64/021-3	10.03.03	76° 50.17' N	19° 1.93' E	118.7	X	
PS64/021-4	10.03.03	76° 50.16' N	19° 1.88' E	117.2	X	

Station	Date	Latitude	Longitude	Depth [m]	MUC	AGT
PS64/022-4	10.03.03	76° 49.52' N	19° 17.54' E	141.2	X	
PS64/024-3	11.03.03	76° 49.66' N	19° 30.14' E	166.7	X	
PS64/025-3	11.03.03	76° 50.12' N	19° 43.62' E	166.0	X	
PS64/026-2	12.03.03	76° 50.04' N	19° 55.62' E	166.4	X	
PS64/029-2	14.03.03	76° 49.98' N	20° 22.57' E	129.7	X	
PS64/031-1	14.03.03	76° 59.60' N	20° 21.81' E	118.3	X	
PS64/034-2	15.03.03	77° 13.06' N	20° 27.97' E	90.7	X	
PS64/036-2	16.03.03	77° 29.38' N	20° 10.40' E	134.4		X
PS64/039-7	17.03.03	77° 31.58' N	20° 19.47' E	112.0	X	
PS64/041-2	17.03.03	77° 40.21' N	20° 29.66' E	61.1	X	
PS64/048-7	18.03.03	77° 29.47' N	19° 4.91' E	192.6	X	
PS64/050-2	18.03.03	77° 27.25' N	18° 31.58' E	99.2	X	
PS64/062-9	19.03.03	77° 12.11' N	19° 15.06' E	177.7	X	
PS64/064-2	20.03.03	77° 8.94' N	18° 50.26' E	124.3	X	
PS64/067-6	22.03.03	76° 26.06' N	21° 45.67' E	267.4	X	
PS64/070-5	23.03.03	76° 18.45' N	23° 19.96' E	114.1	X	
PS64/072-6	24.03.03	76° 4.84' N	25° 20.49' E	92.9	X	
PS64/075-6	25.03.03	75° 54.97' N	27° 1.22' E	229.3	X	X
PS64/076-4	25.03.03	75° 52.65' N	27° 29.78' E	255.9	X	
PS64/081-1	26.03.03	75° 30.24' N	27° 58.13' E	274.6		X

6.8 Submarine methane in the Storfjorden - its water in influence on benthic foraminifera, the 12C / 13C- ratio in the water column and in calcareous benthic foraminifera

Wollenburg (AWI)

Methane is one of the most important greenhouse gases. It is speculated that rapid climatic changes are caused by sudden high methane releases. The water column of Storfjorden reveals increased methane concentrations. Although these concentrations increase towards the north, neither their origin and source, nor their retention times in the water column are known or understood. It is further uncertain if and to what extend increased bottom water methane concentrations affect the local benthic fauna.

During the ARKXIX-1a expedition methane concentrations and isotopes were analyzed by Ellen Damm (see this volume). We will analyze the d13C (and d 18O) values of the water column and of calcareous benthic foraminifera tests. For this purpose we took approximately 400 water samples which will be analyzed during the following months at the AWI. It is assumed, that the d13C values of Storfjorden are significantly lower than those from areas of normal methane concentrations due to intensive methane oxidation (see article of E. Damm).

Benthic foraminifera are one of the most important benthic groups for long term environmental studies due to their high abundance, high fossil potential and sensitivity to environmental influences. During the ARKXIX-1a expedition samples for benthic foraminiferal analyses have been taken in 1cm-thick slices from the sediment surface down to 10 cm subbottom depth at 19 multicorer sites. During the following months they will be analyzed for their living and dead benthic foraminifera

communities. Furthermore, to reveal certain cell characteristics, at each site specimens of selected species were fixated for future transmission electron microscope analyses.
Preliminary onboard analyzes may indicate an increased abundance of benthic foraminifera species described from methane-influenced sites, at sites of increased bottom water methane concentrations. However, comprehensive investigations are needed to show whether this is an accidental phenomenon or a real relationship. By taking these foraminifera samples we also obtained the first winter foraminifera faunas from high northern latitudes. This is especially important because the distribution and abundance of subarctic to arctic benthic foraminifera is controlled by export production. The dark green protoplasm staining of living foraminifera indicated an unexpectedly high late winter primary production / ice algae production already at the beginning of this cruise. This production is presumably responsible for the surprisingly high standing stock (no. of living specimen). The observation of sexual and asexual reproducing specimen in late winter are a further unexpected quite spectacular observation. The foraminifera fauna of the top most sediment centimeter is dominated by Nonionellina labradorica, Robertinoides charlottensis, Recurvoides turbinatus, Labrospira crassimargo, Globobulimina aculeata, Reophax subfusiformis, Pyrgo williamsoni, Islandiella helenae, I. norcrossi, Silicosigmoilina groenlandica, Quinqueloculina agglutinata and Ammotium cassis (Fig. 6.8.A). Living specimens of these species have been found in summer samples at highly productive sites. However, during summer they are usually found much deeper in the sediment (>3 cm), whereas the surface centimetre is dominated by different species (e.g. phytodetritus species like Epistominella vitrea, E. exigua und E. pusilla), that are almost absent in the Storfjorden winter fauna.

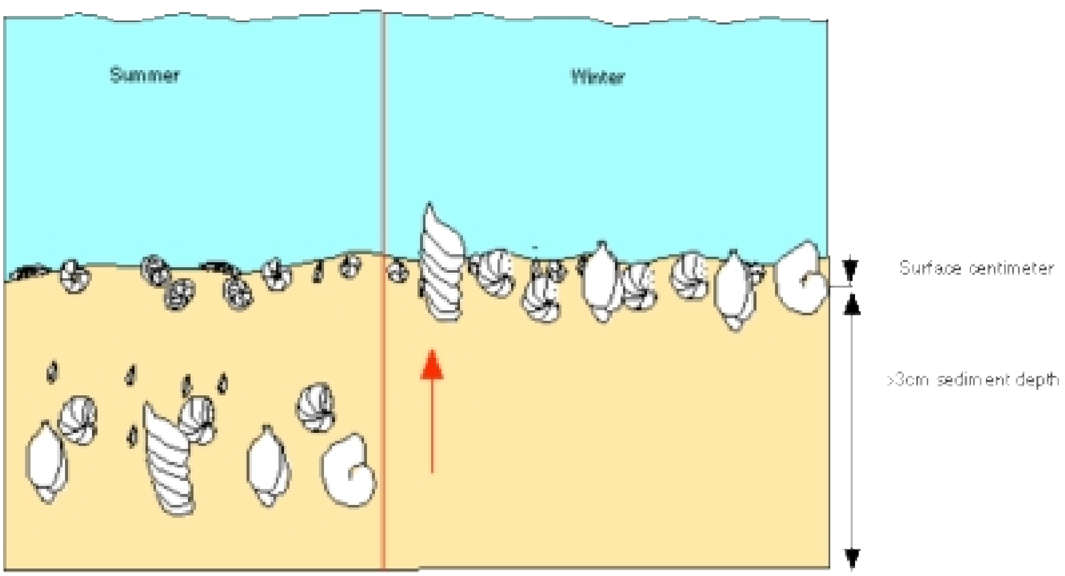


Figure 6.8.A

7. SEDIMENTOLOGY

Kukina (MMBI)

Reconstructions of the geological history of Svalbard`s shelf has fundamental scientific problem, because of peculiarities of evolution of the marine ecosystem in conditions of melting ice sheets, input of the sediment material, intensive sedimentogenesis and changing of sea water salinity in the modern period in connection with anthropogenic influences.

The main directions of the geological investigations:

- Modern periglacial processes and their influence on the geological, geomorphological and sedimentological details of archipelagoes.

- Influence of the ice sheet edge on formation of the frontal zones in the littoral areas.

Preliminary Results

During ARK XIX/1a, geological work was carried out at 17 stations (Fig. 1) from Storfjord, Svalbard. At 2 stations sea-ice sediments were sampled. Smear-slides were prepared from the surface layer (0-1cm) of bottom sediments and from sea-ice sediments in order to obtain the mineralogical composition of the clastic material from the sample material (Table 1).

Table 1
Volume of geological works in the ARK XIX/1a expedition

Station	Date	PositionLat	PositionLon	Depth [m]	Gear	Sea-Ice Sed	Smear-slide
PS64/004-2	06.03.03	75° 40.03' N	17° 18.58' E	201.3	MUC		+
PS64/012-2	07.03.03	76° 38.19' N	18° 3.68' E	247.3	MUC		+
PS64/014-2	08.03.03	76° 35.41' N	20° 38.54' E	117.6	MUC		+
PS64/015-8	08.03.03	76° 38.09' N	20° 9.63' E	206.7	MUC		+
PS64/021-3	10.03.03	76° 50.16' N	19° 1.92' E	118.5	MUC		+
PS64/021-2	10.03.03.	76° 50.18'N	19° 1.99' E	119.6	ICE	Ice-Core	+
PS64/024-3	11.03.03	76° 49.66' N	19° 30.11' E	167.2	MUC		+
PS64/029-2	14.03.03	76° 49.98' N	20° 22.56' E	130.2	MUC		+
PS64/031-2	14.03.03	76° 59.60' N	20° 21.76' E	117.2	MUC		+
PS64/034-2	15.03.03	77° 13.07' N	20° 28.01' E	91.9	MUC		+
PS64/039-7	17.03.03	77° 31.58' N	20° 19.48' E	111.6	MUC		+
PS64/041-2	17.03.03	77° 40.21' N	20° 29.66' E	61.4	MUC		+
PS64/048-7	18.03.03	77° 29.45' N	19° 4.68' E	188.4	MUC		+
PS64/062-9	19.03.03	77° 12.12' N	19° 14.97' E	177.7	MUC		+
PS64/062-2	19.03.03	77° 17.12' N	20° 02' E	177	ICE	Ice-Core	
PS64/064-2	20.03.03	77° 8.93' N	18° 50.30' E	124.5	MUC		+
PS64/067-6	22.03.03	76° 26.01' N	21° 45.23' E	266.4	MUC		+
PS64/70-5	23.03.03	76° 18.41' N	23° 20.13' E	114.7	MUC		
PS64/72-6	24.03.03	76° 4.82' N	25° 20.67' E	93.3	MUC		

Sea-Ice Sediment Investigation

Sediments in the sea-ice are important for erosion and distribution and consequently are a factor for the sediment budget of the Arctic Ocean.
The main targets of the field work was:

a) Tracing possible transport pathways of sea-ice sediments based on sedimentological parameters in surface deposits and sea-ice entrained material in source and melt areas.

b) Identification of sample composition, grain size distributions and mineral assemblages between sea-ice sediments in the different areas of the Arctic Ocean.

During the expedition ARK XIX/1a dirty sea-ice was sampled (Werner I., Schunemann H.). Shipboard sample analyses included:

1) Measured volumes of melted ice and water samples were filtered through 0.2mm filter papers (Schwarz J.N.). In the shore-based laboratory the filters will be weighed to quantify the load of sediments.
2) Melted ice and water samples were filtered through 0.2mm filters for mineralogical, granulometric analysis and study of morphology of quartz grains.
3) Smear-slide description for bulk mineral composition.

Smear-slide description of sea-ice sediments reveal fine-grained composition. Most of the sediment consisted of material less 63 mm in size. Terrigenous components accounted for more than 85% of all counted macelars. The sampled sediments consisted mainly of quartz and feldspar (Tab.2). The quartz was mostly clear, some grains included black minerals and air bubbles. Organic-clay-ferrous aggregates, heavy minerals, clay minerals and microorganisms accounted for 30%. Rock fragments, mica and black ores were generally less abundant (10-12%). Heavy minerals presented amphibole-garnet-black ores association.

Table 2
Mineralogical composition of the sea-ice sediments (%).

Station	Quartz	Feld spar	Mica	Heavy Mineral	Black Ores	Iron-Clay Aggregate	Rock Fragm	Clay Miner	Organic Remain
PS64/21	44	9	6	18	4	3	2	11	3

Surface sediments were taken with the multicorer (MUC, 12 tubes of 6 cm in diameter) for sedimentological (grain size distribution, heavy and light mineralogy and morphology of quartz grain estimates) investigations. In the cruise ARK XIX/1 for sedimentological investigations was sampling surface bottom sediments from multicorer (1 tube). The sediments were described and packed in plastic bags. The smer-slides were also prepared on board and bulk minerals described.

On board RV "Polarstern" the surface sediments cores were described visually. Sediment colours were identified according to the "Munsell Soil Color Chart". Smear-slides were prepared to obtain estimates of the bulk mineral composition, biogenic and terrigenous components.

All sediment surfaces consist of dark olive brown and olive gray mud, the dominant size fraction of which is clay and silt. Only at a few sites (PS64/04, PS64/21, PS64/64, PS64/70) sandy lithology appears. Terrigenous materials (mainly quartz, feldspar, mica and clay minerals) predominate. Heavy minerals include epidote, garnet, pyroxenes and iron hydroxides.

Biogenic components are of minor importance, though diatoms, benthic foraminifera, shell fragments and plant remains were always present. The most abundant organisms were polychaetes.

The uppermost dark brown to olive gray lithological unit of the sediment cores ranges from 2-20 cm in thickness. This strongly bioturbated unit resembles the sediment surface in the multicores and apparently reflects the depth of oxygenation. Below, the sediment color gradually darkened due to Fe precipitation. Bioturbation by living organisms (polychaetes) homogenizing the sediment column was observed down to 10 cm core depth.

Smear-slide analyses showed that quartz is the dominant mineral (24-36%), feldspar, clay minerals and mica were the next most important minerals (Table 3). The heavy minerals composed 14-18% and presented epidote, garnet, pyroxenes and black ores.

Table 3
Mineralogical composition of the surface layer (0-1cm) of bottom sediments (%).

Station	Quartz	Feld Spar	Mica	Calcite	Heavy Min.	Black Ores	Iron-Clay Aggregate	Rock Fragm	Clay Miner	Organic Remain
PS64/04	25.3	13.7	2.1	4.2	15.8	2.1	6.3	1.8	11.6	17.1
PS64/12	30.0	9.8	4.2	5.1	10.9	1.0	5.2	0.8	20.0	13.0
PS64/14	25.5	16.0	3.5	0.5	18.5	5.0	8.5	1.5	14.2	6.8
PS64/15	31.0	14.0	5.1	1.9	18.0	9.0	5.7	0.3	23.0	7.0
PS64/21	27.9	9.7	4.5	3.9	16.9	1.2	6.6	6.5	17.5	4.5
PS64/24	30.0	17.0	4.2	5.8	13.0	3.0	1.5	1.5	18.0	6.0
PS64/29	31,0	9,1	5,2	4,1	9,1	4,1	8,2	0,8	22,4	6,0
PS64/34	27,0	13,0	7,0	4,0	11,4	0,9	3,6	0,2	24,8	8,1
PS64/39	38.0	16.0	8.6	7.4	14.2	0.6	1.8	2.1	3.3	8.0
PS64/41	34.0	12.0	2.8	7.4	16.0	5.6	9.9	0.4	9.9	2.0
PS64/48	39.4	15.6	7.4	2.1	13.3	0.4	1.2	7.6	3.0	11.0
PS64/62	34.2	12.3	5.2	2.3	11.2	1.3	2.6	4.2	15.3	11.4
PS64/64	35.8	15.6	4.5	5.6	16.5	5.4	4.9	2.3	4.0	5.4
PS64/67	34.6	16.2	5.3	5.8	16.2	4.3	8.3	2.8	2.5	4.0

Further detailed sedimentological and mineralogical studies will follow to indentify the different source areas.

Future geological investigations in MMBI will include:

- Grain size distribution;
- heavy and light mineralogy
- Morphology of the quartz grain

PS64/04-2 (MUC)

Recovery: 0.25 cm

Storfjord Svalbard

75°40.03N 17°18.58E

ARK XIX/1a

Water Depth: 201.3 m

Lithology	Texture	Color	Description
		2.5Y3/2	0-16 cm Very dark grayish brown, sand silty clay, polychaetes 4-6 cm hard ground 6-8 cm gravel, pebbles 0.5-1 cm in diameter
		2.5Y3/0	16-25 cm Very dark gray, sand silty clay 24-25 cm Boiturbation, pebble 3cm in diameter

PS64/12-2 (MUC)

Recovery: 0.33 cm

Storfjord Svalbard

76°38.19N 18°3.68E

ARK XIX/1a

Water Depth: 247.3 m

Lithology	Texture	Color	Description
		10YR3/2	0-4 cm Very dark grayish brown, silty clay, polychaetes
		2.5Y3/2	4-18 cm Very dark grayish brown, silty clay, polychaetes
		5Y3/1	18-28 cm Very dark gray, silty clay 28-33 cm Boiturbation

PS64/14-2 (MUC)

Recovery: 0.16 cm

Storfjord Svalbard

76°35.41N 20°38.54E

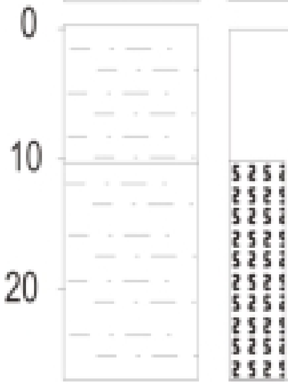
ARK XIX/1a

Water Depth: 117.6 m

Lithology	Texture	Color	Description
		2.5Y4/3	0-6 cm Olive brown, sand silty clay, pebbles 1-3 cm in diameter
		2.5Y3/2	6-16 cm Very dark grayish brown, silty clay Boiturbation

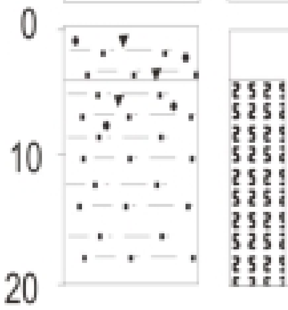
PS64/15-2 (MUC) | Storfjord Svalbard | **ARK XIX/1a**
Recovery: 0.26 cm | 76°38.09N 20°9.63E | Water Depth: 206.7 m

Lithology	Texture	Color	Description
		2.5Y3/3	0-10 cm Dark olive brown, silty clay, polychaetes
		5Y3/2	10-26 cm Dark olive gray, silty clay, bioturbated



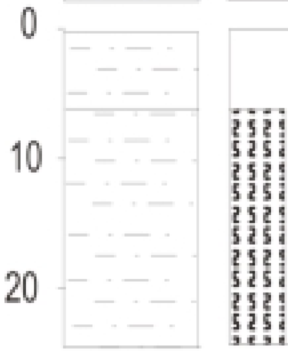
PS64/21-3 (MUC) | Storfjord Svalbard | **ARK XIX/1a**
Recovery: 0.20 cm | 76°50.16N 19°1.92E | Water Depth: 118.5 m

Lithology	Texture	Color	Description
		2.5Y3/3	0-4 cm Dark olive brown, gravel sand silty clay, polychaetes 0-2 cm dropstone 3 cm in diameter
		2.5Y3/0	4-20 cm Very dark gray, sand silty clay, bioturbated. 4-8 cm pebble, gravel 1.5 cm and less in diameter



PS64/24-3 (MUC) | Storfjord Svalbard | **ARK XIX/1a**
Recovery: 0.24 cm | 76°49.66N 19°30.11E | Water Depth: 167.2 m

Lithology	Texture	Color	Description
		2.5Y3/3	0-6 cm Dark olive brown, silty clay
		2.5Y3/0	6-24 cm Very dark gray, silty clay, bioturbated



PS64/29-2 (MUC) | Storfjord Svalbard | **ARK XIX/1a**

Recovery: 0.18 cm | 76° 49.98N 20° 22.56E | Water Depth: 130.2 m

Lithology	Texture	Color	Description
0–20		2.5Y3/3	0-6 cm Dark olive brown, silty clay
			4-6 cm Oxidized spots
		5Y3/2	6-18cm Dark olive gray, silty clay, bioturbated

PS64/34-2 (MUC) | Storfjord Svalbard | **ARK XIX/1a**

Recovery: 0.28 cm | 77° 13.07N 20° 28.01E | Water Depth: 91.9 m

Lithology	Texture	Color	Description
0–30		2.5Y3/3	0-8 cm Dark olive brown, silty clay
		2.5Y3/0	8-28cm Very dark gray, silty clay, bioturbated
			8-16 cm shells fragment, polychaetes

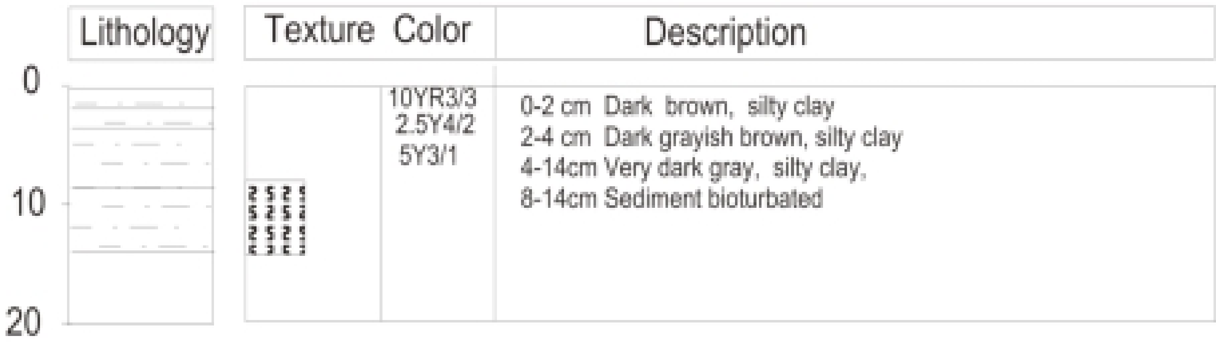
PS64/41-2 (MUC) | Storfjord Svalbard | **ARK XIX/1a**

Recovery: 0.28 cm | 77° 13.07N 20° 28.01E | Water Depth: 91.9 m

Lithology	Texture	Color	Description
0–30		2.5Y3/3	0-6 cm Dark olive brown, silty clay
		2.5Y3/0	6-28cm Very dark gray, silty clay, bioturbated

PS64/48-7 (MUC) Storfjord Svalbard **ARK XIX/1a**

Recovery: 0.14 cm 77°29.45N 19° 4.68E Water Depth: 188.4 m



PS64/62-9 (MUC) Storfjord Svalbard **ARK XIX/1a**

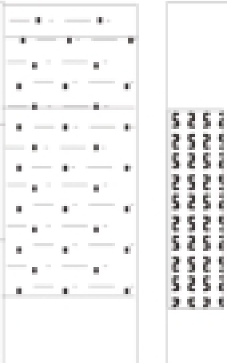
Recovery: 0.26 cm 77°12.12N 19° 14.97E Water Depth: 177.7 m

PS64/64-2 (MUC) Storfjord Svalbard **ARK XIX/1a**

Recovery: 0.34 cm 77°8.93N 18° 50.30E Water Depth: 124.5 m

PS64/67-6 (MUC) | Storfjord Svalbard | **ARK XIX/1a**

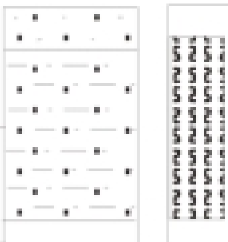
Recovery: 0.25 cm | 76° 26.01N 21 45.23E | Water Depth: 266.4 m



Depth	Lithology	Texture	Color	Description
0			2.5Y3/3	0-3 cm Dark olive brown, clayey sandy silt
			5Y3/2	3-9 cm Dark olive gray, clayey sandy silt,
10			2.5Y3/0	9-25cm Very dark gray, clayey sandy silt, bioturbated 20-2cm Shells fragment 24-25cm Oxidized spots
20				
30				

PS64/70-5 (MUC) | Storfjord Svalbard | **ARK XIX/1a**

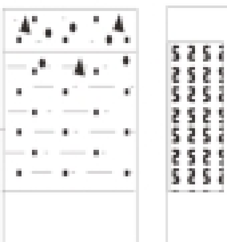
Recovery: 0.18 cm | 76° 18.41N 23 20.13E | Water Depth: 114.7 m



Depth	Lithology	Texture	Color	Description
0			2.5Y3/2	0-3 cm Dark olive brown, silty sand
			5Y3/1	3-18cm Very dark gray, clayey sandy silt, bioturbated, shells fragment 16-18cm Oxidized spots
10				
20				

PS64/72-6 (MUC) | Storfjord Svalbard | **ARK XIX/1a**

Recovery: 0.16 cm | 76° 4.82N 25° 20.67E | Water Depth: 93.3 m



Depth	Lithology	Texture	Color	Description
0			5Y4/2	0-3 cm Olive gray, gravel, sandy mud, 0-1 cm dropstones 3-5 cm in diameter
			5Y3/2	3-16cm Dark olive gray, clayey sandy silt, bioturbated, shells fragment 3-4 cm dropstones 4 sm in diameter (organogenic sandstone)
10				
20				

APPENDIX

A.1 Participants

A.2 Participating Institutions

A.3 Station List

A.1 Participants ARK XIX/1

Name	First Name	Institute	Profession
Alexandrov	Vitaly	NERSC	Oceanographist
Auel	Holger	Uni Bremen	Biologist
B□semann	Hinrich		Geologist/Journalist
Birnbaum	Gerit	AWI	Meteorologist
Buschmann	Marco	AWI	Engineer
Cohrs	Wolfgang	AWI	IT Technician
Damm	Ellen	AWI	Geologist
Debatin	Siegrid	AWI	Technician
Dimmler	Werner	Fielax	Electronic.Technician
Doble	Martin	SAMS Oban	Scientist
Fer	Ilker	Uni Bergen	Scientist
Fr□b	Ilker	Uni Bergen	Electronic.Technician
Gerchow	Peter	Fielax	Engineer
Gerdes	Birte	AWI	Ph.D. Student
Graf	Sabine	AWI	Student
Haas	Christian	AWI	Geophysician
Harms	Ingo	Uni Hamburg	Oceanographer
Hartmann	J□rg	AWI	Scientist
Herrmann	Regine	AWI	Student
Hollmann	Beate	AWI	Technician
Hughes	Nicolas	SAMS	Scientist
Jacobi	Hans-Werner	AWI	Chemist
Kern	Stefan	Uni Hamburg	Scientist
Kiko	Rainer	IP□	Student
Klein	Boris	AWI	Technician
Kukina	Natalja	KSC Murmansk	Geologist
Lieser	Jan	AWI	Meteorologist
Lobach	John	Ferra Dynamics	Geophysicist
L□pkes	Christof	AWI	Meteorologist
Martin	Torge	AWI	Student
Max	Thomas	AWI	Technician
Mercer	Duncan	SAMS	Engineer
Niehoff	Barbara	AWI	Scientist
Pascal	Robin	SAMS	Scientist
Pfaffling	Andreas	AWI	Geophysicist
Pisarev	Sergey	AWI	Oceanographer
Piskorzynski	Andreas	Fielax	Electron.Technician
Rudels	Bert	FIMR Helsinki	Oceanographer
Sartoris	Franz Josef	AWI	Biologis
Schauer	Ursula	AWI	Chief Scientist
Scheltz	Annette	IP□	Technician
Schmitz-K□ster	Dorothee	Radio Bremen	Journalist
Sch□nemann	Henrike	IP□	scientific. employee
Schwarz	Jill Nicola	AWI	Scientist

Name	First Name	Institute	Profession
Sirevaag	Anders	Uni Bergen	Student
Spieß	Thomas	TU Braunschweig	Meteorologist
Verhoeven	Roger	Fielax	Electron.Technician
Welsch	Andreas	Uni Hamburg	Technician
Werner	Iris	IP□	Biologist
Willmes	Sascha	AWI	Student
Wollenburg	Jutta	AWI	scientific employee
Yelland	Margaret	SAMS	Scientist

A.2 Participating Institutes ARK XIX/1

	Adresse **Address**
AWI Bremerhaven	Stiftung Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz-Gemeinschaft Postfach 12 01 61 27515 Bremerhaven
AWI Potsdam	Stiftung Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz-Gemeinschaft Telegrafenberg A43 D-14473 Potsdam
DWD	Deutscher Wetterdienst Jenfelder Allee 70A 22043 Hamburg
FIMR	Finnish Institute of Marine Research P.O. Box 33 Lyypekinkuja 3A FIN-00931 Helsinki, Finland
GIUB	Geophysical Institute, University of Bergen Allegaten 70 N-5007 Bergen, Norway
HSW	Helicopter Service Wasserthal GmbH Flughafen Hamburg 22335 Hamburg
IfMH	Institut für Meereskunde Universität Hamburg Troplowitzstrasse 7 22529 Hamburg

	Adresse Address
IF□N	Institut f□r □kologie und Naturschutz Abt. f□r Meeresbiologie Althanstr. 14 A-1090 Wien Austria
IP□	Institut f□r Polar□kologie Wischhofstr. 1-3 Geb. 12 24148 Kiel
MIH	Meteorologisches Institut Universit□t Hamburg Bundesstrasse 55 20146 Hamburg
MMBI	Murmansk Marine Biology Institute RAS 17 Vladimirskaya St. Murmansk 183010 Russia
NERSC	Nansen Environmental and Remote Sensing Center Edv. Griegsvei 3a N-5059 Bergen, Norway
RAS	P.P. Shirshov Institute of Oceanology 36, Nachimovsky prosp Moscow 117851 Russia
RB	Radio Bremen H□rfunk B□rgermeister-Spitta-Allee 45 28329 Bremen
SAMS	Scottish Association for Marine Science Dunstaffnage Marine Laboratory Oban, Argyll, PA37 1QA Great Britain
UB	Marine Zoology (FB2) University of Bremen P.O. Box 330 440 D-28334 Bremen

Station	Date	Time	PositionLat	PositionLon	Depth [m]	Windstrength	Course [°]	Speed [kn]	Gear	Gear Abbrevia
PS64/001-1	03.03.03	14:24	64° 35.46' N	6° 2.45' E	687.6	SW 10	201.7	2.0	Multiple net	MN
PS64/001-1	03.03.03	14:45	64° 35.40' N	6° 2.32' E	682.8	SSW 10	236.6	0.3	Multiple net	MN
PS64/001-1	03.03.03	14:46	64° 35.40' N	6° 2.32' E	671.2	SW 10	12.8	0.1	Multiple net	MN
PS64/001-1	03.03.03	15:05	64° 35.41' N	6° 2.43' E	681.2	SW 11	142.5	0.2	Multiple net	MN
PS64/001-2	03.03.03	15:11	64° 35.44' N	6° 2.47' E	680.4	SSW 12	264.9	0.5	Bongo net	BONGO
PS64/001-2	03.03.03	16:02	64° 35.53' N	6° 2.61' E	680.4	SW 10	206.4	0.0	Bongo net	BONGO
PS64/001-3	03.03.03	16:15	64° 35.56' N	6° 2.78' E	343.2	SW 10	15.6	0.2	Multiple net	MN
PS64/001-3	03.03.03	16:19	64° 35.56' N	6° 2.81' E	345.6	SSW 10	74.1	0.6	Multiple net	MN
PS64/001-3	03.03.03	16:27	64° 35.55' N	6° 2.87' E	345.2	SSW 12	59.7	1.3	Multiple net	MN
PS64/001-4	03.03.03	16:34	64° 35.59' N	6° 2.96' E	342.4	SW 7	47.5	0.4	Nansen Net	NN
PS64/001-4	03.03.03	16:38	64° 35.61' N	6° 3.01' E	342.8	SSW 7	342.8	0.2	Nansen Net	NN
PS64/001-4	03.03.03	16:45	64° 35.67' N	6° 3.13' E	342.4	SSW 11	25.1	0.5	Nansen Net	NN
PS64/001-5	03.03.03	16:52	64° 35.72' N	6° 3.21' E	342.0	SSW 10	60.1	0.5	CTD	CTD
PS64/001-5	03.03.03	17:03	64° 35.77' N	6° 3.35' E	339.2	SW 10	51.3	0.1	CTD	CTD
PS64/001-5	03.03.03	17:04	64° 35.77' N	6° 3.36' E	339.6	SW 11	77.3	0.6	CTD	CTD
PS64/001-6	03.03.03	17:33	64° 35.80' N	6° 3.77' E	341.2	SSW 10	303.9	0.1	Bongo net	BONGO
PS64/001-6	03.03.03	17:36	64° 35.81' N	6° 3.81' E	341.2	SW 11	44.7	0.7	Bongo net	BONGO
PS64/001-6	03.03.03	17:41	64° 35.81' N	6° 3.87' E	341.6	SW 10	141.0	0.2	Bongo net	BONGO
PS64/002-1	04.03.03	16:36	68° 35.59' N	9° 55.65' E	2806.0	WSW 3	28.0	11.2	Calibration	CAL
PS64/002-1	04.03.03	17:00	68° 36.06' N	9° 57.03' E	2817.2	WSW 3	167.9	0.5	Calibration	CAL
PS64/003-1	05.03.03	15:38	72° 30.41' N	14° 14.94' E	1021.9	WNW 8	2.3	11.4	Calibration	CAL
PS64/003-1	05.03.03	16:24	72° 30.59' N	14° 15.80' E	1015.0	W 7	2.4	11.4	Calibration	CAL
PS64/004-1	06.03.03	11:06	75° 40.14' N	17° 20.14' E	200.0	NE 6	263.0	0.8	CTD/rosette w	CTD/RO
PS64/004-1	06.03.03	11:14	75° 40.13' N	17° 19.73' E	204.2	NE 6	315.0	0.3	CTD/rosette w	CTD/RO
PS64/004-1	06.03.03	11:25	75° 40.07' N	17° 19.29' E	199.6	NE 7	246.1	1.0	CTD/rosette w	CTD/RO
PS64/004-2	06.03.03	11:30	75° 40.05' N	17° 18.98' E	203.6	NE 6	238.8	1.4	Multi corer	MUC
PS64/004-2	06.03.03	11:38	75° 40.03' N	17° 18.58' E	201.3	ENE 6	253.7	0.7	Multi corer	MUC
PS64/004-2	06.03.03	11:43	75° 40.02' N	17° 18.30' E	200.5	NE 7	268.1	1.2	Multi corer	MUC
PS64/005-1	06.03.03	13:30	75° 49.41' N	17° 10.57' E	304.5	NE 7	217.2	0.7	CTD/rosette w	CTD/RO
PS64/005-1	06.03.03	13:40	75° 49.35' N	17° 10.29' E	303.9	NE 8	239.2	0.4	CTD/rosette w	CTD/RO
PS64/005-1	06.03.03	13:54	75° 49.25' N	17° 9.89' E	303.7	NE 8	243.2	0.4	CTD/rosette w	CTD/RO
PS64/006-1	06.03.03	15:20	75° 58.29' N	17° 1.70' E	327.8	NE 6	45.4	0.3	CTD/rosette w	CTD/RO
PS64/006-1	06.03.03	15:30	75° 58.27' N	17° 1.55' E	328.2	ENE 8	302.6	0.2	CTD/rosette w	CTD/RO
PS64/006-1	06.03.03	15:47	75° 58.22' N	17° 1.22' E	326.9	NE 8	216.5	0.3	CTD/rosette w	CTD/RO
PS64/006-2	06.03.03	16:00	75° 58.19' N	17° 1.08' E	326.0	NE 8	349.4	0.1	Multiple net	MN

PS64/006-2	06.03.03	16:13	75° 58.16' N	17° 1.01' E	326.2	NE 8	83.7	0.4	Multiple net	MN
PS64/006-2	06.03.03	16:34	75° 58.11' N	17° 0.81' E	326.0	NE 7	353.8	0.1	Multiple net	MN
PS64/006-3	06.03.03	16:48	75° 58.04' N	17° 0.74' E	327.0	NE 8	182.5	0.2	Bongo net	BONGO
PS64/006-3	06.03.03	16:59	75° 57.98' N	17° 0.63' E	326.1	ENE 8	228.5	0.6	Bongo net	BONGO
PS64/006-3	06.03.03	17:18	75° 57.91' N	17° 0.52' E	326.7	NE 8	74.0	0.3	Bongo net	BONGO
PS64/006-4	06.03.03	17:20	75° 57.90' N	17° 0.52' E	326.1	NE 8	247.4	0.2	Bongo net	BONGO
PS64/006-4	06.03.03	17:32	75° 57.84' N	17° 0.46' E	326.1	NE 9	189.2	0.2	Bongo net	BONGO
PS64/006-4	06.03.03	17:49	75° 57.74' N	17° 0.33' E	325.8	NE 8	194.3	0.2	Bongo net	BONGO
PS64/006-5	06.03.03	17:58	75° 57.70' N	17° 0.28' E	325.8	NE 9	131.0	0.2	Nansen Net	NN
PS64/006-5	06.03.03	18:13	75° 57.62' N	16° 59.95' E	327.3	ENE 11	220.9	0.3	Nansen Net	NN
PS64/006-5	06.03.03	18:30	75° 57.54' N	16° 59.67' E	327.0	NE 9	230.4	1.3	Nansen Net	NN
PS64/007-1	06.03.03	19:58	76° 7.32' N	16° 53.39' E	324.1	NE 10	295.2	0.4	CTD/rosette w	CTD/RO
PS64/007-1	06.03.03	20:09	76° 7.35' N	16° 53.24' E	323.9	NE 10	279.3	0.3	CTD/rosette w	CTD/RO
PS64/007-1	06.03.03	20:18	76° 7.35' N	16° 53.11' E	324.6	NE 10	230.9	0.3	CTD/rosette w	CTD/RO
PS64/008-1	06.03.03	21:11	76° 12.20' N	16° 47.49' E	316.8	NE 12	284.3	0.8	CTD/rosette w	CTD/RO
PS64/008-1	06.03.03	21:21	76° 12.22' N	16° 47.01' E	315.5	NE 10	298.4	0.7	CTD/rosette w	CTD/RO
PS64/008-1	06.03.03	21:31	76° 12.22' N	16° 46.54' E	309.0	NE 10	264.3	0.6	CTD/rosette w	CTD/RO
PS64/009-1	06.03.03	22:54	76° 16.30' N	16° 42.19' E	170.2	NE 14	273.2	1.5	CTD/rosette w	CTD/RO
PS64/009-1	06.03.03	23:00	76° 16.29' N	16° 41.58' E	165.9	NE 13	281.4	1.2	CTD/rosette w	CTD/RO
PS64/009-1	06.03.03	23:05	76° 16.30' N	16° 41.17' E	162.7	ENE 11	278.5	1.2	CTD/rosette w	CTD/RO
PS64/010-1	06.03.03	23:47	76° 19.98' N	16° 38.89' E	68.1	ENE 16	272.2	2.1	CTD/rosette w	CTD/RO
PS64/010-1	06.03.03	23:51	76° 20.00' N	16° 38.34' E	65.0	ENE 15	279.7	2.0	CTD/rosette w	CTD/RO
PS64/010-1	06.03.03	23:56	76° 20.02' N	16° 37.61' E	64.9	ENE 14	273.6	2.3	CTD/rosette w	CTD/RO
PS64/010-2	07.03.03	00:08	76° 20.01' N	16° 35.68' E	63.7	ENE 15	274.3	2.0	Multi corer	MUC
PS64/010-2	07.03.03	00:11	76° 20.02' N	16° 35.26' E	63.6	ENE 17	277.3	2.0	Multi corer	MUC
PS64/010-2	07.03.03	00:15	76° 20.03' N	16° 34.67' E	61.4	ENE 16	278.7	2.0	Multi corer	MUC
PS64/011-1	07.03.03	06:55	76° 38.81' N	17° 33.84' E	153.2	NE 11	264.6	0.3	CTD/rosette w	CTD/RO
PS64/011-1	07.03.03	07:02	76° 38.80' N	17° 33.76' E	152.4	NE 12	188.6	0.1	CTD/rosette w	CTD/RO
PS64/011-1	07.03.03	07:12	76° 38.78' N	17° 33.70' E	152.8	NE 11	14.3	0.0	CTD/rosette w	CTD/RO
PS64/012-1	07.03.03	11:26	76° 37.46' N	17° 59.79' E	228.1	NE 14	244.9	1.0	Ice station	ICE
PS64/012-1	07.03.03	11:32	76° 37.42' N	17° 59.44' E	225.1	NE 16	242.8	1.0	Ice station	ICE
PS64/012-1	07.03.03	11:46	76° 37.32' N	17° 58.61' E	225.4	NE 16	242.2	0.9	Ice station	ICE
PS64/012-1	07.03.03	12:49	76° 36.83' N	17° 55.00' E	223.6	NE 17	245.0	1.0	Ice station	ICE
PS64/012-1	07.03.03	12:54	76° 36.79' N	17° 54.73' E	224.2	NE 19	241.5	1.0	Ice station	ICE
PS64/012-1	07.03.03	12:56	76° 36.77' N	17° 54.63' E	223.1	NE 17	239.0	0.9	Ice station	ICE
PS64/013-1	07.03.03	16:35	76° 38.24' N	18° 4.14' E	270.5	NE 17	246.0	0.5	CTD/rosette w	CTD/RO
PS64/013-1	07.03.03	16:44	76° 38.24' N	18° 4.09' E	303.8	NE 19	47.0	0.0	CTD/rosette w	CTD/RO

PS64/013-1	07.03.03	16:54	76° 38.22' N	18° 3.92' E	249.3	NE 16	47.1	0.0	CTD/rosette w	CTD/RO
PS64/013-2	07.03.03	17:01	76° 38.21' N	18° 3.78' E	247.3	NE 17	47.2	0.0	Multi corer	MUC
PS64/013-2	07.03.03	17:07	76° 38.19' N	18° 3.68' E	247.3	NE 17	47.2	0.0	Multi corer	MUC
PS64/013-2	07.03.03	17:14	76° 38.18' N	18° 3.56' E	249.4	NE 18	47.2	0.0	Multi corer	MUC
PS64/014-1	08.03.03	12:36	76° 35.34' N	20° 39.31' E	125.5	W 5	27.2	0.6	CTD/rosette w	CTD/RO
PS64/014-1	08.03.03	12:41	76° 35.37' N	20° 39.24' E	126.6	W 4	339.7	0.4	CTD/rosette w	CTD/RO
PS64/014-1	08.03.03	12:46	76° 35.38' N	20° 39.08' E	127.4	W 4	299.8	0.5	CTD/rosette w	CTD/RO
PS64/014-2	08.03.03	13:07	76° 35.40' N	20° 38.59' E	116.9	W 4	70.2	0.1	Multi corer	MUC
PS64/014-2	08.03.03	13:11	76° 35.41' N	20° 38.54' E	117.6	W 4	233.6	0.0	Multi corer	MUC
PS64/014-2	08.03.03	13:15	76° 35.41' N	20° 38.50' E	119.3	W 4	233.1	0.0	Multi corer	MUC
PS64/014-3	08.03.03	13:24	76° 35.37' N	20° 38.48' E	120.1	W 4	333.7	0.2	CTD/rosette w	CTD/RO
PS64/014-3	08.03.03	13:29	76° 35.43' N	20° 37.90' E	121.3	W 4	292.0	1.8	CTD/rosette w	CTD/RO
PS64/014-3	08.03.03	13:36	76° 35.46' N	20° 37.63' E	120.1	WSW 4	297.2	1.0	CTD/rosette w	CTD/RO
PS64/014-4	08.03.03	13:56	76° 35.41' N	20° 37.64' E	122.0	WSW 6	255.7	0.3	Ice station	ICE
PS64/014-4	08.03.03	14:00	76° 35.43' N	20° 37.55' E	122.2	WSW 6	288.1	0.3	Ice station	ICE
PS64/014-4	08.03.03	14:05	76° 35.45' N	20° 37.47' E	122.4	WSW 6	325.1	0.4	Ice station	ICE
PS64/014-4	08.03.03	15:21	76° 35.60' N	20° 37.13' E	124.0	SW 6	23.7	0.0	Ice station	ICE
PS64/014-4	08.03.03	15:22	76° 35.60' N	20° 37.13' E	123.1	SW 6	23.7	0.0	Ice station	ICE
PS64/014-4	08.03.03	15:27	76° 35.61' N	20° 37.13' E	123.7	WSW 5	24.8	0.0	Ice station	ICE
PS64/015-1	08.03.03	17:33	76° 38.24' N	20° 6.13' E	205.3	SW 4	104.5	0.3	CTD/rosette w	CTD/RO
PS64/015-1	08.03.03	17:40	76° 38.23' N	20° 6.32' E	206.1	SW 4	90.6	0.4	CTD/rosette w	CTD/RO
PS64/015-1	08.03.03	17:47	76° 38.24' N	20° 6.52' E	208.3	SW 4	64.3	0.5	CTD/rosette w	CTD/RO
PS64/015-2	08.03.03	18:02	76° 38.22' N	20° 6.69' E	207.5	SW 3	145.6	0.5	Multiple net	MN
PS64/015-2	08.03.03	18:13	76° 38.21' N	20° 7.33' E	211.1	SSW 4	102.1	0.9	Multiple net	MN
PS64/015-2	08.03.03	18:28	76° 38.21' N	20° 7.47' E	215.5	SSW 4	199.6	0.0	Multiple net	MN
PS64/015-3	08.03.03	18:38	76° 38.19' N	20° 7.59' E	215.8	SSW 3	191.9	0.9	Bongo net	BONGO
PS64/015-3	08.03.03	18:45	76° 38.15' N	20° 7.94' E	216.5	SSW 4	101.7	1.2	Bongo net	BONGO
PS64/015-3	08.03.03	18:57	76° 38.19' N	20° 8.40' E	217.7	SSW 4	52.4	0.6	Bongo net	BONGO
PS64/015-4	08.03.03	18:59	76° 38.19' N	20° 8.40' E	217.5	SSW 4	33.8	0.5	Bongo net	BONGO
PS64/015-4	08.03.03	19:07	76° 38.16' N	20° 8.45' E	217.4	SSW 3	194.9	0.0	Bongo net	BONGO
PS64/015-4	08.03.03	19:19	76° 38.17' N	20° 8.70' E	216.4	S 3	55.0	0.5	Bongo net	BONGO
PS64/015-5	08.03.03	19:21	76° 38.17' N	20° 8.81' E	215.3	S 3	90.4	0.5	Bongo net	BONGO
PS64/015-5	08.03.03	19:29	76° 38.13' N	20° 9.15' E	216.1	S 2	104.5	0.7	Bongo net	BONGO
PS64/015-5	08.03.03	19:41	76° 38.13' N	20° 9.14' E	214.6	S 3	173.1	0.0	Bongo net	BONGO
PS64/015-6	08.03.03	19:47	76° 38.13' N	20° 9.19' E	214.0	S 2	173.1	0.0	Nansen Net	NN
PS64/015-6	08.03.03	19:56	76° 38.13' N	20° 9.25' E	213.7	SSE 2	173.2	0.0	Nansen Net	NN
PS64/015-6	08.03.03	20:08	76° 38.13' N	20° 9.34' E	211.2	SSE 2	173.1	0.0	Nansen Net	NN

PS64/015-7	08.03.03	20:20	76° 38.12' N	20° 9.42' E	209.0	SSE 2	173.1	0.0	Multiple net	MN
PS64/015-7	08.03.03	20:28	76° 38.12' N	20° 9.48' E	209.0	SE 2	173.0	0.0	Multiple net	MN
PS64/015-7	08.03.03	20:38	76° 38.11' N	20° 9.54' E	208.2	ESE 1	173.1	0.0	Multiple net	MN
PS64/015-8	08.03.03	20:51	76° 38.10' N	20° 9.61' E	206.8	E 2	173.1	0.0	Multi corer	MUC
PS64/015-8	08.03.03	20:57	76° 38.09' N	20° 9.63' E	206.7	E 2	173.0	0.0	Multi corer	MUC
PS64/015-8	08.03.03	21:04	76° 38.09' N	20° 9.66' E	207.6	ENE 2	173.1	0.0	Multi corer	MUC
PS64/016-1	09.03.03	09:03	76° 38.63' N	19° 30.53' E	198.5	ENE 3	33.8	0.0	CTD/rosette w	CTD/RO
PS64/016-1	09.03.03	09:11	76° 38.60' N	19° 30.52' E	198.5	E 2	187.0	0.2	CTD/rosette w	CTD/RO
PS64/016-1	09.03.03	09:19	76° 38.59' N	19° 30.53' E	199.0	ENE 3	33.5	0.0	CTD/rosette w	CTD/RO
PS64/016-2	09.03.03	09:41	76° 38.58' N	19° 30.49' E	199.2	E 3	358.6	0.0	Ice station	ICE
PS64/016-2	09.03.03	09:45	76° 38.58' N	19° 30.48' E	199.5	ENE 3	358.6	0.0	Ice station	ICE
PS64/016-2	09.03.03	09:52	76° 38.57' N	19° 30.46' E	199.3	ENE 3	358.5	0.0	Ice station	ICE
PS64/016-2	09.03.03	10:55	76° 38.44' N	19° 30.05' E	206.0	ENE 6	357.8	0.0	Ice station	ICE
PS64/016-2	09.03.03	10:58	76° 38.43' N	19° 30.01' E	204.6	ENE 6	357.7	0.0	Ice station	ICE
PS64/016-2	09.03.03	10:59	76° 38.43' N	19° 30.00' E	204.5	ENE 5	357.7	0.0	Ice station	ICE
PS64/017-1	09.03.03	13:16	76° 38.51' N	19° 21.59' E	198.5	NE 7	263.7	0.6	CTD/rosette w	CTD/RO
PS64/017-1	09.03.03	13:23	76° 38.49' N	19° 21.34' E	197.1	ENE 7	266.6	0.5	CTD/rosette w	CTD/RO
PS64/017-1	09.03.03	13:35	76° 38.47' N	19° 21.02' E	196.3	ENE 6	277.2	0.0	CTD/rosette w	CTD/RO
PS64/018-1	09.03.03	14:29	76° 38.69' N	19° 14.78' E	182.7	ENE 6	263.6	0.5	CTD/rosette w	CTD/RO
PS64/018-1	09.03.03	14:35	76° 38.68' N	19° 14.61' E	183.3	ENE 6	272.9	0.5	CTD/rosette w	CTD/RO
PS64/018-1	09.03.03	14:40	76° 38.67' N	19° 14.46' E	182.6	ENE 6	269.5	0.4	CTD/rosette w	CTD/RO
PS64/019-1	09.03.03	15:50	76° 38.51' N	19° 6.64' E	148.2	ENE 5	265.2	0.2	CTD/rosette w	CTD/RO
PS64/019-1	09.03.03	15:56	76° 38.50' N	19° 6.50' E	146.7	NE 5	262.6	0.3	CTD/rosette w	CTD/RO
PS64/019-1	09.03.03	16:04	76° 38.49' N	19° 6.42' E	146.7	ENE 6	278.6	0.0	CTD/rosette w	CTD/RO
PS64/020-1	09.03.03	20:49	76° 38.30' N	19° 0.06' E	128.0	NNE 6	186.6	0.2	CTD/rosette w	CTD/RO
PS64/020-1	09.03.03	20:56	76° 38.27' N	19° 0.01' E	128.2	NNE 5	191.1	0.2	CTD/rosette w	CTD/RO
PS64/020-1	09.03.03	21:02	76° 38.26' N	19° 0.00' E	128.3	NNE 5	291.8	0.0	CTD/rosette w	CTD/RO
PS64/021-1	10.03.03	10:45	76° 50.20' N	19° 2.05' E	119.5	NE 2	19.7	0.0	CTD/rosette w	CTD/RO
PS64/021-1	10.03.03	10:54	76° 50.18' N	19° 2.01' E	119.7	NE 2	19.6	0.0	CTD/rosette w	CTD/RO
PS64/021-1	10.03.03	10:59	76° 50.18' N	19° 2.00' E	119.7	NE 2	19.5	0.0	CTD/rosette w	CTD/RO
PS64/021-2	10.03.03	11:00	76° 50.18' N	19° 1.99' E	119.6	NNE 2	19.4	0.0	Ice station	ICE
PS64/021-3	10.03.03	11:14	76° 50.17' N	19° 1.93' E	118.7	NNE 2	18.7	0.0	Multi corer	MUC
PS64/021-3	10.03.03	11:16	76° 50.16' N	19° 1.92' E	118.5	NNE 2	18.7	0.0	Multi corer	MUC
PS64/021-3	10.03.03	11:22	76° 50.16' N	19° 1.89' E	118.2	NNE 2	18.1	0.0	Multi corer	MUC
PS64/021-4	10.03.03	11:25	76° 50.16' N	19° 1.88' E	117.2	NNE 2	17.4	0.0	Multi corer	MUC
PS64/021-4	10.03.03	11:29	76° 50.15' N	19° 1.85' E	117.6	NNE 2	16.3	0.0	Multi corer	MUC
PS64/021-4	10.03.03	11:33	76° 50.15' N	19° 1.83' E	117.3	NNE 3	15.8	0.0	Multi corer	MUC

PS64/021-2	10.03.03	11:50	76° 50.12' N	19° 1.72' E	116.2	N 6	11.4	0.0	Ice station	ICE
PS64/021-2	10.03.03	11:51	76° 50.12' N	19° 1.71' E	116.3	N 7	9.5	0.0	Ice station	ICE
PS64/022-1	10.03.03	19:51	76° 49.60' N	19° 17.46' E	140.9	ENE 4	149.3	0.0	CTD/rosette w	CTD/RO
PS64/022-1	10.03.03	20:05	76° 49.59' N	19° 17.47' E	140.6	ENE 4	149.2	0.0	CTD/rosette w	CTD/RO
PS64/022-1	10.03.03	20:11	76° 49.58' N	19° 17.48' E	140.8	ENE 3	326.5	0.3	CTD/rosette w	CTD/RO
PS64/022-2	10.03.03	20:37	76° 49.52' N	19° 17.56' E	142.5	ENE 3	166.7	0.3	CTD/rosette w	CTD/RO
PS64/022-2	10.03.03	20:42	76° 49.53' N	19° 17.54' E	142.2	ENE 3	147.4	0.0	CTD/rosette w	CTD/RO
PS64/022-2	10.03.03	20:50	76° 49.53' N	19° 17.54' E	141.2	E 3	147.4	0.0	CTD/rosette w	CTD/RO
PS64/022-3	10.03.03	20:54	76° 49.53' N	19° 17.54' E	141.0	E 3	147.4	0.0	Mini corer	MIC
PS64/022-3	10.03.03	20:58	76° 49.52' N	19° 17.54' E	141.5	E 3	147.4	0.0	Mini corer	MIC
PS64/022-3	10.03.03	21:02	76° 49.52' N	19° 17.54' E	141.3	E 3	147.4	0.0	Mini corer	MIC
PS64/022-4	10.03.03	21:03	76° 49.52' N	19° 17.54' E	141.2	E 3	147.4	0.0	Multi corer	MUC
PS64/022-4	10.03.03	21:08	76° 49.52' N	19° 17.53' E	140.8	E 2	147.4	0.0	Multi corer	MUC
PS64/022-4	10.03.03	21:12	76° 49.51' N	19° 17.53' E	140.8	E 3	147.4	0.0	Multi corer	MUC
PS64/023-1	11.03.03	06:45	76° 50.04' N	19° 24.82' E	167.3	ESE 5	97.9	0.0	Mooring	MOR
PS64/023-1	11.03.03	06:49	76° 50.04' N	19° 24.82' E	166.4	ESE 5	97.9	0.0	Mooring	MOR
PS64/023-1	11.03.03	07:19	76° 50.04' N	19° 24.82' E	167.4	E 6	97.1	0.0	Mooring	MOR
PS64/023-1	11.03.03	07:19	76° 50.04' N	19° 24.82' E	167.4	E 6	97.1	0.0	Mooring	MOR
PS64/024-1	11.03.03	10:30	76° 49.67' N	19° 30.21' E	5440.0	E 6	124.0	0.0	Ice station	ICE
PS64/024-1	11.03.03	10:37	76° 49.67' N	19° 30.22' E	6582.0	ENE 7	169.0	0.1	Ice station	ICE
PS64/024-1	11.03.03	11:21	76° 49.68' N	19° 30.22' E	8850.0	E 6	124.0	0.0	Ice station	ICE
PS64/024-1	11.03.03	11:27	76° 49.68' N	19° 30.22' E	9223.0	ENE 6	123.2	0.3	Ice station	ICE
PS64/024-2	11.03.03	12:14	76° 49.65' N	19° 30.31' E	163.2	E 6	137.2	0.0	CTD/rosette w	CTD/RO
PS64/024-2	11.03.03	12:20	76° 49.65' N	19° 30.30' E	163.2	E 5	134.8	0.0	CTD/rosette w	CTD/RO
PS64/024-2	11.03.03	12:58	76° 49.67' N	19° 30.12' E	163.6	E 6	305.6	0.5	CTD/rosette w	CTD/RO
PS64/024-3	11.03.03	13:15	76° 49.66' N	19° 30.14' E	166.7	ENE 5	293.2	0.2	Multi corer	MUC
PS64/024-3	11.03.03	13:19	76° 49.66' N	19° 30.11' E	167.2	ENE 6	288.3	0.2	Multi corer	MUC
PS64/024-3	11.03.03	13:25	76° 49.67' N	19° 30.10' E	166.0	ENE 6	306.2	0.2	Multi corer	MUC
PS64/025-1	11.03.03	17:59	76° 50.11' N	19° 43.63' E	166.2	E 3	90.1	0.0	CTD/rosette w	CTD/RO
PS64/025-1	11.03.03	18:06	76° 50.12' N	19° 43.62' E	166.8	E 3	90.1	0.0	CTD/rosette w	CTD/RO
PS64/025-1	11.03.03	18:14	76° 50.11' N	19° 43.62' E	166.6	E 4	90.1	0.0	CTD/rosette w	CTD/RO
PS64/025-2	11.03.03	18:26	76° 50.12' N	19° 43.62' E	166.3	E 4	90.1	0.0	Nansen Net	NN
PS64/025-2	11.03.03	18:34	76° 50.12' N	19° 43.62' E	165.8	E 3	90.2	0.0	Nansen Net	NN
PS64/025-2	11.03.03	18:44	76° 50.12' N	19° 43.62' E	166.0	ENE 4	90.2	0.0	Nansen Net	NN
PS64/025-2	11.03.03	18:46	76° 50.12' N	19° 43.62' E	165.8	ENE 3	90.3	0.0	Nansen Net	NN
PS64/025-2	11.03.03	18:54	76° 50.12' N	19° 43.62' E	166.5	E 4	90.2	0.0	Nansen Net	NN
PS64/025-2	11.03.03	19:03	76° 50.12' N	19° 43.62' E	167.0	ENE 4	90.3	0.0	Nansen Net	NN

PS64/025-3	11.03.03	19:14	76° 50.12' N	19° 43.62' E	166.0	ENE 4	90.4	0.0	Multi corer	MUC
PS64/025-3	11.03.03	19:19	76° 50.12' N	19° 43.62' E	166.0	ENE 4	90.4	0.0	Multi corer	MUC
PS64/025-3	11.03.03	19:24	76° 50.12' N	19° 43.62' E	166.0	ENE 4	90.4	0.0	Multi corer	MUC
PS64/026-1	12.03.03	02:27	76° 50.04' N	19° 55.58' E	165.5	E 4	276.4	0.2	CTD/rosette w	CTD/RO
PS64/026-1	12.03.03	02:34	76° 50.04' N	19° 55.61' E	166.3	E 3	354.6	0.1	CTD/rosette w	CTD/RO
PS64/026-1	12.03.03	02:43	76° 50.04' N	19° 55.63' E	165.6	E 3	95.4	0.0	CTD/rosette w	CTD/RO
PS64/026-2	12.03.03	02:55	76° 50.04' N	19° 55.62' E	166.4	E 4	96.6	0.0	Multi corer	MUC
PS64/026-2	12.03.03	03:00	76° 50.04' N	19° 55.62' E	165.9	E 3	96.6	0.0	Multi corer	MUC
PS64/026-2	12.03.03	03:05	76° 50.04' N	19° 55.62' E	165.9	E 3	96.2	0.0	Multi corer	MUC
PS64/027-1	12.03.03	07:12	76° 49.37' N	20° 11.18' E	165.1	W 3	58.3	0.2	CTD/rosette w	CTD/RO
PS64/027-1	12.03.03	07:16	76° 49.37' N	20° 11.22' E	165.3	WNW 3	76.2	0.2	CTD/rosette w	CTD/RO
PS64/027-1	12.03.03	07:22	76° 49.37' N	20° 11.22' E	165.0	WNW 3	179.9	0.0	CTD/rosette w	CTD/RO
PS64/027-1	12.03.03	07:30	76° 49.37' N	20° 11.26' E	168.0	WNW 3	180.4	0.0	CTD/rosette w	CTD/RO
PS64/028-1	12.03.03	08:20	0° 0.00' N	0° 0.00' E	0.0	N 0	0.0	0.0	Ice station	ICE
PS64/028-1	12.03.03	08:34	76° 48.71' N	20° 12.68' E	167.0	W 4	330.0	0.0	Ice station	ICE
PS64/028-1	12.03.03	08:40	76° 48.70' N	20° 12.73' E	167.9	W 4	330.1	0.0	Ice station	ICE
PS64/028-2	12.03.03	09:45	76° 48.66' N	20° 13.38' E	178.3	W 3	330.0	0.0	Turbulenzmes	TMS
PS64/028-3	12.03.03	13:09	76° 48.29' N	20° 15.02' E	177.1	W 4	330.3	0.0	Bongo net	BONGO
PS64/028-3	12.03.03	13:31	76° 48.24' N	20° 14.98' E	176.0	W 5	330.2	0.0	Bongo net	BONGO
PS64/028-3	12.03.03	13:39	76° 48.23' N	20° 14.97' E	177.4	W 4	330.0	0.0	Bongo net	BONGO
PS64/028-4	12.03.03	13:55	76° 48.20' N	20° 14.91' E	175.6	WSW 4	329.1	0.0	Multiple net	MN
PS64/028-4	12.03.03	14:00	76° 48.19' N	20° 14.89' E	176.0	WSW 3	329.3	0.0	Multiple net	MN
PS64/028-4	12.03.03	14:01	76° 48.19' N	20° 14.88' E	175.5	WSW 3	329.3	0.0	Multiple net	MN
PS64/028-4	12.03.03	14:09	76° 48.17' N	20° 14.84' E	175.1	SW 3	329.5	0.0	Multiple net	MN
PS64/028-1	12.03.03	16:36	76° 48.11' N	20° 13.89' E	166.7	SW 5	328.8	0.0	Ice station	ICE
PS64/028-1	12.03.03	17:18	76° 48.15' N	20° 13.54' E	166.0	SSW 3	327.7	0.0	Ice station	ICE
PS64/028-2	12.03.03	20:50	76° 48.46' N	20° 13.32' E	170.4	SSE 5	330.6	0.0	Turbulenzmes	TMS
PS64/028-1	12.03.03	23:10	76° 48.64' N	20° 13.61' E	173.6	SE 5	334.1	0.0	Ice station	ICE
PS64/028-1	12.03.03	23:48	76° 48.71' N	20° 13.53' E	170.3	SE 9	336.4	0.0	Ice station	ICE
PS64/028-1	13.03.03	12:30	76° 49.31' N	19° 55.17' E	162.1	ENE 12	223.2	0.6	Ice station	ICE
PS64/028-1	13.03.03	13:18	76° 48.98' N	19° 53.71' E	163.8	ENE 11	240.7	0.6	Ice station	ICE
PS64/028-1	13.03.03	13:22	76° 48.96' N	19° 53.58' E	162.2	ENE 14	235.0	0.6	Ice station	ICE
PS64/028-1	13.03.03	16:19	76° 47.82' N	19° 48.61' E	158.1	NNE 4	231.3	0.4	Ice station	ICE
PS64/028-1	13.03.03	16:40	76° 47.72' N	19° 48.11' E	158.5	N 3	239.1	0.4	Ice station	ICE
PS64/029-1	14.03.03	01:50	76° 49.99' N	20° 22.65' E	129.7	NW 2	87.3	0.0	CTD/rosette w	CTD/RO
PS64/029-1	14.03.03	01:55	76° 49.99' N	20° 22.64' E	129.9	NW 2	87.3	0.0	CTD/rosette w	CTD/RO
PS64/029-1	14.03.03	02:04	76° 49.98' N	20° 22.60' E	129.5	NNW 2	86.1	0.0	CTD/rosette w	CTD/RO

PS64/029-2	14.03.03	02:13	76° 49.98' N	20° 22.57' E	129.7	NW 2	86.0	0.0	Multi corer	MUC
PS64/029-2	14.03.03	02:16	76° 49.98' N	20° 22.56' E	130.2	NNW 2	86.0	0.0	Multi corer	MUC
PS64/029-2	14.03.03	02:20	76° 49.98' N	20° 22.55' E	129.5	NW 3	85.7	0.0	Multi corer	MUC
PS64/029-3	14.03.03	02:22	76° 49.98' N	20° 22.54' E	129.8	NW 3	85.7	0.0	Multi corer	MUC
PS64/029-3	14.03.03	02:26	76° 49.98' N	20° 22.52' E	130.0	NW 3	85.7	0.0	Multi corer	MUC
PS64/029-3	14.03.03	02:30	76° 49.98' N	20° 22.50' E	129.8	NW 2	273.5	0.1	Multi corer	MUC
PS64/030-1	14.03.03	09:01	76° 54.89' N	20° 20.90' E	129.2	NW 1	60.5	0.1	CTD/rosette w	CTD/RO
PS64/030-1	14.03.03	09:06	76° 54.89' N	20° 20.95' E	129.6	NW 1	68.1	0.2	CTD/rosette w	CTD/RO
PS64/030-1	14.03.03	09:13	76° 54.90' N	20° 21.02' E	128.3	NW 1	68.8	0.1	CTD/rosette w	CTD/RO
PS64/031-1	14.03.03	16:39	76° 59.60' N	20° 21.81' E	118.3	SW 3	287.7	0.2	Multi corer	MUC
PS64/031-1	14.03.03	16:42	76° 59.60' N	20° 21.76' E	117.2	SW 3	281.2	0.2	Multi corer	MUC
PS64/031-1	14.03.03	16:46	76° 59.60' N	20° 21.69' E	117.9	SW 3	273.5	0.3	Multi corer	MUC
PS64/031-1	14.03.03	16:49	76° 59.60' N	20° 21.64' E	117.5	SW 4	254.8	0.3	Multi corer	MUC
PS64/031-1	14.03.03	16:54	76° 59.60' N	20° 21.56' E	117.7	SW 5	262.1	0.2	Multi corer	MUC
PS64/031-2	14.03.03	17:19	76° 59.63' N	20° 21.15' E	119.1	SSW 2	307.2	0.2	CTD/rosette w	CTD/RO
PS64/031-2	14.03.03	17:24	76° 59.64' N	20° 21.08' E	119.2	SW 3	322.0	0.2	CTD/rosette w	CTD/RO
PS64/031-2	14.03.03	17:31	76° 59.65' N	20° 20.96' E	119.3	SW 4	318.4	0.2	CTD/rosette w	CTD/RO
PS64/032-1	14.03.03	23:49	77° 4.79' N	20° 22.59' E	91.5	W 7	112.1	0.2	CTD/rosette w	CTD/RO
PS64/032-1	14.03.03	23:54	77° 4.79' N	20° 22.64' E	91.3	W 6	124.0	0.2	CTD/rosette w	CTD/RO
PS64/032-1	15.03.03	00:00	77° 4.77' N	20° 22.72' E	90.2	W 6	135.5	0.2	CTD/rosette w	CTD/RO
PS64/033-1	15.03.03	02:50	77° 9.85' N	20° 22.83' E	113.3	SW 4	128.0	0.2	CTD/rosette w	CTD/RO
PS64/033-1	15.03.03	02:55	77° 9.84' N	20° 22.89' E	113.7	SW 4	111.6	0.2	CTD/rosette w	CTD/RO
PS64/033-1	15.03.03	03:04	77° 9.84' N	20° 22.99' E	113.3	SW 5	91.5	0.2	CTD/rosette w	CTD/RO
PS64/034-1	15.03.03	08:08	77° 13.03' N	20° 27.67' E	90.4	WSW 9	88.0	0.1	CTD/rosette w	CTD/RO
PS64/034-1	15.03.03	08:22	77° 13.05' N	20° 27.77' E	90.8	WSW 8	51.2	0.2	CTD/rosette w	CTD/RO
PS64/034-1	15.03.03	08:26	77° 13.05' N	20° 27.81' E	90.7	WSW 8	38.6	0.0	CTD/rosette w	CTD/RO
PS64/034-2	15.03.03	08:42	77° 13.06' N	20° 27.97' E	90.7	WSW 8	59.1	0.2	Multi corer	MUC
PS64/034-2	15.03.03	08:46	77° 13.07' N	20° 28.01' E	91.9	WSW 8	62.5	0.2	Multi corer	MUC
PS64/034-2	15.03.03	08:50	77° 13.07' N	20° 28.06' E	92.1	WSW 8	84.4	0.2	Multi corer	MUC
PS64/035-1	15.03.03	16:20	77° 23.08' N	20° 26.97' E	30.5	SW 1	304.4	0.0	Turbulenzmes	TMS
PS64/035-1	15.03.03	22:24	77° 24.34' N	20° 18.18' E	97.2	NW 8	138.9	0.1	Turbulenzmes	TMS
PS64/036-1	16.03.03	04:30	77° 28.99' N	20° 16.65' E	113.9	SSW 3	316.4	2.4	Rectangular m	RMT
PS64/036-1	16.03.03	04:34	77° 29.08' N	20° 16.09' E	125.2	SSE 2	308.4	2.2	Rectangular m	RMT
PS64/036-1	16.03.03	04:54	77° 29.36' N	20° 13.30' E	134.8	WSW 3	286.0	2.1	Rectangular m	RMT
PS64/036-1	16.03.03	04:57	77° 29.38' N	20° 12.83' E	135.2	WSW 4	284.0	2.1	Rectangular m	RMT
PS64/036-2	16.03.03	05:18	77° 29.38' N	20° 10.40' E	134.4	SW 3	72.4	3.0	Agassiz trawl	AGT
PS64/036-2	16.03.03	05:32	77° 29.44' N	20° 13.20' E	136.1	SW 4	102.3	2.6	Agassiz trawl	AGT

PS64/036-2	16.03.03	05:47	77° 29.30' N	20° 14.95' E	134.7	WSW 5	106.9	1.3	Agassiz trawl	AGT
PS64/036-2	16.03.03	05:59	77° 29.18' N	20° 16.02' E	129.5	SW 5	117.5	1.3	Agassiz trawl	AGT
PS64/036-2	16.03.03	05:59	77° 29.18' N	20° 16.02' E	129.5	SW 5	117.5	1.3	Agassiz trawl	AGT
PS64/036-2	16.03.03	06:05	77° 29.11' N	20° 16.59' E	123.1	SSW 3	119.0	1.3	Agassiz trawl	AGT
PS64/037-1	16.03.03	10:56	77° 34.66' N	20° 33.44' E	72.1	SW 5	92.7	0.0	CTD/rosette w	CTD/RO
PS64/037-1	16.03.03	11:00	77° 34.66' N	20° 33.45' E	71.5	SW 5	70.0	0.1	CTD/rosette w	CTD/RO
PS64/037-1	16.03.03	11:04	77° 34.66' N	20° 33.45' E	71.9	SW 5	87.7	0.1	CTD/rosette w	CTD/RO
PS64/037-2	16.03.03	11:12	77° 34.66' N	20° 33.41' E	71.7	SW 6	93.1	0.0	Trap, fish	TRAPF
PS64/037-2	16.03.03	11:17	77° 34.66' N	20° 33.39' E	71.7	SW 5	92.9	0.0	Trap, fish	TRAPF
PS64/037-2	16.03.03	11:18	77° 34.66' N	20° 33.39' E	71.9	SW 5	92.9	0.0	Trap, fish	TRAPF
PS64/037-2	16.03.03	11:19	77° 34.66' N	20° 33.39' E	71.8	SW 6	92.9	0.0	Trap, fish	TRAPF
PS64/037-2	16.03.03	11:21	77° 34.66' N	20° 33.39' E	71.9	SW 5	92.9	0.0	Trap, fish	TRAPF
PS64/038-1	16.03.03	11:49	77° 34.05' N	20° 30.17' E	79.3	SSW 4	47.0	0.3	CTD/rosette w	CTD/RO
PS64/038-1	16.03.03	11:53	77° 34.05' N	20° 30.19' E	79.1	SW 5	248.0	0.0	CTD/rosette w	CTD/RO
PS64/038-1	16.03.03	12:00	77° 34.04' N	20° 30.19' E	79.3	WSW 8	247.9	0.0	CTD/rosette w	CTD/RO
PS64/038-2	16.03.03	12:07	77° 34.04' N	20° 30.20' E	79.5	SSW 3	247.8	0.0	Trap, fish	TRAPF
PS64/038-2	16.03.03	12:10	77° 34.04' N	20° 30.21' E	79.8	S 3	247.8	0.0	Trap, fish	TRAPF
PS64/038-2	16.03.03	12:12	77° 34.04' N	20° 30.22' E	79.5	SSW 3	247.8	0.0	Trap, fish	TRAPF
PS64/038-2	16.03.03	12:13	77° 34.04' N	20° 30.22' E	79.5	S 3	247.8	0.0	Trap, fish	TRAPF
PS64/039-1	16.03.03	14:52	77° 33.01' N	20° 21.61' E	123.3	SSE 3	275.7	0.0	Ice station	ICE
PS64/039-1	16.03.03	14:58	77° 33.01' N	20° 21.62' E	124.0	SSE 3	275.7	0.0	Ice station	ICE
PS64/039-1	16.03.03	15:08	77° 33.01' N	20° 21.62' E	122.7	S 3	275.6	0.0	Ice station	ICE
PS64/039-1	16.03.03	18:30	77° 32.98' N	20° 21.61' E	122.2	??? -100	274.8	0.0	Ice station	ICE
PS64/039-2	17.03.03	00:41	77° 32.40' N	20° 18.58' E	113.3	N 8	175.9	0.3	CTD/rosette w	CTD/RO
PS64/039-2	17.03.03	00:47	77° 32.36' N	20° 18.61' E	112.8	NNW 7	170.5	0.3	CTD/rosette w	CTD/RO
PS64/039-2	17.03.03	00:53	77° 32.33' N	20° 18.64' E	114.1	NNW 7	171.6	0.3	CTD/rosette w	CTD/RO
PS64/039-3	17.03.03	01:43	77° 32.03' N	20° 18.91' E	112.3	N 7	171.5	0.3	Multiple net	MN
PS64/039-3	17.03.03	01:47	77° 32.01' N	20° 18.94' E	111.2	N 7	163.9	0.3	Multiple net	MN
PS64/039-3	17.03.03	01:48	77° 32.00' N	20° 18.95' E	110.0	N 7	162.7	0.3	Multiple net	MN
PS64/039-3	17.03.03	01:53	77° 31.97' N	20° 18.99' E	109.4	N 8	162.6	0.4	Multiple net	MN
PS64/039-4	17.03.03	02:15	77° 31.86' N	20° 19.12' E	108.8	NNW 6	159.3	0.3	Bongo net	BONGO
PS64/039-4	17.03.03	02:22	77° 31.82' N	20° 19.17' E	108.9	N 5	157.3	0.3	Bongo net	BONGO
PS64/039-4	17.03.03	02:28	77° 31.79' N	20° 19.20' E	108.3	N 6	160.1	0.3	Bongo net	BONGO
PS64/039-5	17.03.03	02:32	77° 31.78' N	20° 19.22' E	108.9	NNE 6	159.3	0.3	Bongo net	BONGO
PS64/039-5	17.03.03	02:36	77° 31.76' N	20° 19.25' E	109.1	NNE 6	160.7	0.3	Bongo net	BONGO
PS64/039-5	17.03.03	02:40	77° 31.74' N	20° 19.26' E	110.0	NNE 6	161.1	0.3	Bongo net	BONGO
PS64/039-6	17.03.03	02:45	77° 31.72' N	20° 19.28' E	109.6	NNE 5	162.6	0.2	Nansen Net	NN

PS64/039-6	17.03.03	02:51	77° 31.70' N	20° 19.29' E	110.0	NNE 5	178.8	0.2	Nansen Net	NN
PS64/039-6	17.03.03	02:57	77° 31.67' N	20° 19.31' E	111.7	NNE 6	192.0	0.2	Nansen Net	NN
PS64/039-7	17.03.03	02:59	77° 31.67' N	20° 19.31' E	110.7	NNE 5	191.1	0.2	Nansen Net	NN
PS64/039-7	17.03.03	03:04	77° 31.65' N	20° 19.34' E	110.5	N 5	177.9	0.2	Nansen Net	NN
PS64/039-7	17.03.03	03:10	77° 31.63' N	20° 19.38' E	111.1	N 4	155.7	0.2	Nansen Net	NN
PS64/039-7	17.03.03	03:25	77° 31.58' N	20° 19.47' E	112.0	NNE 4	154.1	0.2	Multi corer	MUC
PS64/039-7	17.03.03	03:27	77° 31.58' N	20° 19.48' E	111.6	N 4	150.5	0.2	Multi corer	MUC
PS64/039-7	17.03.03	03:33	77° 31.57' N	20° 19.51' E	111.6	N 3	140.2	0.2	Multi corer	MUC
PS64/039-1	17.03.03	06:10	77° 31.53' N	20° 20.20' E	115.2	NNW 2	283.9	0.0	Ice station	ICE
PS64/039-1	17.03.03	08:04	77° 31.78' N	20° 20.24' E	112.2	SW 3	1.2	0.2	Ice station	ICE
PS64/039-1	17.03.03	13:22	77° 32.33' N	20° 20.33' E	125.5	SE 4	282.7	0.0	Ice station	ICE
PS64/039-1	17.03.03	13:32	77° 32.32' N	20° 20.39' E	126.8	SE 3	282.6	0.0	Ice station	ICE
PS64/039-1	17.03.03	13:36	77° 32.32' N	20° 20.48' E	126.8	SE 4	81.2	0.3	Ice station	ICE
PS64/038-2	17.03.03	16:04	77° 34.04' N	20° 30.15' E	79.2	S 5	50.5	0.2	Trap, fish	TRAPF
PS64/038-2	17.03.03	16:14	77° 34.07' N	20° 30.25' E	78.7	S 4	62.4	0.2	Trap, fish	TRAPF
PS64/037-2	17.03.03	16:45	77° 34.66' N	20° 33.30' E	72.2	E 4	58.4	0.5	Trap, fish	TRAPF
PS64/037-2	17.03.03	16:49	77° 34.67' N	20° 33.34' E	71.8	E 4	49.2	0.3	Trap, fish	TRAPF
PS64/037-2	17.03.03	16:51	77° 34.67' N	20° 33.31' E	71.8	E 4	260.0	0.8	Trap, fish	TRAPF
PS64/037-2	17.03.03	16:53	77° 34.67' N	20° 33.29' E	72.3	E 4	98.6	0.1	Trap, fish	TRAPF
PS64/037-2	17.03.03	17:04	77° 34.63' N	20° 33.19' E	71.4	E 4	275.6	0.0	Trap, fish	TRAPF
PS64/037-2	17.03.03	17:08	77° 34.63' N	20° 33.19' E	71.1	ESE 4	275.7	0.0	Trap, fish	TRAPF
PS64/037-2	17.03.03	17:17	77° 34.64' N	20° 33.16' E	73.1	ESE 4	63.2	0.2	Trap, fish	TRAPF
PS64/040-1	17.03.03	18:32	77° 35.09' N	20° 26.35' E	116.6	ESE 2	100.9	2.0	Turbulenzmes	TMS
PS64/040-1	17.03.03	20:24	77° 35.55' N	20° 30.51' E	101.7	ENE 2	23.2	0.0	Turbulenzmes	TMS
PS64/041-1	17.03.03	21:56	77° 40.20' N	20° 29.76' E	61.0	N 2	233.4	0.1	CTD/rosette w	CTD/RO
PS64/041-1	17.03.03	22:02	77° 40.20' N	20° 29.69' E	61.2	N 1	266.6	0.1	CTD/rosette w	CTD/RO
PS64/041-1	17.03.03	22:06	77° 40.20' N	20° 29.67' E	61.9	N 1	273.6	0.2	CTD/rosette w	CTD/RO
PS64/041-2	17.03.03	22:13	77° 40.21' N	20° 29.66' E	61.1	N 1	54.1	0.0	Multi corer	MUC
PS64/041-2	17.03.03	22:16	77° 40.21' N	20° 29.66' E	61.4	NNW 2	54.7	0.0	Multi corer	MUC
PS64/041-2	17.03.03	22:20	77° 40.20' N	20° 29.65' E	61.8	NNW 2	54.9	0.3	Multi corer	MUC
PS64/042-1	17.03.03	23:24	77° 37.60' N	20° 24.58' E	87.4	SE 4	252.5	0.2	CTD/rosette w	CTD/RO
PS64/042-1	17.03.03	23:31	77° 37.60' N	20° 24.54' E	87.3	SE 5	284.3	0.0	CTD/rosette w	CTD/RO
PS64/042-1	17.03.03	23:35	77° 37.60' N	20° 24.55' E	87.3	SE 5	284.0	0.2	CTD/rosette w	CTD/RO
PS64/043-1	18.03.03	00:13	77° 36.86' N	20° 15.69' E	128.3	NNE 4	183.0	0.1	CTD/rosette w	CTD/RO
PS64/043-1	18.03.03	00:18	77° 36.84' N	20° 15.64' E	128.1	NNE 5	202.5	0.2	CTD/rosette w	CTD/RO
PS64/043-1	18.03.03	00:24	77° 36.83' N	20° 15.58' E	129.1	NNE 5	193.6	0.2	CTD/rosette w	CTD/RO
PS64/044-1	18.03.03	01:01	77° 35.69' N	20° 6.96' E	96.4	NE 4	199.8	0.2	CTD/rosette w	CTD/RO

PS64/044-1	18.03.03	01:07	77° 35.66' N	20° 6.91' E	96.7	E 3	205.8	0.3	CTD/rosette w	CTD/RO
PS64/044-1	18.03.03	01:09	77° 35.66' N	20° 6.91' E	96.8	ENE 4	207.6	0.3	CTD/rosette w	CTD/RO
PS64/045-1	18.03.03	01:39	77° 34.28' N	20° 0.38' E	139.0	NE 5	231.8	0.1	CTD/rosette w	CTD/RO
PS64/045-1	18.03.03	01:45	77° 34.26' N	20° 0.31' E	138.5	ENE 5	194.5	0.3	CTD/rosette w	CTD/RO
PS64/045-1	18.03.03	01:52	77° 34.22' N	20° 0.24' E	139.4	ENE 3	190.7	0.3	CTD/rosette w	CTD/RO
PS64/046-1	18.03.03	02:44	77° 32.43' N	19° 49.25' E	105.1	E 5	142.2	0.1	CTD/rosette w	CTD/RO
PS64/046-1	18.03.03	02:50	77° 32.41' N	19° 49.19' E	106.4	E 5	238.5	0.5	CTD/rosette w	CTD/RO
PS64/046-1	18.03.03	02:52	77° 32.41' N	19° 49.17' E	107.2	E 5	237.0	0.4	CTD/rosette w	CTD/RO
PS64/046-1	18.03.03	02:57	77° 32.39' N	19° 49.15' E	108.3	E 5	220.4	0.2	CTD/rosette w	CTD/RO
PS64/046-1	18.03.03	03:00	77° 32.39' N	19° 49.12' E	109.8	E 4	219.9	0.2	CTD/rosette w	CTD/RO
PS64/047-1	18.03.03	04:16	77° 31.17' N	19° 26.97' E	154.1	ENE 7	229.3	0.1	CTD/rosette w	CTD/RO
PS64/047-1	18.03.03	04:23	77° 31.15' N	19° 26.92' E	154.4	ENE 6	231.5	0.1	CTD/rosette w	CTD/RO
PS64/047-1	18.03.03	04:32	77° 31.13' N	19° 26.76' E	154.8	E 4	247.8	0.3	CTD/rosette w	CTD/RO
PS64/048-1	18.03.03	06:17	77° 29.97' N	19° 9.99' E	195.3	ENE 10	251.4	0.3	CTD/rosette w	CTD/RO
PS64/048-1	18.03.03	06:27	77° 29.95' N	19° 9.77' E	186.9	ENE 8	249.6	0.3	CTD/rosette w	CTD/RO
PS64/048-1	18.03.03	06:42	77° 29.93' N	19° 9.38' E	188.1	NE 10	261.2	0.3	CTD/rosette w	CTD/RO
PS64/048-2	18.03.03	06:54	77° 29.91' N	19° 9.08' E	188.2	NE 10	241.7	0.2	Multiple net	MN
PS64/048-2	18.03.03	07:02	77° 29.90' N	19° 8.84' E	188.8	NE 11	258.9	0.3	Multiple net	MN
PS64/048-2	18.03.03	07:12	77° 29.88' N	19° 8.54' E	188.5	NE 10	260.4	0.4	Multiple net	MN
PS64/048-3	18.03.03	07:27	77° 29.84' N	19° 8.12' E	188.4	NE 11	252.2	0.4	Multiple net	MN
PS64/048-3	18.03.03	07:34	77° 29.83' N	19° 7.93' E	188.4	NE 11	251.4	0.4	Multiple net	MN
PS64/048-3	18.03.03	07:45	77° 29.80' N	19° 7.61' E	188.5	NE 13	252.3	0.4	Multiple net	MN
PS64/048-4	18.03.03	07:56	77° 29.77' N	19° 7.30' E	191.3	NE 14	240.6	0.4	Bongo net	BONGO
PS64/048-4	18.03.03	08:07	77° 29.73' N	19° 6.98' E	189.2	NNE 16	236.1	0.4	Bongo net	BONGO
PS64/048-4	18.03.03	08:15	77° 29.70' N	19° 6.74' E	190.5	NNE 15	238.7	0.4	Bongo net	BONGO
PS64/048-5	18.03.03	08:17	77° 29.70' N	19° 6.68' E	189.7	NNE 16	235.9	0.4	Bongo net	BONGO
PS64/048-5	18.03.03	08:25	77° 29.67' N	19° 6.44' E	191.0	NNE 16	230.9	0.4	Bongo net	BONGO
PS64/048-5	18.03.03	08:34	77° 29.63' N	19° 6.17' E	192.1	NNE 15	239.4	0.5	Bongo net	BONGO
PS64/048-6	18.03.03	08:42	77° 29.60' N	19° 5.90' E	193.3	NNE 15	244.8	0.5	Nansen Net	NN
PS64/048-6	18.03.03	08:51	77° 29.56' N	19° 5.61' E	192.8	NNE 15	237.8	0.5	Nansen Net	NN
PS64/048-6	18.03.03	09:02	77° 29.51' N	19° 5.25' E	192.8	NNE 17	240.7	0.5	Nansen Net	NN
PS64/048-7	18.03.03	09:13	77° 29.47' N	19° 4.91' E	192.6	NNE 19	235.1	0.4	Multi corer	MUC
PS64/048-7	18.03.03	09:19	77° 29.45' N	19° 4.68' E	188.4	NE 17	241.4	0.6	Multi corer	MUC
PS64/048-7	18.03.03	09:25	77° 29.42' N	19° 4.43' E	187.1	NE 16	241.3	0.6	Multi corer	MUC
PS64/049-1	18.03.03	11:41	77° 28.19' N	18° 51.75' E	165.0	NNE 19	225.2	0.7	CTD/rosette w	CTD/RO
PS64/049-1	18.03.03	11:48	77° 28.13' N	18° 51.57' E	165.0	NNE 20	214.9	0.6	CTD/rosette w	CTD/RO
PS64/049-1	18.03.03	11:56	77° 28.06' N	18° 51.38' E	165.7	NNE 21	205.2	0.6	CTD/rosette w	CTD/RO

PS64/050-1	18.03.03	13:38	77° 27.55' N	18° 32.04' E	104.3	NNE 20	214.1	1.0	CTD/rosette w	CTD/RO
PS64/050-1	18.03.03	13:43	77° 27.49' N	18° 31.96' E	105.2	NNE 18	204.5	0.5	CTD/rosette w	CTD/RO
PS64/050-1	18.03.03	13:51	77° 27.39' N	18° 31.84' E	103.9	NNE 22	201.0	0.7	CTD/rosette w	CTD/RO
PS64/050-2	18.03.03	14:06	77° 27.25' N	18° 31.58' E	99.2	NNE 19	201.8	0.9	Multi corer	MUC
PS64/050-2	18.03.03	14:09	77° 27.18' N	18° 31.47' E	98.2	NNE 22	177.6	0.2	Multi corer	MUC
PS64/050-2	18.03.03	14:12	77° 27.16' N	18° 31.43' E	97.7	NNE 22	201.7	1.2	Multi corer	MUC
PS64/051-1	18.03.03	19:02	77° 27.78' N	19° 31.56' E	139.0	NNE 13	209.1	0.4	CTD/rosette w	CTD/RO
PS64/051-1	18.03.03	19:09	77° 27.74' N	19° 31.41' E	137.1	NE 14	225.6	0.3	CTD/rosette w	CTD/RO
PS64/051-1	18.03.03	19:15	77° 27.72' N	19° 31.26' E	136.7	NE 14	256.2	0.3	CTD/rosette w	CTD/RO
PS64/052-1	18.03.03	20:45	77° 26.19' N	19° 47.67' E	140.0	NNE 12	236.4	0.3	CTD/rosette w	CTD/RO
PS64/052-1	18.03.03	20:53	77° 26.17' N	19° 47.50' E	139.3	NNE 13	228.4	0.2	CTD/rosette w	CTD/RO
PS64/052-1	18.03.03	21:00	77° 26.15' N	19° 47.36' E	140.1	NNE 11	234.0	0.2	CTD/rosette w	CTD/RO
PS64/053-1	19.03.03	02:29	77° 26.15' N	20° 14.97' E	131.4	N 9	136.3	0.7	CTD/rosette w	CTD/RO
PS64/053-1	19.03.03	02:35	77° 26.09' N	20° 15.09' E	132.2	N 10	137.7	0.6	CTD/rosette w	CTD/RO
PS64/053-1	19.03.03	02:39	77° 26.05' N	20° 15.15' E	132.0	N 11	158.7	0.8	CTD/rosette w	CTD/RO
PS64/054-1	19.03.03	03:09	77° 25.93' N	20° 28.71' E	69.4	N 8	147.5	0.5	CTD/rosette w	CTD/RO
PS64/054-1	19.03.03	03:13	77° 25.87' N	20° 28.82' E	68.3	N 8	167.7	1.4	CTD/rosette w	CTD/RO
PS64/054-1	19.03.03	03:16	77° 25.82' N	20° 28.88' E	68.1	NNE 8	135.8	0.7	CTD/rosette w	CTD/RO
PS64/055-1	19.03.03	03:53	77° 22.66' N	20° 16.15' E	89.4	N 8	112.8	0.9	CTD/rosette w	CTD/RO
PS64/055-1	19.03.03	04:05	77° 22.55' N	20° 16.50' E	82.8	N 7	157.7	0.6	CTD/rosette w	CTD/RO
PS64/055-1	19.03.03	04:10	77° 22.50' N	20° 16.60' E	80.6	N 8	151.6	0.6	CTD/rosette w	CTD/RO
PS64/056-1	19.03.03	04:55	77° 19.51' N	20° 15.84' E	95.8	NNW 8	162.7	0.6	CTD/rosette w	CTD/RO
PS64/056-1	19.03.03	05:00	77° 19.48' N	20° 15.95' E	95.6	NNW 7	118.6	0.4	CTD/rosette w	CTD/RO
PS64/056-1	19.03.03	05:03	77° 19.48' N	20° 16.02' E	96.0	NNW 7	98.9	0.4	CTD/rosette w	CTD/RO
PS64/057-1	19.03.03	05:45	77° 16.58' N	20° 19.03' E	147.1	NNW 8	140.9	0.4	CTD/rosette w	CTD/RO
PS64/057-1	19.03.03	05:49	77° 16.56' N	20° 19.16' E	144.5	NNW 10	115.9	0.6	CTD/rosette w	CTD/RO
PS64/057-1	19.03.03	05:51	77° 16.55' N	20° 19.19' E	140.9	NNW 10	142.1	0.5	CTD/rosette w	CTD/RO
PS64/057-2	19.03.03	06:21	77° 16.14' N	20° 18.02' E	203.4	NNW 4	125.0	0.7	CTD/rosette w	CTD/RO
PS64/057-2	19.03.03	06:34	77° 16.10' N	20° 18.04' E	202.4	NNW 5	143.4	0.4	CTD/rosette w	CTD/RO
PS64/057-2	19.03.03	06:39	77° 16.08' N	20° 18.05' E	201.4	NNW 5	184.5	0.2	CTD/rosette w	CTD/RO
PS64/057-3	19.03.03	06:56	77° 16.04' N	20° 18.02' E	101.1	NNW 4	198.2	0.2	Mooring	MOR
PS64/057-3	19.03.03	07:04	77° 16.03' N	20° 17.99' E	100.4	NW 4	305.1	0.0	Mooring	MOR
PS64/057-3	19.03.03	07:12	77° 16.03' N	20° 17.96' E	100.1	NNW 4	305.6	0.0	Mooring	MOR
PS64/057-3	19.03.03	07:14	77° 16.02' N	20° 17.95' E	99.7	NW 4	305.8	0.0	Mooring	MOR
PS64/058-1	19.03.03	09:18	77° 17.12' N	20° 8.47' E	127.8	W 2	302.6	0.3	CTD/rosette w	CTD/RO
PS64/058-1	19.03.03	09:26	77° 17.15' N	20° 8.32' E	127.2	W 2	322.9	0.3	CTD/rosette w	CTD/RO
PS64/058-1	19.03.03	09:30	77° 17.17' N	20° 8.24' E	126.1	W 2	314.6	0.4	CTD/rosette w	CTD/RO

PS64/059-1	19.03.03	12:02	77° 16.14' N	19° 59.65' E	140.8	NW 4	56.9	0.1	CTD/rosette w	CTD/RO
PS64/059-1	19.03.03	12:07	77° 16.15' N	19° 59.68' E	139.2	NW 4	275.0	0.0	CTD/rosette w	CTD/RO
PS64/059-1	19.03.03	12:16	77° 16.15' N	19° 59.75' E	137.7	NNW 2	275.0	0.0	CTD/rosette w	CTD/RO
PS64/060-1	19.03.03	14:25	77° 14.41' N	19° 45.50' E	137.3	N 2	150.8	0.3	CTD/rosette w	CTD/RO
PS64/060-1	19.03.03	14:31	77° 14.38' N	19° 45.63' E	136.4	N 2	140.6	0.3	CTD/rosette w	CTD/RO
PS64/060-1	19.03.03	14:36	77° 14.35' N	19° 45.71' E	136.3	N 2	129.4	0.3	CTD/rosette w	CTD/RO
PS64/061-1	19.03.03	18:02	77° 15.09' N	19° 32.20' E	178.5	NE 1	200.6	0.5	CTD/rosette w	CTD/RO
PS64/061-1	19.03.03	18:08	77° 15.07' N	19° 32.14' E	179.6	NE 1	350.6	0.0	CTD/rosette w	CTD/RO
PS64/061-1	19.03.03	18:16	77° 15.05' N	19° 32.18' E	175.7	NE 1	166.7	0.1	CTD/rosette w	CTD/RO
PS64/062-1	19.03.03	19:16	77° 11.98' N	19° 17.63' E	176.1	??? -100	327.7	0.5	CTD/rosette w	CTD/RO
PS64/062-1	19.03.03	19:22	77° 12.01' N	19° 17.56' E	176.4	NNE 0	162.4	0.0	CTD/rosette w	CTD/RO
PS64/062-1	19.03.03	19:33	77° 12.03' N	19° 17.55' E	176.8	??? -100	345.6	0.6	CTD/rosette w	CTD/RO
PS64/062-2	19.03.03	19:40	77° 12.06' N	19° 17.48' E	176.7	NNW 1	344.1	0.2	Mooring	MOR
PS64/062-2	19.03.03	20:04	77° 12.10' N	19° 17.36' E	177.6	NW 1	204.6	0.2	Mooring	MOR
PS64/062-2	19.03.03	20:06	77° 12.10' N	19° 17.34' E	177.5	WNW 1	312.4	0.2	Mooring	MOR
PS64/062-3	19.03.03	20:23	77° 12.04' N	19° 17.23' E	175.9	N 2	3.0	0.5	Water Sample	WSB
PS64/062-4	19.03.03	20:38	77° 11.88' N	19° 16.79' E	176.9	W 2	340.1	0.2	Multiple net	MN
PS64/062-4	19.03.03	20:49	77° 11.91' N	19° 16.66' E	176.6	WNW 2	339.3	0.3	Multiple net	MN
PS64/062-4	19.03.03	21:02	77° 11.94' N	19° 16.47' E	178.7	WSW 2	358.9	0.2	Multiple net	MN
PS64/062-5	19.03.03	21:10	77° 11.97' N	19° 16.40' E	177.8	W 1	352.4	0.2	Multiple net	MN
PS64/062-6	19.03.03	21:16	77° 11.99' N	19° 16.32' E	176.5	SSW 0	308.2	0.3	Turbulenzmes	TMS
PS64/062-5	19.03.03	21:19	77° 12.00' N	19° 16.26' E	178.0	WSW 1	298.4	0.3	Multiple net	MN
PS64/062-5	19.03.03	21:27	77° 12.01' N	19° 16.13' E	177.1	SW 1	357.4	0.3	Multiple net	MN
PS64/062-7	19.03.03	21:44	77° 12.05' N	19° 15.84' E	176.8	SSW 1	352.5	0.4	Bongo net	BONGO
PS64/062-7	19.03.03	21:52	77° 12.06' N	19° 15.70' E	178.6	S 2	241.8	0.0	Bongo net	BONGO
PS64/062-7	19.03.03	21:59	77° 12.08' N	19° 15.62' E	178.8	SSW 1	305.4	0.3	Bongo net	BONGO
PS64/062-8	19.03.03	22:04	77° 12.08' N	19° 15.55' E	176.9	S 1	227.7	0.2	Nansen Net	NN
PS64/062-8	19.03.03	22:14	77° 12.10' N	19° 15.40' E	177.5	ESE 0	228.6	0.4	Nansen Net	NN
PS64/062-6	19.03.03	22:21	77° 12.08' N	19° 15.32' E	177.4	S 0	323.9	0.4	Turbulenzmes	TMS
PS64/062-8	19.03.03	22:24	77° 12.10' N	19° 15.26' E	177.8	SSW 1	327.1	0.4	Nansen Net	NN
PS64/062-9	19.03.03	22:32	77° 12.11' N	19° 15.06' E	177.7	SSW 3	235.2	0.0	Multi corer	MUC
PS64/062-9	19.03.03	22:38	77° 12.12' N	19° 14.97' E	177.7	S 1	259.7	0.4	Multi corer	MUC
PS64/062-9	19.03.03	22:43	77° 12.13' N	19° 14.87' E	176.0	SSE 1	287.2	0.2	Multi corer	MUC
PS64/063-1	20.03.03	00:59	77° 10.03' N	19° 3.25' E	150.8	SSW 4	183.0	0.0	CTD/rosette w	CTD/RO
PS64/063-1	20.03.03	01:05	77° 10.04' N	19° 3.29' E	151.6	SSW 4	58.4	0.1	CTD/rosette w	CTD/RO
PS64/063-1	20.03.03	01:10	77° 10.04' N	19° 3.32' E	151.5	SSW 4	53.1	0.2	CTD/rosette w	CTD/RO
PS64/064-1	20.03.03	03:25	77° 8.99' N	18° 49.90' E	124.9	S 2	242.2	0.0	CTD/rosette w	CTD/RO

PS64/064-1	20.03.03	03:31	77° 8.98' N	18° 49.94' E	125.3	S 2	107.7	0.1	CTD/rosette w	CTD/RO
PS64/064-1	20.03.03	03:42	77° 8.95' N	18° 50.10' E	124.9	SSE 2	120.6	0.2	CTD/rosette w	CTD/RO
PS64/064-2	20.03.03	03:51	77° 8.94' N	18° 50.26' E	124.3	SSE 2	127.4	0.2	Multi corer	MUC
PS64/064-2	20.03.03	03:55	77° 8.93' N	18° 50.30' E	124.5	SSE 2	141.1	0.2	Multi corer	MUC
PS64/064-2	20.03.03	03:59	77° 8.92' N	18° 50.34' E	124.8	SSE 2	148.4	0.1	Multi corer	MUC
PS64/065-1	21.03.03	09:06	76° 49.28' N	19° 24.39' E	162.4	WSW 13	255.2	0.7	Water Sample	WSB
PS64/065-1	21.03.03	09:08	76° 49.28' N	19° 24.34' E	162.1	WSW 12	250.6	0.0	Water Sample	WSB
PS64/065-2	21.03.03	09:18	76° 49.24' N	19° 24.28' E	161.0	SW 11	108.9	0.3	CTD/rosette w	CTD/RO
PS64/065-2	21.03.03	09:24	76° 49.24' N	19° 24.36' E	161.7	SW 9	71.9	0.2	CTD/rosette w	CTD/RO
PS64/065-2	21.03.03	09:34	76° 49.25' N	19° 24.51' E	162.2	WSW 10	60.3	0.2	CTD/rosette w	CTD/RO
PS64/066-1	21.03.03	12:11	76° 38.97' N	19° 31.19' E	197.2	SW 4	299.0	0.0	CTD/rosette w	CTD/RO
PS64/066-1	21.03.03	12:18	76° 38.97' N	19° 31.19' E	198.0	SW 5	293.8	0.0	CTD/rosette w	CTD/RO
PS64/066-1	21.03.03	12:25	76° 38.97' N	19° 31.21' E	198.0	WSW 7	305.7	0.1	CTD/rosette w	CTD/RO
PS64/067-1	22.03.03	08:12	76° 27.93' N	21° 53.83' E	271.8	NNW 8	184.6	0.8	CTD/rosette w	CTD/RO
PS64/067-1	22.03.03	08:23	76° 27.80' N	21° 53.73' E	274.9	N 8	187.4	0.7	CTD/rosette w	CTD/RO
PS64/067-1	22.03.03	08:30	76° 27.72' N	21° 53.64' E	272.0	N 7	194.6	0.7	CTD/rosette w	CTD/RO
PS64/067-2	22.03.03	08:44	76° 27.55' N	21° 53.38' E	270.6	N 7	206.7	0.7	Multiple net	MN
PS64/067-2	22.03.03	08:57	76° 27.40' N	21° 53.08' E	273.1	N 6	205.7	0.8	Multiple net	MN
PS64/067-2	22.03.03	09:14	76° 27.20' N	21° 52.52' E	275.5	N 7	215.0	0.8	Multiple net	MN
PS64/067-3	22.03.03	09:24	76° 27.09' N	21° 52.11' E	270.2	N 6	224.2	0.9	Bongo net	BONGO
PS64/067-3	22.03.03	09:39	76° 26.93' N	21° 51.40' E	269.7	N 7	230.2	1.0	Bongo net	BONGO
PS64/067-3	22.03.03	09:50	76° 26.81' N	21° 50.83' E	270.1	N 8	231.7	1.0	Bongo net	BONGO
PS64/067-4	22.03.03	09:54	76° 26.76' N	21° 50.62' E	270.8	N 7	230.8	1.0	Bongo net	BONGO
PS64/067-4	22.03.03	10:10	76° 26.60' N	21° 49.70' E	270.6	N 6	236.5	1.0	Bongo net	BONGO
PS64/067-4	22.03.03	10:21	76° 26.49' N	21° 49.01' E	271.6	N 7	237.8	1.1	Bongo net	BONGO
PS64/067-5	22.03.03	10:28	76° 26.42' N	21° 48.55' E	272.4	N 7	236.8	1.1	Nansen Net	NN
PS64/067-5	22.03.03	10:45	76° 26.27' N	21° 47.40' E	272.1	N 8	242.8	1.1	Nansen Net	NN
PS64/067-5	22.03.03	10:59	76° 26.14' N	21° 46.42' E	270.4	N 7	242.3	1.1	Nansen Net	NN
PS64/067-6	22.03.03	11:09	76° 26.06' N	21° 45.67' E	267.4	N 8	247.7	1.2	Multi corer	MUC
PS64/067-6	22.03.03	11:15	76° 26.01' N	21° 45.23' E	266.4	N 9	247.2	1.2	Multi corer	MUC
PS64/067-6	22.03.03	11:22	76° 25.95' N	21° 44.70' E	265.3	N 9	247.6	1.1	Multi corer	MUC
PS64/068-1	22.03.03	15:24	76° 22.76' N	22° 2.79' E	222.0	NNE 12	211.0	0.2	Turbulenzmes	TMS
PS64/068-2	22.03.03	15:40	76° 22.73' N	22° 2.58' E	222.2	NNE 11	254.0	0.1	Bugkran - Sea	BKS
PS64/068-1	22.03.03	16:17	76° 22.65' N	22° 2.61' E	220.4	N 10	148.7	0.2	Turbulenzmes	TMS
PS64/068-3	22.03.03	16:31	76° 22.79' N	22° 2.81' E	223.0	N 9	14.4	0.7	Water Sample	WSB
PS64/068-4	22.03.03	16:40	76° 22.79' N	22° 2.89' E	222.3	N 8	132.6	0.2	CTD/rosette w	CTD/RO
PS64/068-4	22.03.03	16:47	76° 22.79' N	22° 3.01' E	221.1	N 6	80.6	0.4	CTD/rosette w	CTD/RO

PS64/068-4	22.03.03	16:55	76° 22.78' N	22° 3.19' E	220.4	N 8	94.7	0.3	CTD/rosette w	CTD/RO
PS64/068-2	22.03.03	17:31	76° 22.63' N	22° 3.93' E	214.5	NNE 6	122.3	0.4	Bugkran - Sea	BKS
PS64/068-1	22.03.03	17:45	76° 22.59' N	22° 4.27' E	210.9	NNE 7	169.1	0.6	Turbulenzmes	TMS
PS64/068-1	22.03.03	19:17	76° 22.31' N	22° 6.43' E	205.0	N 9	170.6	0.5	Turbulenzmes	TMS
PS64/068-5	22.03.03	20:15	76° 22.01' N	22° 7.76' E	198.4	NNE 10	203.9	0.6	Ice station	ICE
PS64/068-5	22.03.03	20:35	76° 21.80' N	22° 7.43' E	197.0	NNE 9	207.5	0.8	Ice station	ICE
PS64/069-1	22.03.03	22:04	76° 23.49' N	22° 31.28' E	165.3	NNE 7	240.2	0.7	CTD/rosette w	CTD/RO
PS64/069-1	22.03.03	22:10	76° 23.44' N	22° 30.96' E	165.1	NNE 9	232.5	0.8	CTD/rosette w	CTD/RO
PS64/069-1	22.03.03	22:16	76° 23.39' N	22° 30.64' E	163.9	NNE 6	251.7	0.8	CTD/rosette w	CTD/RO
PS64/069-2	22.03.03	22:27	76° 23.28' N	22° 29.82' E	161.3	NNE 8	260.5	1.0	Multiple net	MN
PS64/069-2	22.03.03	22:35	76° 23.20' N	22° 29.31' E	158.7	NNE 8	265.1	0.8	Multiple net	MN
PS64/069-2	22.03.03	22:46	76° 23.15' N	22° 28.60' E	158.5	NNE 8	252.1	1.3	Multiple net	MN
PS64/069-3	22.03.03	22:56	76° 23.08' N	22° 27.72' E	159.8	NNE 7	261.2	1.1	Bongo net	BONGO
PS64/069-3	22.03.03	23:11	76° 22.99' N	22° 26.52' E	166.1	NNE 7	256.8	1.2	Bongo net	BONGO
PS64/069-3	22.03.03	23:19	76° 22.96' N	22° 25.86' E	169.8	NNE 8	258.2	1.3	Bongo net	BONGO
PS64/069-4	22.03.03	23:23	76° 22.95' N	22° 25.50' E	160.3	??? -100	258.8	1.3	Nansen Net	NN
PS64/069-4	22.03.03	23:33	76° 22.94' N	22° 24.54' E	176.9	NE 8	267.1	1.4	Nansen Net	NN
PS64/069-4	22.03.03	23:45	76° 22.92' N	22° 23.45' E	175.3	NE 6	279.6	1.3	Nansen Net	NN
PS64/070-1	23.03.03	06:33	76° 18.95' N	23° 16.19' E	60.7	NE 6	102.3	1.3	CTD/rosette w	CTD/RO
PS64/070-1	23.03.03	06:36	76° 18.93' N	23° 16.43' E	61.2	NE 5	107.3	1.3	CTD/rosette w	CTD/RO
PS64/070-1	23.03.03	06:39	76° 18.91' N	23° 16.66' E	61.2	NE 6	129.0	1.4	CTD/rosette w	CTD/RO
PS64/070-2	23.03.03	06:49	76° 18.83' N	23° 17.42' E	60.9	NE 5	119.8	1.3	Bongo net	BONGO
PS64/070-2	23.03.03	06:51	76° 18.81' N	23° 17.58' E	60.0	NE 5	117.4	1.3	Bongo net	BONGO
PS64/070-2	23.03.03	06:56	76° 18.77' N	23° 17.98' E	61.1	NE 5	116.3	1.1	Bongo net	BONGO
PS64/070-3	23.03.03	06:59	76° 18.73' N	23° 18.20' E	63.9	NE 4	117.5	1.1	Nansen Net	NN
PS64/070-3	23.03.03	07:03	76° 18.70' N	23° 18.48' E	63.6	NE 5	122.8	1.2	Nansen Net	NN
PS64/070-3	23.03.03	07:07	76° 18.65' N	23° 18.76' E	62.4	NE 5	118.1	1.1	Nansen Net	NN
PS64/070-4	23.03.03	07:09	76° 18.64' N	23° 18.91' E	62.7	NE 4	137.0	1.2	Nansen Net	NN
PS64/070-4	23.03.03	07:14	76° 18.58' N	23° 19.24' E	131.4	NE 5	128.8	1.1	Nansen Net	NN
PS64/070-4	23.03.03	07:17	76° 18.55' N	23° 19.42' E	117.7	NE 4	123.0	1.2	Nansen Net	NN
PS64/070-5	23.03.03	07:26	76° 18.45' N	23° 19.96' E	114.1	ENE 4	130.8	1.1	Multi corer	MUC
PS64/070-5	23.03.03	07:29	76° 18.41' N	23° 20.13' E	114.7	NE 5	127.2	1.1	Multi corer	MUC
PS64/070-5	23.03.03	07:33	76° 18.37' N	23° 20.36' E	117.1	ENE 4	125.1	0.9	Multi corer	MUC
PS64/070-6	23.03.03	08:21	76° 17.70' N	23° 21.95' E	145.7	NE 4	152.1	0.8	Ice station	ICE
PS64/070-6	23.03.03	08:45	76° 17.36' N	23° 22.33' E	63.6	NE 4	173.2	0.9	Ice station	ICE
PS64/070-6	23.03.03	08:53	76° 17.24' N	23° 22.39' E	64.1	NE 4	170.9	0.8	Ice station	ICE
PS64/070-6	23.03.03	16:51	76° 16.96' N	23° 11.06' E	52.3	NE 2	67.9	0.8	Ice station	ICE

PS64/070-6	23.03.03	17:03	76° 17.00' N	23° 11.68' E	54.7	NE 2	76.2	0.8	Ice station	ICE
PS64/070-6	23.03.03	17:09	76° 17.01' N	23° 12.05' E	56.8	NE 2	90.2	1.2	Ice station	ICE
PS64/070-7	23.03.03	17:10	76° 17.01' N	23° 12.13' E	56.9	NE 2	92.0	1.3	Calibration	CAL
PS64/070-7	23.03.03	17:19	76° 17.02' N	23° 12.81' E	54.5	NE 2	82.6	0.9	Calibration	CAL
PS64/071-1	24.03.03	00:11	76° 10.01' N	24° 30.84' E	69.3	N 4	275.4	0.9	CTD/rosette w	CTD/RO
PS64/071-1	24.03.03	00:15	76° 10.01' N	24° 30.56' E	68.4	N 5	273.7	1.1	CTD/rosette w	CTD/RO
PS64/071-1	24.03.03	00:20	76° 10.02' N	24° 30.20' E	70.0	N 4	280.1	0.9	CTD/rosette w	CTD/RO
PS64/071-2	24.03.03	00:30	76° 10.02' N	24° 29.60' E	66.9	N 4	274.5	0.9	Bongo net	BONGO
PS64/071-2	24.03.03	00:34	76° 10.03' N	24° 29.34' E	68.0	N 5	286.8	1.0	Bongo net	BONGO
PS64/071-2	24.03.03	00:37	76° 10.04' N	24° 29.15' E	68.3	N 4	283.4	0.9	Bongo net	BONGO
PS64/071-3	24.03.03	00:40	76° 10.05' N	24° 28.96' E	68.8	N 4	283.0	0.8	Bongo net	BONGO
PS64/071-3	24.03.03	00:43	76° 10.06' N	24° 28.78' E	68.3	N 5	282.9	0.9	Bongo net	BONGO
PS64/071-3	24.03.03	00:47	76° 10.07' N	24° 28.54' E	67.1	NNE 5	280.5	0.9	Bongo net	BONGO
PS64/071-4	24.03.03	00:54	76° 10.09' N	24° 28.12' E	67.5	N 3	288.3	0.9	Nansen Net	NN
PS64/071-4	24.03.03	00:57	76° 10.11' N	24° 27.95' E	67.4	N 4	291.4	0.9	Nansen Net	NN
PS64/071-4	24.03.03	01:00	76° 10.12' N	24° 27.78' E	67.4	N 4	293.6	0.9	Nansen Net	NN
PS64/071-5	24.03.03	01:04	76° 10.14' N	24° 27.55' E	67.3	N 3	294.8	0.9	Nansen Net	NN
PS64/071-5	24.03.03	01:07	76° 10.15' N	24° 27.39' E	67.5	N 4	302.9	1.0	Nansen Net	NN
PS64/071-5	24.03.03	01:11	76° 10.18' N	24° 27.13' E	68.2	NNW 4	303.4	1.0	Nansen Net	NN
PS64/072-1	24.03.03	05:11	76° 5.00' N	25° 17.26' E	93.5	N 8	118.4	0.6	CTD/rosette w	CTD/RO
PS64/072-1	24.03.03	05:15	76° 5.00' N	25° 17.42' E	94.3	N 8	108.7	0.7	CTD/rosette w	CTD/RO
PS64/072-1	24.03.03	05:19	76° 5.00' N	25° 17.59' E	95.6	N 8	83.5	0.7	CTD/rosette w	CTD/RO
PS64/072-2	24.03.03	05:29	76° 4.99' N	25° 18.00' E	94.9	N 8	88.0	0.7	Bongo net	BONGO
PS64/072-2	24.03.03	05:33	76° 4.99' N	25° 18.17' E	96.0	N 8	92.2	0.7	Bongo net	BONGO
PS64/072-2	24.03.03	05:38	76° 4.98' N	25° 18.38' E	97.6	N 8	87.9	0.7	Bongo net	BONGO
PS64/072-3	24.03.03	05:40	76° 4.97' N	25° 18.47' E	96.1	N 8	88.2	0.7	Bongo net	BONGO
PS64/072-3	24.03.03	05:44	76° 4.97' N	25° 18.64' E	94.6	N 8	101.7	0.7	Bongo net	BONGO
PS64/072-3	24.03.03	05:49	76° 4.96' N	25° 18.85' E	93.1	N 8	91.5	0.7	Bongo net	BONGO
PS64/072-4	24.03.03	05:54	76° 4.94' N	25° 19.06' E	93.3	N 8	100.5	0.6	Nansen Net	NN
PS64/072-4	24.03.03	05:58	76° 4.93' N	25° 19.24' E	94.9	N 8	103.2	0.6	Nansen Net	NN
PS64/072-4	24.03.03	06:02	76° 4.92' N	25° 19.41' E	92.8	N 7	105.4	0.6	Nansen Net	NN
PS64/072-5	24.03.03	06:06	76° 4.91' N	25° 19.59' E	91.1	N 7	104.5	0.6	Nansen Net	NN
PS64/072-5	24.03.03	06:11	76° 4.89' N	25° 19.82' E	90.1	N 7	104.5	0.7	Nansen Net	NN
PS64/072-5	24.03.03	06:17	76° 4.87' N	25° 20.09' E	92.6	N 7	106.8	0.7	Nansen Net	NN
PS64/072-6	24.03.03	06:26	76° 4.84' N	25° 20.49' E	92.9	N 6	107.0	0.7	Multi corer	MUC
PS64/072-6	24.03.03	06:30	76° 4.82' N	25° 20.67' E	93.3	N 7	107.1	0.7	Multi corer	MUC
PS64/072-6	24.03.03	06:33	76° 4.81' N	25° 20.81' E	94.3	N 6	109.5	0.7	Multi corer	MUC

PS64/073-1	24.03.03	11:29	75° 58.41' N	25° 36.52' E	127.9	N 0	240.4	0.7	Turbulenzmes	TMS
PS64/073-2	24.03.03	13:31	75° 58.07' N	25° 30.69' E	140.6	N 6	259.4	0.7	Eisfischen	EF
PS64/073-3	24.03.03	13:32	75° 58.07' N	25° 30.64' E	141.9	N 6	258.0	0.7	Bugkran - Sea	BKS
PS64/073-3	24.03.03	13:37	75° 58.06' N	25° 30.42' E	142.5	N 5	252.3	0.7	Bugkran - Sea	BKS
PS64/073-2	24.03.03	13:50	75° 58.03' N	25° 29.91' E	142.5	N 5	247.8	0.5	Eisfischen	EF
PS64/073-1	24.03.03	16:26	75° 58.12' N	25° 26.96' E	128.9	NNW 5	21.0	1.4	Turbulenzmes	TMS
PS64/073-1	24.03.03	18:01	75° 58.65' N	25° 28.35' E	135.5	N 6	87.4	0.4	Turbulenzmes	TMS
PS64/074-1	24.03.03	21:59	75° 59.79' N	26° 3.97' E	161.0	NNW 4	174.3	0.4	CTD/rosette w	CTD/RO
PS64/074-1	24.03.03	22:06	75° 59.73' N	26° 3.94' E	161.9	NNW 4	181.1	0.4	CTD/rosette w	CTD/RO
PS64/074-1	24.03.03	22:14	75° 59.68' N	26° 3.87' E	163.2	NNW 4	197.7	0.4	CTD/rosette w	CTD/RO
PS64/074-2	24.03.03	22:23	75° 59.61' N	26° 3.79' E	164.5	NNW 5	194.6	0.5	Multiple net	MN
PS64/074-2	24.03.03	22:31	75° 59.54' N	26° 3.70' E	164.7	N 6	198.9	0.5	Multiple net	MN
PS64/074-2	24.03.03	22:43	75° 59.46' N	26° 3.56' E	164.0	NNW 4	196.7	0.4	Multiple net	MN
PS64/074-3	24.03.03	22:51	75° 59.40' N	26° 3.43' E	156.7	NNW 4	209.9	0.4	Bongo net	BONGO
PS64/074-3	24.03.03	22:59	75° 59.34' N	26° 3.27' E	156.2	NNW 4	215.4	0.5	Bongo net	BONGO
PS64/074-3	24.03.03	23:06	75° 59.29' N	26° 3.14' E	157.5	NNW 4	210.2	0.5	Bongo net	BONGO
PS64/074-4	24.03.03	23:11	75° 59.26' N	26° 3.05' E	159.1	NNW 3	209.4	0.5	Nansen Net	NN
PS64/074-4	24.03.03	23:21	75° 59.19' N	26° 2.81' E	160.8	NNW 2	220.8	0.5	Nansen Net	NN
PS64/074-4	24.03.03	23:30	75° 59.13' N	26° 2.61' E	162.3	N 2	218.9	0.5	Nansen Net	NN
PS64/075-1	25.03.03	04:45	75° 54.72' N	26° 58.34' E	216.3	NNE 3	23.0	0.4	CTD/rosette w	CTD/RO
PS64/075-1	25.03.03	04:53	75° 54.74' N	26° 58.45' E	217.4	NNE 2	32.3	0.4	CTD/rosette w	CTD/RO
PS64/075-1	25.03.03	05:01	75° 54.75' N	26° 58.60' E	217.8	N 3	44.9	0.4	CTD/rosette w	CTD/RO
PS64/075-2	25.03.03	05:10	75° 54.76' N	26° 58.79' E	219.2	NNE 2	57.7	0.3	Multiple net	MN
PS64/075-2	25.03.03	05:20	75° 54.79' N	26° 58.97' E	220.1	N 2	57.7	0.4	Multiple net	MN
PS64/075-2	25.03.03	05:35	75° 54.82' N	26° 59.32' E	223.5	N 1	61.4	0.4	Multiple net	MN
PS64/075-3	25.03.03	05:44	75° 54.85' N	26° 59.54' E	221.0	NNE 2	53.6	0.4	Bongo net	BONGO
PS64/075-3	25.03.03	05:48	75° 54.86' N	26° 59.64' E	221.7	N 2	51.9	0.5	Bongo net	BONGO
PS64/075-3	25.03.03	05:53	75° 54.87' N	26° 59.78' E	223.8	N 2	58.8	0.4	Bongo net	BONGO
PS64/075-4	25.03.03	05:59	75° 54.89' N	26° 59.94' E	223.8	N 2	55.3	0.4	Nansen Net	NN
PS64/075-4	25.03.03	06:13	75° 54.91' N	27° 0.32' E	226.8	N 2	72.7	0.5	Nansen Net	NN
PS64/075-4	25.03.03	06:24	75° 54.94' N	27° 0.66' E	227.5	N 2	75.3	0.5	Nansen Net	NN
PS64/075-5	25.03.03	06:25	75° 54.94' N	27° 0.69' E	228.0	N 2	74.5	0.5	Nansen Net	NN
PS64/075-5	25.03.03	06:29	75° 54.95' N	27° 0.82' E	228.3	N 3	76.5	0.5	Nansen Net	NN
PS64/075-5	25.03.03	06:33	75° 54.96' N	27° 0.94' E	227.9	N 2	70.7	0.5	Nansen Net	NN
PS64/075-6	25.03.03	06:42	75° 54.97' N	27° 1.22' E	229.3	N 2	69.0	0.5	Multi corer	MUC
PS64/075-6	25.03.03	06:47	75° 54.98' N	27° 1.39' E	230.6	N 2	74.9	0.5	Multi corer	MUC
PS64/075-6	25.03.03	06:54	75° 54.98' N	27° 1.64' E	232.9	N 3	86.2	0.5	Multi corer	MUC

PS64/075-7	25.03.03	07:13	75° 55.14' N	27° 2.74' E	239.5	N 3	253.9	1.6	Agassiz trawl	AGT
PS64/075-7	25.03.03	07:26	75° 55.11' N	27° 0.61' E	229.8	NNE 3	267.4	1.7	Agassiz trawl	AGT
PS64/075-7	25.03.03	07:41	75° 55.13' N	26° 59.46' E	225.1	NNE 2	277.6	1.1	Agassiz trawl	AGT
PS64/075-7	25.03.03	07:58	75° 55.14' N	26° 59.11' E	223.0	N 2	273.2	0.0	Agassiz trawl	AGT
PS64/075-8	25.03.03	08:24	75° 55.25' N	26° 59.93' E	229.1	N 2	97.4	0.4	Ice station	ICE
PS64/075-8	25.03.03	08:29	75° 55.25' N	27° 0.06' E	229.1	N 2	97.9	0.3	Ice station	ICE
PS64/075-8	25.03.03	09:34	75° 55.14' N	27° 1.37' E	231.7	NNE 2	122.6	0.3	Ice station	ICE
PS64/075-8	25.03.03	09:34	75° 55.14' N	27° 1.37' E	231.7	NNE 2	122.6	0.3	Ice station	ICE
PS64/076-1	25.03.03	11:21	75° 52.75' N	27° 32.08' E	257.5	NE 2	242.7	0.4	CTD/rosette w	CTD/RO
PS64/076-1	25.03.03	11:29	75° 52.73' N	27° 31.96' E	258.1	ENE 2	243.4	0.3	CTD/rosette w	CTD/RO
PS64/076-1	25.03.03	11:38	75° 52.71' N	27° 31.82' E	257.1	E 2	249.5	0.4	CTD/rosette w	CTD/RO
PS64/076-2	25.03.03	11:48	75° 52.69' N	27° 31.61' E	258.0	E 2	249.4	0.3	Multiple net	MN
PS64/076-2	25.03.03	11:59	75° 52.69' N	27° 31.47' E	258.4	E 2	279.7	0.2	Multiple net	MN
PS64/076-2	25.03.03	12:00	75° 52.69' N	27° 31.46' E	258.5	E 2	285.3	0.2	Multiple net	MN
PS64/076-2	25.03.03	12:16	75° 52.67' N	27° 31.09' E	258.2	E 1	283.8	0.3	Multiple net	MN
PS64/076-3	25.03.03	12:24	75° 52.66' N	27° 30.87' E	255.6	E 2	262.9	0.4	Nansen Net	NN
PS64/076-3	25.03.03	12:36	75° 52.65' N	27° 30.55' E	255.6	ESE 2	278.3	0.3	Nansen Net	NN
PS64/076-3	25.03.03	12:50	75° 52.65' N	27° 30.19' E	254.0	ESE 3	271.3	0.5	Nansen Net	NN
PS64/076-4	25.03.03	13:02	75° 52.65' N	27° 29.78' E	255.9	ESE 2	290.4	0.3	Multi corer	MUC
PS64/076-4	25.03.03	13:08	75° 52.65' N	27° 29.63' E	257.1	SE 2	290.6	0.4	Multi corer	MUC
PS64/076-4	25.03.03	13:13	75° 52.65' N	27° 29.48' E	257.8	ESE 2	279.6	0.4	Multi corer	MUC
PS64/077-1	25.03.03	16:37	75° 29.92' N	28° 0.17' E	274.2	SE 6	339.3	0.4	CTD/rosette w	CTD/RO
PS64/077-1	25.03.03	16:45	75° 30.00' N	27° 59.99' E	274.3	SE 7	283.4	0.9	CTD/rosette w	CTD/RO
PS64/077-1	25.03.03	16:52	75° 30.08' N	27° 59.74' E	273.1	SE 6	359.3	1.2	CTD/rosette w	CTD/RO
PS64/077-2	25.03.03	17:02	75° 30.20' N	27° 59.32' E	274.0	SE 7	332.6	1.1	Trap, fish	TRAPF
PS64/077-2	25.03.03	17:08	75° 30.28' N	27° 59.02' E	274.0	SE 7	335.1	1.1	Trap, fish	TRAPF
PS64/077-2	25.03.03	17:11	75° 30.32' N	27° 58.92' E	272.7	SE 7	320.8	1.1	Trap, fish	TRAPF
PS64/077-2	25.03.03	17:13	75° 30.35' N	27° 58.81' E	269.5	SE 7	306.3	1.0	Trap, fish	TRAPF
PS64/077-2	25.03.03	17:14	75° 30.36' N	27° 58.76' E	269.7	SE 7	313.5	1.0	Trap, fish	TRAPF
PS64/077-2	25.03.03	17:15	75° 30.37' N	27° 58.71' E	271.9	SE 7	329.5	1.1	Trap, fish	TRAPF
PS64/077-2	25.03.03	17:18	75° 30.42' N	27° 58.60' E	272.1	SE 7	334.5	1.2	Trap, fish	TRAPF
PS64/077-3	25.03.03	17:43	75° 30.69' N	27° 59.66' E	272.9	SE 8	345.3	1.1	Trap, fish	TRAPF
PS64/077-3	25.03.03	17:46	75° 30.74' N	27° 59.54' E	272.2	SE 8	339.2	1.3	Trap, fish	TRAPF
PS64/077-3	25.03.03	17:59	75° 30.92' N	27° 59.42' E	270.2	SE 9	301.5	1.2	Trap, fish	TRAPF
PS64/078-1	25.03.03	20:26	75° 24.60' N	28° 59.95' E	343.3	SE 12	13.1	0.7	CTD/rosette w	CTD/RO
PS64/078-1	25.03.03	20:37	75° 24.72' N	28° 59.92' E	340.4	SE 12	344.3	0.9	CTD/rosette w	CTD/RO
PS64/078-1	25.03.03	20:46	75° 24.85' N	28° 59.67' E	339.7	SE 13	331.3	1.2	CTD/rosette w	CTD/RO

PS64/079-1	25.03.03	23:14	75° 19.49' N	30° 0.23' E	379.5	ESE 13	314.9	1.0	CTD/rosette w	CTD/RO
PS64/079-1	25.03.03	23:26	75° 19.67' N	29° 59.63' E	378.3	ESE 12	313.7	0.9	CTD/rosette w	CTD/RO
PS64/079-1	25.03.03	23:33	75° 19.75' N	29° 59.35' E	377.6	ESE 13	321.1	0.8	CTD/rosette w	CTD/RO
PS64/080-1	26.03.03	03:09	75° 13.64' N	31° 0.23' E	368.5	ESE 20	311.8	1.4	CTD/rosette w	CTD/RO
PS64/080-1	26.03.03	03:21	75° 13.83' N	30° 59.89' E	366.8	ESE 19	48.2	1.2	CTD/rosette w	CTD/RO
PS64/080-1	26.03.03	03:31	75° 13.97' N	31° 0.02' E	367.6	ESE 21	344.2	1.4	CTD/rosette w	CTD/RO
PS64/077-2	26.03.03	10:04	75° 30.21' N	27° 58.83' E	273.9	WNW 7	351.2	0.8	Trap, fish	TRAPF
PS64/077-2	26.03.03	10:07	75° 30.21' N	27° 58.84' E	273.3	WNW 8	177.9	0.2	Trap, fish	TRAPF
PS64/077-2	26.03.03	10:14	75° 30.19' N	27° 59.11' E	273.2	WNW 9	85.2	0.6	Trap, fish	TRAPF
PS64/077-2	26.03.03	10:18	75° 30.15' N	27° 59.25' E	274.5	NW 8	148.5	1.0	Trap, fish	TRAPF
PS64/077-2	26.03.03	10:30	75° 30.36' N	27° 58.71' E	272.0	NW 8	107.3	0.7	Trap, fish	TRAPF
PS64/077-2	26.03.03	11:06	75° 30.00' N	27° 59.84' E	273.4	NW 8	68.6	0.3	Trap, fish	TRAPF
PS64/077-3	26.03.03	11:20	75° 30.77' N	27° 59.30' E	270.7	NW 9	91.4	1.0	Trap, fish	TRAPF
PS64/077-3	26.03.03	11:22	75° 30.75' N	27° 59.41' E	272.2	NW 6	124.8	0.6	Trap, fish	TRAPF
PS64/077-3	26.03.03	11:38	75° 30.76' N	27° 59.98' E	271.3	NW 8	139.6	0.5	Trap, fish	TRAPF
PS64/077-3	26.03.03	12:21	75° 30.65' N	27° 59.90' E	271.1	NW 6	220.0	0.7	Trap, fish	TRAPF
PS64/077-3	26.03.03	12:48	75° 30.38' N	27° 58.83' E	272.5	NW 7	234.6	0.6	Trap, fish	TRAPF
PS64/077-3	26.03.03	12:49	75° 30.37' N	27° 58.80' E	270.0	NNW 6	230.6	0.4	Trap, fish	TRAPF
PS64/077-3	26.03.03	12:54	75° 30.31' N	27° 58.63' E	276.7	NNW 7	188.8	0.4	Trap, fish	TRAPF
PS64/077-3	26.03.03	12:56	75° 30.30' N	27° 58.59' E	275.7	NW 7	202.2	0.5	Trap, fish	TRAPF
PS64/077-3	26.03.03	12:58	75° 30.29' N	27° 58.52' E	275.3	NNW 7	224.7	0.4	Trap, fish	TRAPF
PS64/081-1	26.03.03	13:11	75° 30.24' N	27° 58.13' E	274.6	WNW 2	32.7	2.8	Agassiz trawl	AGT
PS64/081-1	26.03.03	13:26	75° 30.74' N	27° 59.57' E	272.6	WNW 3	43.6	2.2	Agassiz trawl	AGT
PS64/081-1	26.03.03	13:26	75° 30.74' N	27° 59.57' E	272.6	WNW 3	43.6	2.2	Agassiz trawl	AGT
PS64/081-1	26.03.03	13:41	75° 30.99' N	28° 0.36' E	269.7	NW 3	45.1	0.9	Agassiz trawl	AGT
PS64/081-1	26.03.03	13:42	75° 31.00' N	28° 0.40' E	269.5	NW 4	38.7	0.9	Agassiz trawl	AGT
PS64/081-1	26.03.03	13:52	75° 31.08' N	28° 0.64' E	269.2	NW 2	25.0	0.5	Agassiz trawl	AGT
PS64/081-1	26.03.03	14:05	75° 31.30' N	28° 1.18' E	267.8	WNW 2	37.1	1.4	Agassiz trawl	AGT
PS64/082-1	28.03.03	18:00	77° 53.95' N	11° 2.80' E	142.8	ENE 1	359.6	6.5	Calibration	CAL
PS64/082-1	28.03.03	18:44	77° 53.47' N	11° 4.11' E	123.2	ENE 3	320.4	7.4	Calibration	CAL
PS64/082-1	28.03.03	19:33	77° 53.38' N	11° 4.85' E	119.2	ENE 2	342.2	6.6	Calibration	CAL

Action	Comment
surface	
at depth	EL 30 / 502m
Hoisting	
on deck	
surface	
on deck	EL 30 / 500m
surface	
at depth	100 m Draht
on deck	
in the water	
at depth	100 m Draht
on Deck	
surface	
at depth	317 m Draht
on deck	
surface	
at depth	50 m
on deck	
start	HELIPOD-Calibration on Helideck; Ship standing still
End	Test aborted - no success
start	
End	Helipod
surface	
at depth	EL 31 192 m
on deck	
surface	
at sea bottom	200 m GE 52,2
on deck	
surface	
at depth	EL 31 /292m
on deck	
surface	
at depth	
on deck	
surface	

at depth	313 m
on deck	
surface	
at depth	300 m
on deck	
surface	
at depth	300 m
on deck	
in the water	
at depth	300m auf Tiefe
on Deck	
surface	
at depth	311 m
on deck	
surface	
at depth	303 m
on deck	
surface	
at depth	156 m
on deck	
surface	
at depth	58 m
on deck	
surface	
at sea bottom	
on deck	
surface	
at depth	143 m
on deck	
Alongside Floe	
Ice Gangway on the ice	
Scientists on the ice	
Scientists on board	
Ice Gangway on board	
Departure from floe	
surface	
at depth	

on deck	
surface	
at sea bottom	241 m
on deck	
surface	
at depth	
on deck	
surface	
at sea bottom	
on deck	
surface	
at depth	
on deck	
Alongside Floe	
Ice Gangway on the ice	
Scientists on the ice	
Scientists on board	
Ice Gangway on board	
Departure from floe	
surface	
at depth	191 m
on deck	
surface	
at depth	210m gesteckt
on deck	
surface	
at depth	190 m
on deck	
surface	
at depth	190 m
on deck	
surface	
at depth	185 m
on deck	
in the water	
at depth	185 m
on Deck	

surface	
at depth	195 m
on deck	
surface	
at sea bottom	200 m
on deck	
surface	
at depth	186 m
on deck	
Alongside Floe	
Ice Gangway on the ice	
Scientists on the ice	
Scientists on board	
Ice Gangway on board	
Departure from floe	
surface	
at depth	
on deck	
surface	
at depth	
on deck	
surface	
at depth	
on deck	
surface	
at depth	116 m
on deck	
surface	Schnitt C
at depth	109 m
on deck	
Scientists on t	Mummychair Bb achtern
surface	
at sea bottom	120 m
on deck	nicht ausgelöst Wiederholung
surface	
at sea bottom	122 m
on deck	

Scientists on board		
Departure from floe		
surface		
at depth	118 m - Sensoren nicht in Ordnung - Abbruch	
on deck	sensors not working - cancelled	
surface		
at depth	127 m	
on deck		
surface		
at sea bottom	135 m	
on deck	leer	
surface		
at sea bottom	140 m	
on deck		
surface	Gewicht, Auslöser, Microcat, RCM8, TR7, Beginn T-Kette, 4 Benthos	seit 0626 hrs
surface	Microcat	
surface	RCM 4, 2 Benthos, Ende T-Kette, Toppkugel + Schwimmleine	
slipped		
Alongside Floe		
Scientists on the ice		
Scientists on board		
Departure from floe		
surface		
at depth		
on deck		
surface		
at sea bottom		
on deck		
surface		
at depth	155m gesteckt	
on deck		
in the water		
at depth	150 m	
on Deck		
in the water		
at depth	145 m	
on Deck		

surface	
at sea bottom	161 m
on deck	
surface	
at depth	
on deck	
surface	
at sea bottom	
on deck	
surface	
Information	Hieven und anschließendes Fieren wg. Problemen mit CTD
surface	151 m
on deck	
Alongside Floe	
Ice Gangway on the ice	
Scientists on the ice	
Start of measurement	
surface	
at depth	
on deck	
surface	
at depth	
Hoisting	
on deck	
Ice Gangway (	Mummy Chair stand by für 2 Forscher auf dem Eis
Scientists on board	
End of measu	wegen ungünstiger Windrichtung Mast eingenommen
Scientists on t	2 Leute bewaffnet zum betanken des Aggragtes
Scientists on board	
Alongside Floe	
Ice Gangway on the ice	
Scientists on the ice	
Scientists on board	
Departure from floe	
surface	
at depth	
on deck	

surface	
at sea bottom	
on deck	
surface	
at sea bottom	
on deck	
surface	
at depth	118 m
on deck	
surface	
at sea bottom	115 m
surface	nicht ausgelöst - 2. Versuch
at sea bottom	120 m
on deck	
surface	
at depth	108 m
on deck	
surface	
at depth	81 m
on deck	
surface	
at depth	
on deck	
surface	
at depth	83 m
on deck	
surface	
at sea bottom	97 m
on deck	
Start of measurement	
End of measu	Recovery of Ice Mast from floe
surface	
Begin Trawling	
End of Trawl	
on deck	
surface	
start trawl	450 m Draht

Start hoisting
Stop Trawl
AGT off ground
on deck
surface
at depth 65 m
on deck
surface
at sea bottom rote Fahne , UKW Sender, 65 m
Hydrophon to the water
released
Releaser on Deck
surface
at depth 74 m
on deck
surface
at sea bottom
released
Releaser on Deck
Alongside Floe
Ice Gangway on the ice
Scientists on the ice
Scientists on board
surface
at depth
on deck
surface
at depth
Hoisting
on deck
surface
at depth
on deck
surface
at depth
on deck
in the water

at depth	
on Deck	
in the water	
at depth	
on Deck	
surface	
at sea bottom	
on deck	
Ice Gangway on the ice	
Scientists on the ice	
Scientists on board	
Ice Gangway on board	
Departure from floe	
Hydrophon to the water	
on deck	
Hydrophon to the water	
Hydrophon ou	no answer
Hydrophon to the water	
Hydrophon ou	no answer from trap
Hydrophon to	different hydrophon
Hydrophon out of the water	
on deck	
Start of measurement	
End of measurement	
surface	
at depth	56 m
on deck	
surface	
at sea bottom	63 m
on deck	
surface	
at depth	80 m
on deck	
surface	
at depth	
on deck	
surface	

at depth	
on deck	
surface	
at depth	
on deck	
surface	
on deck	
surface	
at depth	
on deck	
surface	
at depth	140 m
on deck	
surface	
at depth	171 m
on deck	
surface	
at depth	168 m
on deck	
surface	
at depth	171 m
on deck	
surface	
at depth	165 m
on deck	
surface	
at depth	165 m
on deck	
in the water	
at depth	165 m
on Deck	
surface	
at sea bottom	183 m
on deck	
surface	
at depth	152 m
on deck	

surface	
at depth	
on deck	
surface	
at sea bottom	
on deck	
surface	
at depth	142 m
on deck	
surface	
at depth	127 m
on deck	
surface	
at depth	
on deck	
surface	
at depth	
on deck	
surface	
surface	77 m
on deck	
surface	
at depth	88 m
on deck	
surface	
surface	66 m
on deck	
surface	
at depth	Tiefensensor daneben: 102 m Draht 94m
on deck	
surface	Ankerstein, Releaser, Seacat 3024, RCM 7 11295, 4 Benthos
surface	Microcat 2719
surface	40 m Meteor, RCM 4 207, 2 Benthos, 5 m Meteor, Toppkugel mit Schwimmleine
slipped	
surface	
at depth	117 m
on deck	

surface	
at depth	
on deck	
surface	
at depth	
on deck	
surface	
at depth	163m gesteckt
on deck	
surface	
at depth	169 m
on deck	
surface	Ankerstein, Releaser 200, Microcat 2721, RCM 7 11297, TR7, 4 Benthos
surface	RCM 5, 2 Benthos, Toppkugel, Schwimmleine
slipped	
into the water	vom Bugkran
surface	
at depth	163 m
on deck	
surface	
Start of measurement	
at depth	161 m
on deck	
surface	
at depth	155 m
on deck	
in the water	
at depth	160 m
End of measu	wegen fehlenden Wind Abbruch
on Deck	
surface	
at sea bottom	171 m
on deck	
surface	
at depth	
on deck	
surface	

at depth	
on deck	
surface	
at sea bottom	
on deck	
into the water	
into the water	
surface	
at depth	149 m
on deck	
surface	
at depth	
on deck	
surface	
at depth	258 m
on deck	
surface	
at depth	251 m
on deck	
surface	
at depth	240 m
on deck	
surface	
at depth	240 m
on deck	
in the water	
at depth	240 m
on Deck	
surface	
at sea bottom	260 m
on deck	
Start of measurement	
in the water	
Information	Beginn Drift Richtung Mitte Polynia
into the water	
surface	
at depth	206 m

on deck	
on Deck	
Information	Verholen mit kleinster Fahrt an Schollenrand - bis Mast über dem Eis
End of measurement	
Scientists on the ice	
Scientists on b	Ice Mast geborgen
surface	
at depth	154 m
on deck	
surface	
at depth	149 m
on deck	
surface	
at depth	145 m
on deck	
in the water	
at depth	145 m
on Deck	
surface	
at depth	54 m
on deck	
surface	
at depth	50 m
on deck	
in the water	
at depth	50 m
on Deck	
in the water	
at depth	50 m
on Deck	
surface	
at sea bottom	65 m
on deck	
Alongside Floe	
Ice Gangway on the ice	
Scientists on the ice	
Scientists on board	

Ice Gangway on board	
Departure from floe	
start	Kalibrierung SIMS Eisdickenmessgerät über offenem Wasser
End	
surface	
at depth	
on deck	
surface	
at depth	
on deck	
surface	
at depth	
on deck	
in the water	
at depth	
on Deck	
in the water	
at depth	
on Deck	
surface	
at depth	88 m
on deck	
surface	
at depth	80 m
on deck	
surface	
at depth	80 m
on deck	
in the water	
at depth	80 m
on Deck	
in the water	
at depth	80 m
on Deck	
surface	
at sea bottom	96 m
on deck	

Start of measurement	
start	
in the water	
on Deck	
End	
Information	Reference Mast recovered
End of measurement	
surface	
at depth	148 m
on deck	
surface	
at depth	152 m
on deck	
surface	
at depth	140 m
on deck	
in the water	
at depth	140 m
on Deck	
surface	
at depth	206 m
on deck	
surface	
at depth	205 m
on deck	
surface	
surface	100 m
on deck	
in the water	
in the water	200 m
on Deck	
in the water	
at depth	60 m
on Deck	
surface	
at sea bottom	228 m
on deck	

surface	
start trawl	652 m
Start hoisting	
on deck	
Alongside Floe	
Scientists on t	per Mummychair
Scientists on board	
Departure from floe	
surface	
at depth	245 m
on deck	
surface	
at depth	
Hoisting	
on deck	
in the water	
at depth	
on Deck	
surface	
at sea bottom	
on deck	
surface	
at depth	261 m
on deck	
surface	
Hydrophon to	255 m Draht
Hydrophon ou	Funktionsstörung des Hydrophon
Hydrophon to the water	
released	
Hydrophon out of the water	
Releaser on Deck	
surface	
at sea bottom	
Releaser on Deck	
surface	
at depth	326 m
on deck	

surface	
at depth	364 m
on deck	
surface	
at depth	
on deck	
Hydrophon to the water	
released	
Hydrophon to the water	
Releaser on Deck	
Hydrophon to the water	
on deck	
Hydrophon to the water	
released	
Hydrophon out of the water	
Searching by helicopter	
Hydrophon to the water	
Hydrophon ou	stb
Hydrophon to the water	
Hydrophon out of the water	
Aborted, trap not afloat	
surface	
start trawl	
AGT on ground	
Stop Trawl	
Start hoisting	
AGT off ground	
on deck	
start	Magnetik Drehkreise: 1x über Stb, 1x über Bb; Radius 1nm, v=7 kn
Information	Beginnen 2. Drehkreis
End	

Station	Date	Time	PositionLat	PositionLon	Depth [m]	Windstreng	Course [°]	Speed [kn]	Gear	Gear Abbre	Action	Comment
PS64/083-1	30.03.03	00:39	78° 32,91' N	10° 18,84' E	102,6	N 15	187,2	1,0	CTD/rosette	CTD/RO	surface	
PS64/083-1	30.03.03	00:44	78° 32,86' N	10° 18,67' E	93,1	N 15	190,8	1,1	CTD/rosette	CTD/RO	at depth	
PS64/083-1	30.03.03	00:51	78° 32,75' N	10° 18,50' E	84,1	NNW 13	180,8	1,3	CTD/rosette	CTD/RO	on deck	
PS64/084-1	30.03.03	03:25	78° 48,93' N	9° 35,43' E	96,6	N 11	288,3	0,7	CTD/rosette	CTD/RO	surface	
PS64/084-1	30.03.03	03:30	78° 48,85' N	9° 35,28' E	99,5	NNW 13	235,9	0,6	CTD/rosette	CTD/RO	at depth	
PS64/084-1	30.03.03	03:36	78° 48,79' N	9° 35,04' E	100,2	N 12	221,7	0,8	CTD/rosette	CTD/RO	on deck	
PS64/085-1	30.03.03	10:16	79° 4,04' N	4° 20,22' E	2373,0	NNW 9	307,0	0,9	CTD/rosette	CTD/RO	surface	
PS64/085-1	30.03.03	11:03	79° 4,20' N	4° 19,24' E	2368,0	NNW 10	347,1	0,5	CTD/rosette	CTD/RO	at depth	2317 m
PS64/085-1	30.03.03	11:36	79° 4,31' N	4° 18,95' E	2359,0	NNW 12	340,8	0,1	CTD/rosette	CTD/RO	on deck	
PS64/085-2	30.03.03	11:45	79° 4,35' N	4° 18,90' E	2354,0	N 10	348,0	0,4	Multiple net	MN	surface	
PS64/085-2	30.03.03	13:00	79° 4,46' N	4° 19,31' E	2338,0	NNW 11	22,6	0,2	Multiple net	MN	at depth	
PS64/085-2	30.03.03	14:19	79° 4,32' N	4° 19,66' E	2344,0	NNW 11	163,2	0,3	Multiple net	MN	on deck	
PS64/085-3	30.03.03	14:28	79° 4,27' N	4° 19,69' E	2350,0	NNW 10	172,5	0,4	Multiple net	MN	surface	
PS64/085-3	30.03.03	14:38	79° 4,29' N	4° 19,71' E	2349,0	NNW 10	357,3	0,8	Multiple net	MN	Error - Restart	
PS64/085-3	30.03.03	14:45	79° 4,31' N	4° 19,74' E	2345,0	NNW 10	349,3	0,0	Multiple net	MN	surface	
PS64/085-3	30.03.03	15:03	79° 4,29' N	4° 19,85' E	2346,0	N 10	348,8	0,0	Multiple net	MN	Hoisting	
PS64/085-3	30.03.03	15:03	79° 4,29' N	4° 19,85' E	2346,0	NNW 10	348,8	0,0	Multiple net	MN	at depth	
PS64/085-3	30.03.03	15:21	79° 4,30' N	4° 19,83' E	2345,0	N 9	359,6	0,1	Multiple net	MN	on deck	
PS64/085-4	30.03.03	15:33	79° 4,35' N	4° 19,84' E	2342,0	NNW 8	7,6	0,5	Colonization	CTR	to water	
PS64/085-4	30.03.03	15:43	79° 4,41' N	4° 19,92' E	2332,0	NNW 10	40,4	0,3	Colonization	CTR	slipped	
PS64/085-5	30.03.03	16:02	79° 4,47' N	4° 15,92' E	2387,0	N 8	140,5	0,6	Bongo net	BONGO	surface	
PS64/085-5	30.03.03	16:55	79° 3,93' N	4° 17,86' E	2409,0	N 9	97,8	0,5	Bongo net	BONGO	at depth	1500 m
PS64/085-5	30.03.03	18:17	79° 3,10' N	4° 19,91' E	2457,0	NNW 9	181,8	0,7	Bongo net	BONGO	on deck	
PS64/085-6	30.03.03	18:40	79° 2,32' N	4° 17,49' E	2549,0	NNW 7	51,1	2,7	Rectangula	RMT	surface	
PS64/085-6	30.03.03	18:43	79° 2,38' N	4° 17,97' E	2540,0	NNW 9	58,3	1,8	Rectangula	RMT	Begin Traw	33 m
PS64/085-6	30.03.03	19:03	79° 2,52' N	4° 20,39' E	2508,0	N 9	64,9	1,6	Rectangula	RMT	End of Trawl	
PS64/085-6	30.03.03	19:06	79° 2,57' N	4° 20,81' E	2498,0	NNW 7	62,3	1,7	Rectangula	RMT	on deck	
PS64/086-1	31.03.03	06:03	79° 55,66' N	9° 0,49' E	483,7	NW 6	120,4	0,4	CTD/rosette	CTD/RO	surface	
PS64/086-1	31.03.03	06:15	79° 55,55' N	9° 1,17' E	483,8	NW 6	125,1	0,7	CTD/rosette	CTD/RO	at depth	467 m
PS64/086-1	31.03.03	06:31	79° 55,36' N	9° 1,96' E	484,7	NNW 6	148,5	0,6	CTD/rosette	CTD/RO	on deck	
PS64/087-1	31.03.03	07:21	79° 52,50' N	9° 31,63' E	477,7	NW 3	54,2	1,2	Water Sam	WSB	into the water	
PS64/087-2	31.03.03	07:32	79° 52,47' N	9° 31,63' E	476,5	NNW 6	198,5	0,2	CTD/rosette	CTD/RO	surface	
PS64/087-2	31.03.03	07:43	79° 52,44' N	9° 31,56' E	476,8	NNW 6	304,5	0,4	CTD/rosette	CTD/RO	at depth	458 m
PS64/087-2	31.03.03	07:56	79° 52,39' N	9° 31,49' E	475,6	NW 6	152,0	0,6	CTD/rosette	CTD/RO	on deck	
PS64/088-1	31.03.03	08:55	79° 48,75' N	10° 1,68' E	403,4	NNW 6	123,1	0,6	CTD/rosette	CTD/RO	surface	

PS64/088-1	31.03.03	09:07	79° 48,70' N	10° 2,15' E	400,7	NW 5	64,9	0,3	CTD/rosette	CTD/RO	at depth	386 m
PS64/088-1	31.03.03	09:22	79° 48,66' N	10° 2,53' E	398,8	NW 5	31,7	0,3	CTD/rosette	CTD/RO	on deck	
PS64/089-1	31.03.03	10:10	79° 46,77' N	10° 17,66' E	233,7	WNW 2	124,1	0,4	CTD/rosette	CTD/RO	surface	
PS64/089-1	31.03.03	10:17	79° 46,75' N	10° 17,88' E	200,3	NW 4	99,1	0,4	CTD/rosette	CTD/RO	at depth	172 m
PS64/089-1	31.03.03	10:23	79° 46,78' N	10° 18,03' E	197,0	N 3	31,4	0,5	CTD/rosette	CTD/RO	on deck	
PS64/090-1	31.03.03	10:46	79° 45,80' N	10° 24,42' E	96,0	NNW 4	117,0	0,4	Water Sam	WSB	into the water	
PS64/090-2	31.03.03	10:55	79° 45,74' N	10° 24,43' E	94,2	NNW 3	161,0	0,5	CTD/rosette	CTD/RO	surface	
PS64/090-2	31.03.03	11:00	79° 45,71' N	10° 24,37' E	92,1	NNW 4	240,1	0,5	CTD/rosette	CTD/RO	at depth	91 m
PS64/090-2	31.03.03	11:10	79° 45,66' N	10° 24,26' E	96,8	NNW 4	134,0	0,4	CTD/rosette	CTD/RO	on deck	
PS64/091-1	01.04.03	02:50	80° 20,09' N	13° 0,21' E	126,6	WNW 4	66,1	0,1	CTD/rosette	CTD/RO	surface	
PS64/091-1	01.04.03	02:57	80° 20,09' N	13° 0,29' E	126,9	W 3	80,0	0,1	CTD/rosette	CTD/RO	at depth	
PS64/091-1	01.04.03	03:06	80° 20,09' N	13° 0,40' E	128,1	WNW 3	79,8	0,1	CTD/rosette	CTD/RO	on deck	
PS64/092-1	01.04.03	04:55	80° 25,44' N	12° 51,14' E	195,6	NW 3	116,4	0,2	CTD/rosette	CTD/RO	surface	
PS64/092-1	01.04.03	05:01	80° 25,43' N	12° 51,15' E	194,7	NW 4	301,5	0,0	CTD/rosette	CTD/RO	at depth	188 m
PS64/092-1	01.04.03	05:09	80° 25,43' N	12° 51,16' E	193,6	NW 3	301,6	0,0	CTD/rosette	CTD/RO	on deck	
PS64/093-1	01.04.03	08:35	80° 26,17' N	12° 49,44' E	289,3	NNW 2	221,4	0,2	Ice station	ICE	Alongside Floe	
PS64/093-1	01.04.03	08:56	80° 26,13' N	12° 49,38' E	281,9	N 3	196,3	0,1	Ice station	ICE	Ice Gangway on the ice	
PS64/093-1	01.04.03	08:58	80° 26,12' N	12° 49,36' E	281,3	NNW 3	211,6	0,1	Ice station	ICE	Scientists on the ice	
PS64/093-1	01.04.03	17:51	80° 25,18' N	12° 47,20' E	192,2	ENE 6	232,8	0,3	Ice station	ICE	Scientists on board	
PS64/093-1	01.04.03	19:43	80° 24,76' N	12° 43,73' E	184,8	ENE 10	240,0	0,5	Ice station	ICE	Scientists o	Tomato Tea
PS64/093-1	01.04.03	20:46	80° 24,45' N	12° 40,64' E	188,6	ENE 9	237,4	0,6	Ice station	ICE	Scientists on board	
PS64/093-1	01.04.03	23:41	80° 23,56' N	12° 30,90' E	201,4	NE 11	246,3	0,6	Ice station	ICE	Scientists o	4 Personen
PS64/093-1	02.04.03	00:23	80° 23,40' N	12° 28,94' E	193,4	ENE 10	246,1	0,5	Ice station	ICE	Scientists on board	
PS64/093-1	02.04.03	06:10	80° 22,61' N	12° 21,63' E	179,3	NE 10	224,4	0,2	Ice station	ICE	Scientists on the ice	
PS64/093-1	02.04.03	07:23	80° 22,36' N	12° 20,12' E	182,1	NE 9	219,3	0,4	Ice station	ICE	Scientists on board	
PS64/093-1	02.04.03	07:59	80° 22,21' N	12° 19,13' E	178,9	ENE 9	235,3	0,4	Ice station	ICE	Scientists o	zum Meteor
PS64/093-1	02.04.03	08:21	80° 22,13' N	12° 18,56' E	176,2	NE 10	242,6	0,3	Ice station	ICE	Scientists on board	
PS64/093-1	02.04.03	08:22	80° 22,13' N	12° 18,53' E	177,0	NE 10	241,6	0,3	Ice station	ICE	Ice Gangway on board	
PS64/093-1	02.04.03	08:46	80° 21,98' N	12° 16,84' E	189,4	NE 9	241,5	0,6	Ice station	ICE	Alongside Floe	
PS64/093-1	02.04.03	08:47	80° 21,97' N	12° 16,80' E	189,5	NE 10	89,4	0,1	Ice station	ICE	Scientists o	per mummy
PS64/093-1	02.04.03	08:58	80° 21,93' N	12° 16,47' E	188,8	NE 8	234,0	0,2	Ice station	ICE	Scientists on the ice	
PS64/093-1	02.04.03	08:59	80° 21,92' N	12° 16,45' E	188,0	NE 8	213,7	0,3	Ice station	ICE	Departure from floe	
PS64/093-2	02.04.03	09:10	80° 21,82' N	12° 16,47' E	181,2	NE 8	166,7	0,7	CTD/rosette	CTD/RO	surface	
PS64/093-2	02.04.03	09:17	80° 21,75' N	12° 16,61' E	182,7	NE 6	161,5	0,3	CTD/rosette	CTD/RO	at depth	176 m
PS64/093-2	02.04.03	09:34	80° 21,72' N	12° 16,44' E	184,0	NE 7	224,6	1,0	CTD/rosette	CTD/RO	on deck	
PS64/093-3	02.04.03	10:00	80° 21,51' N	12° 15,24' E	184,5	NE 8	232,7	1,3	Multiple net	MN	surface	
PS64/093-3	02.04.03	10:07	80° 21,45' N	12° 14,90' E	184,2	NE 8	224,7	0,5	Multiple net	MN	at depth	173 m

PS64/093-3	02.04.03	10:15	80° 21,40' N	12° 14,58' E	185,4	NE 7	225,6	0,6	Multiple net	MN	on deck	
PS64/093-4	02.04.03	10:36	80° 20,90' N	12° 1,60' E	198,3	NE 8	258,4	2,3	Water Sam	WSB	into the water	
PS64/094-1	02.04.03	14:50	80° 19,59' N	11° 46,68' E	198,3	N 0	225,6	0,3	Turbulenzm	TMS	Start of measurement	
PS64/094-1	02.04.03	19:50	80° 19,11' N	11° 47,95' E	196,4	NNE 7	227,5	0,5	Turbulenzm	TMS	End of measurement	
PS64/095-1	03.04.03	06:01	80° 27,95' N	13° 14,86' E	466,5	NNE 6	6,9	0,4	CTD/rosette	CTD/RO	surface	
PS64/095-1	03.04.03	06:16	80° 27,93' N	13° 14,79' E	464,6	NE 8	298,4	0,6	CTD/rosette	CTD/RO	at depth	449 m
PS64/095-1	03.04.03	06:33	80° 27,89' N	13° 14,45' E	463,3	NNE 7	20,1	0,2	CTD/rosette	CTD/RO	on deck	
PS64/096-1	03.04.03	07:45	80° 31,83' N	13° 28,23' E	306,6	NNE 6	351,3	0,7	CTD/rosette	CTD/RO	surface	
PS64/096-1	03.04.03	07:54	80° 31,85' N	13° 28,19' E	307,1	NNE 6	35,2	0,2	CTD/rosette	CTD/RO	at depth	295 m
PS64/096-1	03.04.03	08:04	80° 31,83' N	13° 28,01' E	311,3	NNE 6	17,0	0,0	CTD/rosette	CTD/RO	on deck	
PS64/096-1	03.04.03	08:04	80° 31,83' N	13° 28,01' E	311,3	NNE 6	17,0	0,0	CTD/rosette	CTD/RO	surface	
PS64/097-1	03.04.03	08:59	80° 35,34' N	13° 15,35' E	634,7	NNE 6	235,5	0,5	CTD/rosette	CTD/RO	surface	
PS64/097-1	03.04.03	09:18	80° 35,28' N	13° 14,97' E	641,0	NNE 6	212,2	0,2	CTD/rosette	CTD/RO	at depth	627 m
PS64/097-1	03.04.03	09:35	80° 35,22' N	13° 14,60' E	647,6	NNE 6	209,1	0,2	CTD/rosette	CTD/RO	on deck	
PS64/098-1	03.04.03	10:32	80° 39,67' N	13° 5,12' E	981,8	NNE 6	264,3	0,4	CTD/rosette	CTD/RO	surface	
PS64/098-1	03.04.03	10:51	80° 39,64' N	13° 4,50' E	986,9	NNE 7	236,9	0,3	CTD/rosette	CTD/RO	at depth	955 m
PS64/098-1	03.04.03	11:07	80° 39,58' N	13° 4,08' E	989,7	NNE 7	226,7	0,4	CTD/rosette	CTD/RO	on deck	
PS64/099-1	03.04.03	18:47	80° 44,38' N	13° 12,23' E	1190,0	NNE 7	342,6	0,3	CTD/rosette	CTD/RO	surface	
PS64/099-1	03.04.03	19:11	80° 44,47' N	13° 11,99' E	1196,0	NNE 7	313,1	0,3	CTD/rosette	CTD/RO	at depth	1158 m
PS64/099-1	03.04.03	19:34	80° 44,42' N	13° 11,48' E	1201,0	NNE 8	204,9	0,5	CTD/rosette	CTD/RO	on deck	
PS64/100-1	03.04.03	20:21	80° 49,29' N	13° 13,59' E	1484,0	NNE 7	214,2	0,4	CTD/rosette	CTD/RO	surface	
PS64/100-1	03.04.03	20:49	80° 49,17' N	13° 12,98' E	1481,0	N 7	235,2	0,2	CTD/rosette	CTD/RO	at depth	1436 m
PS64/100-1	03.04.03	21:16	80° 49,06' N	13° 12,34' E	1478,0	NNE 8	229,1	0,4	CTD/rosette	CTD/RO	on deck	
PS64/101-1	03.04.03	22:42	80° 58,59' N	13° 1,89' E	1967,0	NNE 10	191,4	0,3	CTD/rosette	CTD/RO	surface	
PS64/101-1	03.04.03	23:18	80° 58,42' N	13° 1,04' E	1962,0	NNE 10	214,9	0,5	CTD/rosette	CTD/RO	at depth	1913 m
PS64/101-1	03.04.03	23:54	80° 58,23' N	13° 0,34' E	1955,0	NNE 10	185,4	0,6	CTD/rosette	CTD/RO	on deck	
PS64/102-1	04.04.03	01:27	81° 7,44' N	12° 35,45' E	2219,0	NNE 7	227,0	0,5	CTD/rosette	CTD/RO	surface	
PS64/102-1	04.04.03	02:08	81° 7,30' N	12° 34,72' E	2219,0	NNE 7	202,5	0,2	CTD/rosette	CTD/RO	at depth	
PS64/102-1	04.04.03	02:51	81° 7,10' N	12° 33,99' E	2216,0	NNE 8	236,4	0,1	CTD/rosette	CTD/RO	on deck	
PS64/103-1	04.04.03	04:18	81° 14,58' N	11° 52,90' E	2100,0	NNE 7	211,8	0,3	CTD/rosette	CTD/RO	surface	
PS64/103-1	04.04.03	05:00	81° 14,41' N	11° 52,33' E	2099,0	NNE 7	208,3	0,2	CTD/rosette	CTD/RO	at depth	2046m
PS64/103-1	04.04.03	05:40	81° 14,25' N	11° 51,70' E	2101,0	NNE 7	203,1	0,3	CTD/rosette	CTD/RO	on deck	
PS64/104-1	04.04.03	06:28	81° 18,08' N	11° 31,15' E	1620,0	NNE 8	210,6	0,2	CTD/rosette	CTD/RO	surface	
PS64/104-1	04.04.03	06:58	81° 17,93' N	11° 30,56' E	1644,0	NNE 8	215,4	0,3	CTD/rosette	CTD/RO	at depth	1582m
PS64/104-1	04.04.03	07:19	81° 17,83' N	11° 30,13' E	1663,0	N 8	213,3	0,3	CTD/rosette	CTD/RO	on deck	
PS64/105-1	04.04.03	09:04	81° 21,93' N	10° 32,83' E	1936,0	N 8	222,2	0,7	CTD/rosette	CTD/RO	surface	
PS64/105-1	04.04.03	09:38	81° 21,69' N	10° 32,78' E	1939,0	N 8	199,7	0,6	CTD/rosette	CTD/RO	at depth	1887 m

PS64/105-1	04.04.03	10:07	81° 21,40' N	10° 32,45' E	1944,0	N 9	181,9	1,0	CTD/rosette	CTD/RO	on deck	
PS64/105-2	04.04.03	10:52	81° 20,91' N	10° 32,17' E	1940,0	N 9	177,9	0,2	Multiple net	MN	surface	
PS64/105-2	04.04.03	10:56	81° 20,89' N	10° 32,21' E	1940,0	N 9	169,8	0,5	Multiple net	MN	at depth	103 m
PS64/105-2	04.04.03	11:02	81° 20,83' N	10° 32,18' E	1941,0	N 9	192,1	0,7	Multiple net	MN	on deck	
PS64/106-1	04.04.03	13:28	81° 30,07' N	10° 12,80' E	1793,0	N 11	227,3	0,6	CTD/rosette	CTD/RO	surface	
PS64/106-2	04.04.03	13:32	81° 30,03' N	10° 12,66' E	1792,0	N 10	185,0	0,8	Akustik Dop	ADCP	Start Profile	Bugkran, zu
PS64/106-1	04.04.03	14:02	81° 29,83' N	10° 12,46' E	1794,0	N 11	190,9	0,3	CTD/rosette	CTD/RO	at depth	
PS64/106-2	04.04.03	14:19	81° 29,75' N	10° 12,02' E	1791,0	N 11	181,7	0,6	Akustik Dop	ADCP	Finish profil	Hand-ADCP
PS64/106-1	04.04.03	14:27	81° 29,72' N	10° 12,07' E	1790,0	N 11	142,8	0,3	CTD/rosette	CTD/RO	on deck	
PS64/107-1	04.04.03	16:59	81° 39,20' N	9° 48,30' E	1284,0	N 13	1,0	0,7	CTD/rosette	CTD/RO	surface	
PS64/107-1	04.04.03	17:25	81° 39,00' N	9° 47,90' E	1284,0	NNW 11	343,0	0,3	CTD/rosette	CTD/RO	at depth	1247m
PS64/107-1	04.04.03	17:44	81° 38,90' N	9° 47,70' E	1278,0	NNW 11	343,0	0,3	CTD/rosette	CTD/RO	on deck	
PS64/108-1	05.04.03	01:12	81° 47,41' N	8° 54,53' E	820,1	N 9	196,6	0,4	CTD/rosette	CTD/RO	surface	
PS64/108-1	05.04.03	01:28	81° 47,34' N	8° 54,38' E	821,2	N 8	190,8	0,3	CTD/rosette	CTD/RO	at depth	
PS64/108-1	05.04.03	01:41	81° 47,27' N	8° 54,27' E	825,2	N 8	198,6	0,3	CTD/rosette	CTD/RO	on deck	
PS64/109-1	05.04.03	02:31	81° 46,24' N	8° 19,66' E	832,7	NNW 7	183,8	0,2	CTD/rosette	CTD/RO	surface	
PS64/109-1	05.04.03	02:50	81° 46,17' N	8° 19,77' E	832,8	N 7	169,4	0,3	CTD/rosette	CTD/RO	at depth	
PS64/109-1	05.04.03	03:06	81° 46,11' N	8° 19,87' E	832,4	NNW 6	165,3	0,3	CTD/rosette	CTD/RO	on deck	
PS64/110-1	06.04.03	02:38	81° 48,27' N	9° 29,47' E	871,1	S 6	21,1	0,4	CTD/rosette	CTD/RO	surface	
PS64/110-1	06.04.03	02:56	81° 48,33' N	9° 29,90' E	869,4	S 6	37,8	0,3	CTD/rosette	CTD/RO	at depth	
PS64/110-1	06.04.03	03:10	81° 48,38' N	9° 30,20' E	872,1	S 7	36,3	0,3	CTD/rosette	CTD/RO	on deck	
PS64/111-1	06.04.03	14:00	81° 51,85' N	9° 34,02' E	864,0	SE 15	334,1	1,0	English Tur	ETM	Begin	
PS64/111-1	06.04.03	21:37	81° 54,99' N	9° 25,64' E	847,8	SE 8	143,9	0,6	English Tur	ETM	End	unterbreche
PS64/111-2	06.04.03	22:15	81° 55,37' N	9° 29,53' E	862,1	SE 7	284,5	1,2	Ice station	ICE	Alongside Floe	
PS64/111-2	06.04.03	22:22	81° 55,38' N	9° 29,33' E	862,0	SE 6	307,2	0,2	Ice station	ICE	Scientists o	Ausbringen
PS64/111-2	07.04.03	00:36	81° 55,28' N	9° 27,41' E	854,5	NW 11	165,1	0,6	Ice station	ICE	Scientists on board	
PS64/111-2	07.04.03	00:36	81° 55,28' N	9° 27,41' E	854,5	NW 11	165,1	0,6	Ice station	ICE	Departure from floe	
PS64/111-1	07.04.03	01:06	81° 55,08' N	9° 23,59' E	842,0	NW 10	129,7	0,3	English Tur	ETM	Begin	
PS64/111-1	07.04.03	08:06	81° 53,88' N	9° 31,50' E	857,5	NW 2	299,5	0,6	English Tur	ETM	End	
PS64/111-3	07.04.03	08:30	81° 53,90' N	9° 34,17' E	855,8	WSW 3	276,4	0,4	Ice station	ICE	Alongside Floe	
PS64/111-3	07.04.03	08:40	81° 53,88' N	9° 34,07' E	855,4	SW 4	253,8	0,1	Ice station	ICE	Ice Gangway on the ice	
PS64/111-3	07.04.03	08:44	81° 53,87' N	9° 34,07' E	856,1	SW 6	122,1	0,0	Ice station	ICE	Scientists on the ice	
PS64/111-4	07.04.03	17:21	81° 54,14' N	9° 27,14' E	845,0	ESE 8	302,5	0,4	CTD/rosette	CTD/RO	surface	
PS64/111-4	07.04.03	17:37	81° 54,18' N	9° 26,43' E	844,0	ESE 9	299,1	0,4	CTD/rosette	CTD/RO	at depth	812 m
PS64/111-4	07.04.03	17:52	81° 54,23' N	9° 25,75' E	843,4	E 10	299,9	0,4	CTD/rosette	CTD/RO	on deck	
PS64/111-3	07.04.03	18:24	81° 54,33' N	9° 24,12' E	841,5	E 12	289,9	0,5	Ice station	ICE	Scientists on board	
PS64/111-3	08.04.03	08:00	81° 58,95' N	9° 21,94' E	828,5	SW 15	71,1	0,4	Ice station	ICE	Scientists on the ice	

PS64/111-5	08.04.03	10:33	81° 58,89' N	9° 25,51' E	838,2	SW 5	157,7	0,1	Multiple net	MN	surface	
PS64/111-5	08.04.03	10:37	81° 58,89' N	9° 25,51' E	839,5	SW 6	80,7	0,0	Multiple net	MN	at depth	102 m
PS64/111-5	08.04.03	10:42	81° 58,88' N	9° 25,51' E	840,8	SW 6	80,7	0,0	Multiple net	MN	on deck	
PS64/111-6	08.04.03	10:58	81° 58,83' N	9° 25,53' E	843,1	SW 6	183,6	0,1	Nansen Ne	NN	in the water	
PS64/111-6	08.04.03	11:06	81° 58,81' N	9° 25,54' E	842,4	SW 5	160,0	0,1	Nansen Ne	NN	at depth	200 m
PS64/111-6	08.04.03	11:17	81° 58,78' N	9° 25,54' E	842,4	SW 5	177,2	0,1	Nansen Ne	NN	on Deck	
PS64/111-7	08.04.03	11:27	81° 58,75' N	9° 25,52' E	842,4	SW 6	175,1	0,1	CTD/rosett	CTD/RO	surface	
PS64/111-7	08.04.03	11:41	81° 58,71' N	9° 25,46' E	840,1	SW 7	183,0	0,1	CTD/rosett	CTD/RO	at depth	808 m
PS64/111-7	08.04.03	11:59	81° 58,66' N	9° 25,31' E	840,1	SW 7	210,0	0,2	CTD/rosett	CTD/RO	on deck	
PS64/111-7	08.04.03	11:59	81° 58,66' N	9° 25,31' E	840,1	SW 7	210,0	0,2	CTD/rosett	CTD/RO	on deck	
PS64/111-3	08.04.03	21:39	81° 56,65' N	9° 27,10' E	849,1	NW 8	191,0	0,5	Ice station	ICE	Scientists o	Gangway h
PS64/111-3	08.04.03	22:22	81° 56,35' N	9° 27,01' E	852,0	NW 10	168,2	0,4	Ice station	ICE	Scientists o	Auftanken
PS64/111-3	08.04.03	23:07	81° 56,03' N	9° 27,31' E	859,1	WNW 11	167,0	0,4	Ice station	ICE	Scientists on board	
PS64/111-3	09.04.03	00:15	81° 55,53' N	9° 28,17' E	863,1	WNW 13	167,2	0,5	Ice station	ICE	Scientists o	Tanken
PS64/111-3	09.04.03	00:30	81° 55,41' N	9° 28,36' E	860,5	WNW 15	163,5	0,5	Ice station	ICE	Scientists on board	
PS64/111-3	09.04.03	02:48	81° 54,33' N	9° 30,25' E	867,2	NW 16	156,1	0,4	Ice station	ICE	Scientists on the ice	
PS64/111-3	09.04.03	03:07	81° 54,18' N	9° 30,61' E	865,1	NW 17	156,9	0,4	Ice station	ICE	Scientists on board	
PS64/111-3	09.04.03	07:21	81° 52,55' N	9° 35,95' E	870,5	NW 12	141,1	0,4	Ice station	ICE	Scientists on the ice	
PS64/111-3	09.04.03	08:00	81° 52,31' N	9° 36,90' E	877,7	NW 10	145,9	0,4	Ice station	ICE	Scientists on board	
PS64/111-3	09.04.03	08:30	81° 52,12' N	9° 37,50' E	880,5	NW 9	155,7	0,4	Ice station	ICE	Scientists on the ice	
PS64/111-8	09.04.03	13:22	81° 50,14' N	9° 41,66' E	888,0	WNW 7	166,2	0,4	CTD/rosett	CTD/RO	surface	
PS64/111-8	09.04.03	13:41	81° 50,00' N	9° 41,73' E	893,1	WNW 6	174,3	0,4	CTD/rosett	CTD/RO	at depth	
PS64/111-8	09.04.03	14:00	81° 49,87' N	9° 41,77' E	894,8	WNW 8	183,8	0,4	CTD/rosett	CTD/RO	on deck	
PS64/111-9	09.04.03	14:11	81° 49,79' N	9° 41,78' E	894,2	WNW 7	186,1	0,4	Multi corer	MUC	surface	Video/über
PS64/111-9	09.04.03	14:21	81° 49,73' N	9° 41,81' E	898,0	WNW 8	173,3	0,4	Multi corer	MUC	information	Abbruch/Te
PS64/111-9	09.04.03	14:35	81° 49,63' N	9° 41,83' E	896,2	NW 9	177,5	0,4	Multi corer	MUC	on deck	
PS64/111-3	09.04.03	15:01	81° 49,46' N	9° 41,80' E	898,8	WNW 6	174,3	0,3	Ice station	ICE	Scientists on board	
PS64/111-3	09.04.03	15:02	81° 49,45' N	9° 41,80' E	899,5	WNW 8	173,0	0,3	Ice station	ICE	Ice Gangway on board	
PS64/111-3	09.04.03	15:05	81° 49,43' N	9° 41,80' E	903,1	WNW 7	173,2	0,6	Ice station	ICE	Departure from floe	
PS64/111-3	09.04.03	16:28	81° 48,92' N	9° 41,37' E	898,1	W 5	207,6	0,5	Ice station	ICE	Alongside Floe	
PS64/111-3	09.04.03	16:51	81° 48,80' N	9° 40,97' E	902,4	W 5	203,0	0,3	Ice station	ICE	Ice Gangway on the ice	
PS64/111-3	09.04.03	16:56	81° 48,77' N	9° 40,90' E	900,1	W 6	207,8	0,3	Ice station	ICE	Scientists on the ice	
PS64/111-3	09.04.03	17:03	81° 48,74' N	9° 40,81' E	904,0	W 5	205,9	0,3	Ice station	ICE	Information Positioniere	
PS64/111-3	09.04.03	17:30	81° 48,62' N	9° 40,32' E	904,0	WNW 4	222,3	0,3	Ice station	ICE	Fast on ice anchors	
PS64/111-3	09.04.03	18:00	81° 48,51' N	9° 39,79' E	908,1	NW 3	223,3	0,2	Ice station	ICE	Scientists on the ice	
PS64/111-3	09.04.03	23:00	81° 48,28' N	9° 34,17' E	885,5	SSW 2	288,2	0,2	Ice station	ICE	Scientists on board	
PS64/111-3	10.04.03	00:20	81° 48,36' N	9° 33,42' E	881,8	ESE 2	309,1	0,1	Ice station	ICE	Scientists on the ice	

PS64/111-3	10.04.03	00:45	81° 48,38' N	9° 33,17' E	880,7	E 2	269,3	0,1	Ice station	ICE	Scientists on board	
PS64/111-3	10.04.03	06:18	81° 48,58' N	9° 30,95' E	872,4	SE 3	255,8	0,0	Ice station	ICE	Scientists on the ice	
PS64/111-3	10.04.03	06:36	81° 48,58' N	9° 30,93' E	871,2	SE 3	255,8	0,0	Ice station	ICE	Scientists on board	
PS64/111-3	10.04.03	08:30	81° 48,57' N	9° 31,09' E	868,8	ESE 2	255,9	0,0	Ice station	ICE	Scientists on the ice	
PS64/111-3	10.04.03	11:57	81° 48,39' N	9° 31,45' E	875,2	SE 2	255,6	0,0	Ice station	ICE	Scientists on board	
PS64/111-3	10.04.03	12:22	81° 48,36' N	9° 31,48' E	874,8	SSE 2	180,1	0,1	Ice station	ICE	Scientists on the ice	
PS64/111-1	10.04.03	13:24	81° 48,26' N	9° 31,60' E	876,5	SSE 2	255,7	0,0	Multi corer	MUC	surface	mit Telemet
PS64/111-1	10.04.03	13:43	81° 48,22' N	9° 31,63' E	879,8	SSE 2	175,5	0,2	Multi corer	MUC	at sea bottom	
PS64/111-1	10.04.03	13:51	81° 48,21' N	9° 31,66' E	879,0	SSE 3	154,0	0,2	Multi corer	MUC	information 3 Versuche	
PS64/111-1	10.04.03	14:10	81° 48,17' N	9° 31,64' E	879,8	SSE 3	255,8	0,0	Multi corer	MUC	on deck	
PS64/111-3	10.04.03	16:21	81° 47,85' N	9° 31,38' E	883,5	SSE 2	178,3	0,2	Ice station	ICE	Scientists on board	
PS64/111-3	10.04.03	16:30	81° 47,82' N	9° 31,33' E	882,5	SSE 2	191,5	0,3	Ice station	ICE	Scientists on the ice	
PS64/111-3	10.04.03	19:42	81° 47,29' N	9° 29,22' E	881,7	ENE 2	239,9	0,2	Ice station	ICE	Scientists on board	
PS64/111-3	10.04.03	21:15	81° 47,19' N	9° 27,81' E	879,7	NNE 1	269,4	0,1	Ice station	ICE	Scientists on the ice	
PS64/111-3	10.04.03	22:15	81° 47,15' N	9° 27,15' E	880,1	N 1	255,2	0,0	Ice station	ICE	Scientists on board	
PS64/111-3	10.04.03	23:04	81° 47,11' N	9° 26,91' E	878,8	NW 2	255,1	0,0	Ice station	ICE	Scientists on the ice	
PS64/111-3	11.04.03	01:41	81° 46,92' N	9° 26,54' E	877,0	NW 3	255,2	0,0	Ice station	ICE	Scientists on board	
PS64/111-3	11.04.03	06:23	81° 46,99' N	9° 27,77' E	881,5	ENE 2	45,4	0,2	Ice station	ICE	Scientists on the ice	
PS64/111-3	11.04.03	07:00	81° 47,04' N	9° 28,13' E	883,0	SE 2	32,0	0,1	Ice station	ICE	Scientists on board	
PS64/111-3	11.04.03	08:10	81° 47,14' N	9° 28,93' E	884,7	SE 4	73,9	0,1	Ice station	ICE	Scientists on the ice	
PS64/111-1	11.04.03	08:48	81° 47,17' N	9° 29,26' E	885,5	SSE 4	46,4	0,1	Multi corer	MUC	surface	
PS64/111-1	11.04.03	09:08	81° 47,19' N	9° 29,39' E	885,4	SSE 5	255,9	0,0	Multi corer	MUC	at sea bottc	859 m
PS64/111-1	11.04.03	09:25	81° 47,20' N	9° 29,48' E	887,7	SSE 5	255,8	0,0	Multi corer	MUC	on deck	
PS64/111-3	11.04.03	17:17	81° 47,57' N	9° 29,18' E	878,8	S 8	358,2	0,1	Ice station	ICE	Information Forschung r	
PS64/111-3	11.04.03	17:36	81° 47,60' N	9° 29,23' E	878,5	S 8	22,1	0,1	Ice station	ICE	Scientists on board	
PS64/111-3	11.04.03	17:47	81° 47,62' N	9° 29,25' E	878,4	S 9	345,2	0,2	Ice station	ICE	Information Sichtbesser	
PS64/111-3	11.04.03	18:20	81° 47,70' N	9° 29,40' E	879,2	S 8	5,6	0,2	Ice station	ICE	Scientists on the ice	
PS64/111-3	11.04.03	19:10	81° 47,86' N	9° 29,67' E	877,8	S 7	18,5	0,2	Ice station	ICE	Scientists on board	
PS64/111-3	11.04.03	19:32	81° 47,94' N	9° 29,87' E	874,7	S 4	17,2	0,3	Ice station	ICE	Scientists on the ice	
PS64/111-3	11.04.03	20:42	81° 48,26' N	9° 30,84' E	875,7	SSW 9	19,4	0,3	Ice station	ICE	Scientists on board	
PS64/111-3	12.04.03	00:23	81° 49,29' N	9° 37,17' E	880,4	SSW 11	48,6	0,5	Ice station	ICE	Scientists on the ice	
PS64/111-3	12.04.03	00:52	81° 49,39' N	9° 38,21' E	883,8	SSW 10	58,6	0,4	Ice station	ICE	Scientists on board	
PS64/111-3	12.04.03	08:32	81° 50,62' N	9° 51,83' E	925,5	SSW 6	54,6	0,3	Ice station	ICE	Scientists on the ice	
PS64/111-3	12.04.03	09:46	81° 50,76' N	9° 53,65' E	936,9	SSW 5	65,9	0,3	Ice station	ICE	Scientists on board	
PS64/111-3	12.04.03	10:21	81° 50,80' N	9° 54,40' E	940,7	SSW 4	70,5	0,2	Ice station	ICE	Scientists on the ice	
PS64/111-3	12.04.03	18:06	81° 50,91' N	9° 55,11' E	942,2	SSE 8	308,4	0,1	Ice station	ICE	Scientists on board	
PS64/111-3	12.04.03	18:30	81° 50,93' N	9° 54,73' E	940,2	SSE 9	303,5	0,2	Ice station	ICE	Scientists on the ice	

PS64/111-3	12.04.03	18:52	81° 50,96' N	9° 54,43' E	934,7	SSE 8	323,7	0,2	Ice station	ICE	Scientists on board
PS64/111-3	13.04.03	00:22	81° 51,35' N	9° 53,41' E	943,8	S 4	256,0	0,0	Ice station	ICE	Scientists on the ice
PS64/111-3	13.04.03	00:44	81° 51,37' N	9° 53,43' E	946,4	S 5	255,9	0,0	Ice station	ICE	Scientists on board
PS64/111-3	13.04.03	06:24	81° 51,65' N	9° 52,46' E	938,7	SSE 6	337,2	0,1	Ice station	ICE	Scientists on the ice
PS64/111-3	13.04.03	06:45	81° 51,66' N	9° 52,49' E	934,9	S 5	255,9	0,0	Ice station	ICE	Scientists on board
PS64/111-3	13.04.03	08:30	81° 51,75' N	9° 52,96' E	936,1	SSE 5	20,4	0,2	Ice station	ICE	Scientists on the ice
PS64/111-3	13.04.03	11:58	81° 51,84' N	9° 54,16' E	940,7	SE 6	256,0	0,0	Ice station	ICE	Scientists on board
PS64/111-3	13.04.03	12:33	81° 51,84' N	9° 54,27' E	939,7	SE 7	256,0	0,0	Ice station	ICE	Scientists on the ice
PS64/111-3	13.04.03	14:00	81° 51,83' N	9° 54,12' E	939,9	SE 4	256,0	0,0	Ice station	ICE	Free from ice anchors
PS64/111-3	13.04.03	14:39	81° 51,82' N	9° 53,96' E	941,2	SE 6	256,0	0,0	Ice station	ICE	Information Verholen 2
PS64/111-3	13.04.03	14:40	81° 51,82' N	9° 53,95' E	941,1	SE 6	256,0	0,0	Ice station	ICE	Ice Gangway on board
PS64/111-3	13.04.03	14:44	81° 51,81' N	9° 53,91' E	941,8	SE 6	256,0	0,0	Ice station	ICE	Departure from floe
PS64/111-3	13.04.03	15:55	81° 52,01' N	9° 55,99' E	944,2	SE 3	280,3	0,1	Ice station	ICE	Alongside Floe
PS64/111-3	13.04.03	16:06	81° 52,00' N	9° 55,90' E	945,5	SE 4	252,8	0,1	Ice station	ICE	Ice Gangway on the ice
PS64/111-3	13.04.03	17:00	81° 51,97' N	9° 55,38' E	942,8	SE 3	256,3	0,1	Ice station	ICE	Fast on ice keine Anker
PS64/111-3	13.04.03	17:14	81° 51,97' N	9° 55,22' E	941,1	SE 3	237,0	0,1	Ice station	ICE	Scientists on board
PS64/111-3	13.04.03	18:20	81° 51,94' N	9° 54,48' E	938,9	SE 4	209,7	0,0	Ice station	ICE	Scientists on the ice
PS64/111-3	13.04.03	19:19	81° 51,93' N	9° 53,69' E	940,2	SE 5	268,3	0,2	Ice station	ICE	Scientists on board
PS64/111-3	14.04.03	00:16	81° 52,11' N	9° 54,16' E	941,4	SSW 11	88,1	0,1	Ice station	ICE	Scientists on the ice
PS64/111-3	14.04.03	01:01	81° 52,12' N	9° 54,61' E	943,1	SSW 7	57,6	0,1	Ice station	ICE	Scientists on board
PS64/111-3	14.04.03	06:24	81° 52,16' N	9° 58,23' E	949,4	SSW 10	69,4	0,1	Ice station	ICE	Scientists on the ice
PS64/111-3	14.04.03	08:13	81° 52,13' N	10° 0,21' E	959,4	SSW 8	90,3	0,2	Ice station	ICE	Scientists on board
PS64/111-3	14.04.03	08:52	81° 52,10' N	10° 1,15' E	956,5	SW 8	94,2	0,2	Ice station	ICE	Scientists on the ice
PS64/111-1	14.04.03	10:00	81° 52,02' N	10° 3,13' E	963,1	SW 12	105,4	0,3	Turbulenzm	TMS	Start of measurement
PS64/111-3	14.04.03	19:08	81° 50,38' N	10° 15,16' E	1043,0	W 6	182,8	0,2	Ice station	ICE	Scientists on board
PS64/111-3	14.04.03	20:30	81° 50,12' N	10° 15,03' E	1040,0	W 6	141,0	0,2	Ice station	ICE	Scientists on the ice
PS64/111-3	15.04.03	00:22	81° 49,51' N	10° 14,83' E	1030,0	WNW 4	178,3	0,2	Ice station	ICE	Scientists on the ice
PS64/111-3	15.04.03	01:18	81° 49,42' N	10° 14,75' E	1031,0	NW 4	197,5	0,1	Ice station	ICE	Scientists on board
PS64/111-3	15.04.03	06:20	81° 49,02' N	10° 13,14' E	1020,0	WNW 3	207,9	0,0	Ice station	ICE	Scientists on the ice
PS64/111-3	15.04.03	06:54	81° 48,95' N	10° 13,00' E	1017,0	WNW 2	200,6	0,1	Ice station	ICE	Scientists on board
PS64/111-3	15.04.03	08:36	81° 48,79' N	10° 12,81' E	1013,0	W 2	207,7	0,0	Ice station	ICE	Scientists on the ice
PS64/111-3	15.04.03	15:45	81° 48,91' N	10° 18,74' E	1052,0	S 4	203,9	0,0	Ice station	ICE	Scientists on board
PS64/111-3	15.04.03	16:21	81° 48,91' N	10° 18,78' E	1051,0	SSE 5	203,7	0,0	Ice station	ICE	Scientists on the ice
PS64/111-1	15.04.03	16:29	81° 48,91' N	10° 18,76' E	1053,0	SSE 5	203,7	0,0	Turbulenzm	TMS	End of measurement
PS64/111-3	15.04.03	19:23	81° 48,72' N	10° 18,18' E	1048,0	WSW 11	199,3	0,0	Ice station	ICE	Scientists on board
PS64/111-3	16.04.03	00:25	81° 48,04' N	10° 18,72' E	1084,0	W 4	182,4	0,1	Ice station	ICE	Scientists on the ice
PS64/111-3	16.04.03	01:27	81° 47,94' N	10° 18,73' E	1081,0	W 4	197,7	0,0	Ice station	ICE	Scientists on board

PS64/111-3	16.04.03	06:22	81° 47,38' N	10° 17,19' E	1091,0	NW 3	197,5	0,0	Ice station	ICE	Scientists on the ice
PS64/111-3	16.04.03	07:19	81° 47,26' N	10° 16,81' E	1090,0	NNW 4	227,7	0,2	Ice station	ICE	Scientists on board
PS64/111-3	16.04.03	08:27	81° 47,10' N	10° 16,41' E	1094,0	NNW 4	208,2	0,1	Ice station	ICE	Scientists on the ice
PS64/111-3	16.04.03	18:00	81° 46,06' N	10° 12,63' E	1105,0	NE 4	230,1	0,2	Ice station	ICE	Scientists on board
PS64/111-3	16.04.03	18:27	81° 45,97' N	10° 12,03' E	1111,0	NNE 4	219,8	0,3	Ice station	ICE	Scientists on the ice
PS64/111-3	16.04.03	19:26	81° 45,78' N	10° 10,56' E	1116,0	NNE 4	252,4	0,3	Ice station	ICE	Scientists on board
PS64/111-3	17.04.03	00:17	81° 45,08' N	10° 5,49' E	1139,0	NNE 3	196,4	0,0	Ice station	ICE	Scientists on the ice
PS64/111-3	17.04.03	00:59	81° 45,06' N	10° 5,40' E	1140,0	NNE 3	196,4	0,0	Ice station	ICE	Scientists on board
PS64/111-3	17.04.03	06:12	81° 45,15' N	10° 3,82' E	1133,0	ENE 5	268,9	0,1	Ice station	ICE	Scientists on the ice
PS64/111-3	17.04.03	06:48	81° 45,14' N	10° 3,26' E	1131,0	ENE 5	248,8	0,2	Ice station	ICE	Scientists on board
PS64/111-3	17.04.03	09:10	81° 45,05' N	10° 0,53' E	1120,0	E 5	266,6	0,2	Ice station	ICE	Scientists on the ice
PS64/111-3	17.04.03	17:00	81° 45,16' N	9° 55,17' E	1113,0	ESE 6	287,8	0,2	Ice station	ICE	Scientists on board
PS64/111-3	17.04.03	17:03	81° 45,16' N	9° 55,14' E	1105,0	ESE 6	300,6	0,2	Ice station	ICE	Ice Gangway on board
PS64/111-3	17.04.03	17:06	81° 45,16' N	9° 55,11' E	1108,0	ESE 6	303,2	0,1	Ice station	ICE	Departure from floe
PS64/112-1	18.04.03	15:49	81° 42,39' N	9° 54,85' E	1193,0	NW 10	171,6	0,4	CTD/rosette	CTD/RO	surface
PS64/112-1	18.04.03	16:12	81° 42,23' N	9° 55,06' E	1201,0	NW 10	172,9	0,4	CTD/rosette	CTD/RO	at depth
PS64/112-1	18.04.03	16:35	81° 42,07' N	9° 55,23' E	1204,0	NW 10	169,4	0,4	CTD/rosette	CTD/RO	on deck
PS64/112-2	18.04.03	16:46	81° 41,99' N	9° 55,34' E	1212,0	NW 10	170,5	0,5	Multiple net	MN	surface
PS64/112-2	18.04.03	16:51	81° 41,96' N	9° 55,37' E	1208,0	NW 10	171,1	0,4	Multiple net	MN	at depth 104m
PS64/112-2	18.04.03	16:57	81° 41,92' N	9° 55,40' E	1212,0	NW 10	174,7	0,4	Multiple net	MN	on deck
PS64/112-3	18.04.03	17:04	81° 41,87' N	9° 55,44' E	1212,0	NW 11	177,5	0,4	Nansen Ne	NN	in the water
PS64/112-3	18.04.03	17:17	81° 41,77' N	9° 55,52' E	1216,0	NW 11	164,5	0,4	Nansen Ne	NN	at depth 201m
PS64/112-3	18.04.03	17:29	81° 41,69' N	9° 55,53' E	1218,0	NW 9	180,2	0,4	Nansen Ne	NN	on Deck
PS64/112-4	18.04.03	17:42	81° 41,60' N	9° 55,40' E	1223,0	WNW 9	153,9	0,6	Multi corer	MUC	surface
PS64/112-4	18.04.03	18:08	81° 41,42' N	9° 55,39' E	1232,0	NW 9	178,2	0,4	Multi corer	MUC	at sea bottc 1191m gest
PS64/112-4	18.04.03	18:30	81° 41,28' N	9° 55,35' E	1237,0	WNW 10	188,7	0,4	Multi corer	MUC	on deck
PS64/113-1	18.04.03	20:33	81° 34,71' N	10° 8,80' E	1712,0	WNW 9	191,9	0,7	CTD/rosette	CTD/RO	surface
PS64/113-1	18.04.03	20:56	81° 34,56' N	10° 8,67' E	1710,0	WNW 10	165,1	0,5	CTD/rosette	CTD/RO	at depth 995 m
PS64/113-1	18.04.03	21:10	81° 34,52' N	10° 8,72' E	1716,0	WNW 10	161,2	0,2	CTD/rosette	CTD/RO	on deck
PS64/114-1	19.04.03	00:26	81° 25,05' N	10° 17,92' E	1835,0	W 6	103,3	0,2	CTD/rosette	CTD/RO	surface
PS64/114-1	19.04.03	00:46	81° 25,04' N	10° 18,09' E	1835,0	W 6	73,4	0,3	CTD/rosette	CTD/RO	at depth
PS64/114-1	19.04.03	01:07	81° 25,04' N	10° 18,37' E	1835,0	WSW 4	67,5	0,5	CTD/rosette	CTD/RO	on deck
PS64/114-2	19.04.03	01:16	81° 25,06' N	10° 18,59' E	1836,0	WSW 4	73,2	0,2	Multiple net	MN	surface
PS64/114-2	19.04.03	01:24	81° 25,06' N	10° 18,81' E	1836,0	WSW 4	81,2	0,2	Multiple net	MN	at depth
PS64/114-2	19.04.03	01:34	81° 25,06' N	10° 18,96' E	1836,0	SW 5	44,8	0,4	Multiple net	MN	on deck
PS64/115-1	19.04.03	13:11	81° 16,33' N	10° 40,14' E	2028,0	NW 9	281,9	1,7	Rectangula	RMT	surface
PS64/115-1	19.04.03	13:14	81° 16,35' N	10° 39,48' E	2028,0	NW 9	283,9	1,7	Rectangula	RMT	Begin Trawling

PS64/115-1	19.04.03	13:34	81° 16,50' N	10° 35,44' E	2028,0	NW 8	279,4	1,4	Rectangula	RMT	End of Trawl	
PS64/115-1	19.04.03	13:38	81° 16,48' N	10° 35,24' E	2027,0	NW 9	188,4	0,4	Rectangula	RMT	on deck	
PS64/115-2	19.04.03	15:15	81° 15,33' N	10° 37,43' E	2029,0	NNW 7	210,9	0,3	Turbulenzm	TMS	Start of mea	Mast nicht a
PS64/115-2	19.04.03	15:33	81° 15,22' N	10° 37,45' E	2028,0	NNW 8	176,2	0,4	Turbulenzm	TMS	Information	Verholen fü
PS64/115-2	19.04.03	15:49	81° 15,10' N	10° 35,72' E	2028,0	NNW 8	160,7	0,2	Turbulenzm	TMS	Information	Ende Verho
PS64/115-2	19.04.03	18:44	81° 14,36' N	10° 30,73' E	2002,0	N 7	215,9	0,4	Turbulenzm	TMS	Information	Drehen in W
PS64/115-2	19.04.03	20:30	81° 14,60' N	10° 28,34' E	2001,0	N 8	234,1	0,3	Turbulenzm	TMS	End of measurement	
PS64/115-3	19.04.03	20:45	81° 14,56' N	10° 27,80' E	2000,0	N 8	282,5	0,7	Eisfischen	EF	start	
PS64/115-3	19.04.03	21:04	81° 14,47' N	10° 27,26' E	1997,0	N 8	208,1	0,6	Eisfischen	EF	End	
PS64/115-4	19.04.03	21:11	81° 14,42' N	10° 27,03' E	1992,0	NNE 10	218,8	0,4	CTD/rosette	CTD/RO	surface	
PS64/115-4	19.04.03	21:23	81° 14,38' N	10° 26,66' E	1995,0	NNE 9	258,3	0,3	CTD/rosette	CTD/RO	at depth	437 m
PS64/115-4	19.04.03	21:32	81° 14,34' N	10° 26,38' E	1993,0	N 10	224,8	0,4	CTD/rosette	CTD/RO	on deck	
PS64/116-1	19.04.03	23:06	81° 4,78' N	10° 29,25' E	1999,0	NNE 7	190,8	0,6	CTD/rosette	CTD/RO	surface	
PS64/116-1	19.04.03	23:19	81° 4,70' N	10° 28,63' E	1988,0	NNE 5	304,5	0,5	CTD/rosette	CTD/RO	at depth	
PS64/116-1	19.04.03	23:28	81° 4,69' N	10° 28,04' E	1980,0	NNE 6	272,5	0,6	CTD/rosette	CTD/RO	on deck	
PS64/116-2	19.04.03	23:40	81° 4,66' N	10° 27,33' E	1972,0	NNE 8	248,3	0,6	Multiple net	MN	surface	
PS64/116-2	19.04.03	23:44	81° 4,66' N	10° 27,13' E	1968,0	NNE 8	265,9	0,5	Multiple net	MN	at depth	
PS64/116-2	19.04.03	23:45	81° 4,65' N	10° 27,08' E	1966,0	NNE 7	244,8	0,6	Multiple net	MN	Hoisting	
PS64/116-2	19.04.03	23:50	81° 4,63' N	10° 26,78' E	1959,0	NNE 8	295,0	0,5	Multiple net	MN	on deck	
PS64/117-1	20.04.03	01:23	80° 54,86' N	10° 43,66' E	1491,0	NNE 10	233,7	0,6	CTD/rosette	CTD/RO	surface	
PS64/117-1	20.04.03	01:33	80° 54,88' N	10° 43,49' E	1492,0	NNE 11	215,9	0,8	CTD/rosette	CTD/RO	at depth	
PS64/117-1	20.04.03	01:47	80° 54,80' N	10° 42,86' E	1470,0	NNE 11	218,2	0,8	CTD/rosette	CTD/RO	on deck	
PS64/118-1	20.04.03	03:18	80° 44,51' N	10° 22,45' E	1417,0	NE 16	221,2	0,8	Multiple net	MN	surface	
PS64/118-1	20.04.03	03:20	80° 44,50' N	10° 22,34' E	1415,0	NE 15	241,1	0,7	Multiple net	MN	at depth	107 m
PS64/118-1	20.04.03	03:29	80° 44,50' N	10° 22,11' E	1404,0	NE 16	237,1	0,3	Multiple net	MN	on deck	
PS64/119-1	20.04.03	09:55	80° 24,88' N	10° 0,93' E	703,5	NNE 16	227,7	1,8	Water Sam	WSB	into the water	
PS64/119-2	20.04.03	10:04	80° 24,76' N	10° 0,68' E	701,7	NNE 13	209,8	0,9	Multiple net	MN	surface	
PS64/119-2	20.04.03	10:10	80° 24,69' N	10° 0,43' E	700,0	NNE 13	213,6	1,0	Multiple net	MN	at depth	106 m
PS64/119-2	20.04.03	10:17	80° 24,59' N	10° 0,10' E	700,8	NNE 16	208,3	0,9	Multiple net	MN	on deck	
PS64/119-3	20.04.03	10:26	80° 24,47' N	9° 59,75' E	699,1	NNE 13	203,2	1,0	CTD/rosette	CTD/RO	surface	
PS64/119-3	20.04.03	10:54	80° 24,08' N	9° 58,39' E	700,8	NNE 14	208,1	0,9	CTD/rosette	CTD/RO	on deck	
PS64/120-1	20.04.03	20:42	80° 7,35' N	7° 25,93' E	542,0	NNW 9	19,2	0,4	CTD/rosette	CTD/RO	surface	
PS64/120-1	20.04.03	20:56	80° 7,44' N	7° 26,01' E	542,4	NNW 8	100,2	0,3	CTD/rosette	CTD/RO	at depth	523 m
PS64/120-1	20.04.03	21:10	80° 7,38' N	7° 25,91' E	542,4	NNW 9	197,5	0,2	CTD/rosette	CTD/RO	on deck	
PS64/120-2	20.04.03	21:22	80° 7,32' N	7° 26,12' E	542,8	NNW 8	160,5	0,4	Multiple net	MN	surface	
PS64/120-2	20.04.03	21:27	80° 7,30' N	7° 26,15' E	542,4	N 8	167,4	0,2	Multiple net	MN	at depth	104 m
PS64/120-2	20.04.03	21:34	80° 7,28' N	7° 26,20' E	542,0	NNW 7	352,0	0,0	Multiple net	MN	on deck	

PS64/120-3	20.04.03	21:38	80° 7,28' N	7° 26,26' E	542,4	NNW 8	36,3	0,2	Water Sam	WSB	into the water
PS64/121-1	20.04.03	23:49	80° 4,01' N	6° 19,38' E	787,6	NNW 8	230,7	0,6	Water Sam	WSB	into the water
PS64/121-2	20.04.03	23:55	80° 3,92' N	6° 19,26' E	789,6	NNW 7	181,8	1,2	CTD/rosette	CTD/RO	surface
PS64/121-2	21.04.03	00:12	80° 3,93' N	6° 18,86' E	790,8	NNW 7	266,4	0,2	CTD/rosette	CTD/RO	at depth
PS64/121-2	21.04.03	00:26	80° 3,90' N	6° 18,56' E	792,8	NNW 7	299,8	0,5	CTD/rosette	CTD/RO	on deck
PS64/122-1	21.04.03	02:09	79° 57,38' N	5° 29,81' E	1058,0	NNW 10	192,0	0,6	CTD/rosette	CTD/RO	surface
PS64/122-1	21.04.03	02:24	79° 57,33' N	5° 29,22' E	1062,8	NNW 12	205,9	0,2	CTD/rosette	CTD/RO	at depth
PS64/122-1	21.04.03	02:39	79° 57,29' N	5° 29,04' E	1064,8	NNW 12	272,3	0,4	CTD/rosette	CTD/RO	on deck
PS64/123-1	21.04.03	05:28	79° 46,66' N	4° 27,63' E	2396,8	NW 9	324,3	0,0	CTD/rosette	CTD/RO	surface
PS64/123-1	21.04.03	05:42	79° 46,62' N	4° 27,78' E	2397,2	NW 10	141,6	0,5	CTD/rosette	CTD/RO	at depth 642m
PS64/123-1	21.04.03	05:53	79° 46,63' N	4° 27,87' E	2396,8	NW 9	116,7	0,4	CTD/rosette	CTD/RO	on deck
PS64/085-4	21.04.03	12:23	79° 4,40' N	4° 19,31' E	2331,2	NNW 16	162,2	1,2	Colonizatio	CTR	hydrophon into water
PS64/085-4	21.04.03	12:30	79° 4,25' N	4° 19,51' E	2343,6	NNW 16	171,8	1,5	Colonizatio	CTR	released
PS64/085-4	21.04.03	12:31	79° 4,23' N	4° 19,52' E	2346,0	NNW 16	175,2	1,4	Colonizatio	CTR	hydrophon on deck
PS64/085-4	21.04.03	12:49	79° 4,35' N	4° 19,86' E	2328,8	NW 17	313,9	1,1	Colonizatio	CTR	hydrophon Posi eben a
PS64/085-4	21.04.03	13:01	79° 4,10' N	4° 20,00' E	2355,2	NNW 16	184,3	1,7	Colonizatio	CTR	information Wellen sind
PS64/085-4	21.04.03	13:04	79° 4,00' N	4° 19,87' E	2368,0	NNW 16	190,1	2,1	Colonizatio	CTR	hydrophon nichts gehö
PS64/085-4	21.04.03	13:10	79° 3,80' N	4° 19,53' E	2393,6	NNW 16	196,7	1,8	Colonizatio	CTR	information eingekuppe
PS64/085-4	21.04.03	13:21	79° 3,88' N	4° 18,42' E	2398,8	NW 9	53,7	5,9	Colonizatio	CTR	on surface
PS64/085-4	21.04.03	13:32	79° 4,19' N	4° 18,67' E	2360,8	NW 17	248,0	1,2	Colonizatio	CTR	mooring alongside
PS64/085-4	21.04.03	13:36	79° 4,14' N	4° 18,70' E	2367,6	NW 14	187,5	0,6	Colonizatio	CTR	information am Haken
PS64/085-4	21.04.03	13:52	79° 3,86' N	4° 18,23' E	2400,4	NW 14	265,7	4,5	Colonizatio	CTR	on deck
PS64/124-1	21.04.03	14:06	79° 4,15' N	4° 15,83' E	2402,8	NW 15	279,9	1,5	Rectangula	RMT	surface
PS64/124-1	21.04.03	14:10	79° 4,19' N	4° 15,17' E	2406,8	NW 14	289,3	2,0	Rectangula	RMT	Begin Trawling
PS64/124-1	21.04.03	14:30	79° 4,58' N	4° 12,11' E	2423,6	NW 13	303,9	1,9	Rectangula	RMT	End of Trawl
PS64/124-1	21.04.03	14:33	79° 4,60' N	4° 11,76' E	2426,8	NW 14	262,5	0,9	Rectangula	RMT	on deck
PS64/124-2	21.04.03	14:41	79° 4,57' N	4° 11,20' E	2434,4	NW 13	299,8	2,9	Rectangula	RMT	surface
PS64/124-2	21.04.03	14:53	79° 4,75' N	4° 9,21' E	2455,6	NW 14	301,7	2,3	Rectangula	RMT	heave 200m gefier
PS64/124-2	21.04.03	15:08	79° 5,00' N	4° 6,72' E	2484,0	NW 14	295,6	1,7	Rectangula	RMT	on deck
PS64/125-1	21.04.03	15:48	79° 4,41' N	4° 19,94' E	2322,4	NW 14	209,3	0,7	Colonizatio	CTR	to water
PS64/125-1	21.04.03	15:49	79° 4,40' N	4° 19,91' E	2323,6	NW 14	198,8	0,9	Colonizatio	CTR	Driftmeter in the water
PS64/125-1	21.04.03	15:51	79° 4,37' N	4° 19,86' E	2327,2	NW 14	193,9	1,0	Colonizatio	CTR	information Freq.: 160,7
PS64/125-1	21.04.03	15:58	79° 4,29' N	4° 19,57' E	2338,4	NW 14	218,4	0,5	Colonizatio	CTR	to water Toppeinheit
PS64/125-1	21.04.03	16:00	79° 4,28' N	4° 19,47' E	2340,8	NW 14	242,2	0,6	Colonizatio	CTR	slipped
PS64/126-1	21.04.03	16:31	79° 3,64' N	4° 9,91' E	2497,2	NW 12	210,5	1,0	Algae Fram	AF	in the water
PS64/126-1	21.04.03	18:01	79° 2,80' N	4° 5,50' E	2641,6	NW 14	263,3	0,5	Algae Fram	AF	at depth 2609m
PS64/126-1	21.04.03	18:07	79° 2,79' N	4° 5,15' E	2644,8	NW 15	243,1	0,8	Algae Fram	AF	Hydrophon in the water

PS64/126-1	21.04.03	18:09	79° 2,78' N	4° 5,04' E	2646,4	NW 15	237,0	0,8	Algae Fram	AF	released	
PS64/126-1	21.04.03	18:11	79° 2,76' N	4° 4,92' E	2648,4	NW 14	238,7	0,7	Algae Fram	AF	Information	Posidonia-T
PS64/126-1	21.04.03	18:13	79° 2,75' N	4° 4,82' E	2649,2	NW 12	246,6	0,7	Algae Fram	AF	Hydrophon on deck	
PS64/126-1	21.04.03	18:50	79° 2,43' N	4° 2,11' E	2683,2	NNW 13	271,2	1,1	Algae Fram	AF	Releaser on deck	
PS64/127-1	21.04.03	19:26	79° 2,83' N	4° 14,14' E	2531,6	NW 13	142,8	0,4	Bottom land	LANDER	surface	mit Sedimen
PS64/128-1	21.04.03	22:06	79° 8,31' N	6° 6,10' E	1290,3	NNW 12	334,7	0,8	CTD/rosette	CTD/RO	surface	
PS64/128-1	21.04.03	22:14	79° 8,39' N	6° 5,86' E	1293,2	NNW 12	339,4	0,7	CTD/rosette	CTD/RO	at depth	299m
PS64/128-1	21.04.03	22:25	79° 8,41' N	6° 5,69' E	1293,6	NNW 11	280,1	0,1	CTD/rosette	CTD/RO	on deck	
PS64/128-2	21.04.03	22:37	79° 8,35' N	6° 5,65' E	1292,0	NNW 12	211,7	0,2	Multi corer	MUC	surface	
PS64/128-2	21.04.03	23:06	79° 8,46' N	6° 5,55' E	1296,5	NNW 11	355,7	0,0	Multi corer	MUC	at sea bottom	
PS64/128-2	21.04.03	23:31	79° 8,45' N	6° 5,38' E	1296,0	N 12	316,1	0,2	Multi corer	MUC	on deck	
PS64/128-3	22.04.03	00:03	79° 8,32' N	6° 5,33' E	1292,1	N 11	329,1	0,4	Trap, fish	TRAPF	surface	Sender 160
PS64/128-3	22.04.03	00:54	79° 8,26' N	6° 4,98' E	1290,7	NNW 12	165,9	0,3	Trap, fish	TRAPF	Hydrophon	to the wate
PS64/128-3	22.04.03	00:55	79° 8,25' N	6° 4,98' E	1290,9	NNW 12	172,9	0,3	Trap, fish	TRAPF	released	
PS64/128-3	22.04.03	00:59	79° 8,24' N	6° 4,96' E	1290,4	NNW 12	291,1	0,1	Trap, fish	TRAPF	Hydrophon	keine Antwo
PS64/128-3	22.04.03	01:01	79° 8,24' N	6° 4,93' E	1290,4	N 11	317,5	0,3	Trap, fish	TRAPF	Hydrophon	to the wate
PS64/128-3	22.04.03	01:04	79° 8,26' N	6° 4,86' E	1282,0	N 11	329,0	0,4	Trap, fish	TRAPF	Hydrophon	gosh, no rep
PS64/128-3	22.04.03	01:37	79° 8,33' N	6° 4,30' E	1293,6	N 12	306,2	0,4	Trap, fish	TRAPF	Releaser on Deck	
PS64/129-1	22.04.03	03:36	79° 6,35' N	4° 33,79' E	1806,8	N 10	242,3	1,2	CTD/rosette	CTD/RO	surface	
PS64/129-1	22.04.03	03:44	79° 6,25' N	4° 33,17' E	1781,6	NNW 11	224,0	0,9	CTD/rosette	CTD/RO	at depth	303m
PS64/129-1	22.04.03	03:51	79° 6,22' N	4° 32,74' E	1806,4	N 9	265,9	0,7	CTD/rosette	CTD/RO	on deck	
PS64/129-2	22.04.03	04:04	79° 6,17' N	4° 32,03' E	1826,0	N 9	293,6	0,6	Multi corer	MUC	surface	
PS64/129-2	22.04.03	04:54	79° 6,11' N	4° 29,67' E	1868,0	NNW 9	270,6	0,5	Multi corer	MUC	at sea botto	1845m
PS64/129-2	22.04.03	05:31	79° 6,03' N	4° 28,11' E	1901,6	NNW 10	194,9	0,4	Multi corer	MUC	on deck	
PS64/130-1	22.04.03	07:26	79° 3,72' N	4° 10,59' E	2481,2	NNW 8	340,3	0,3	Multi corer	MUC	surface	
PS64/130-1	22.04.03	08:09	79° 3,67' N	4° 10,78' E	2483,2	NNW 9	287,8	0,5	Multi corer	MUC	at sea botto	2435 m
PS64/130-1	22.04.03	08:46	79° 3,68' N	4° 9,67' E	2496,4	N 8	279,3	0,6	Multi corer	MUC	on deck	
PS64/131-1	22.04.03	09:20	79° 3,45' N	4° 19,38' E	2424,8	NNW 7	234,3	0,7	Colonizatio	CTR	to water	UKW 154,5
PS64/131-1	22.04.03	09:21	79° 3,44' N	4° 19,33' E	2425,6	NNW 8	214,2	0,8	Colonizatio	CTR	Driftmeter in the water	
PS64/131-1	22.04.03	09:26	79° 3,39' N	4° 19,02' E	2430,0	N 8	241,0	0,9	Colonizatio	CTR	information	Toppeinheit
PS64/131-1	22.04.03	09:27	79° 3,39' N	4° 18,95' E	2431,2	N 9	241,7	0,9	Colonizatio	CTR	slipped	
PS64/132-1	22.04.03	10:24	79° 0,06' N	4° 28,98' E	2550,8	NNW 9	199,2	0,3	Mooring	MOR	surface	FEVI; mit A
PS64/132-1	22.04.03	10:29	79° 0,04' N	4° 28,97' E	2551,6	NNW 8	157,7	0,6	Mooring	MOR	action	SM + 5 Ben
PS64/132-1	22.04.03	10:39	78° 60,00' N	4° 28,95' E	2553,2	NNW 10	275,9	0,2	Mooring	MOR	action	Sedimentfa
PS64/132-1	22.04.03	10:47	78° 59,98' N	4° 28,80' E	2555,2	N 9	255,3	0,3	Mooring	MOR	action	5 Benthos
PS64/132-1	22.04.03	11:13	78° 59,99' N	4° 28,07' E	2561,2	N 9	236,6	0,3	Mooring	MOR	action	1000m & 5
PS64/132-1	22.04.03	11:36	78° 59,94' N	4° 27,76' E	2565,2	N 8	270,8	0,1	Mooring	MOR	action	1000m + Se

PS64/132-1	22.04.03	11:47	78° 59,95' N	4° 27,50' E	2567,2	N 8	296,5	0,4	Mooring	MOR	action	150m, 9 Be
PS64/132-1	22.04.03	11:49	78° 59,95' N	4° 27,44' E	2568,0	N 8	298,1	0,3	Mooring	MOR	slipped	
PS64/133-1	22.04.03	12:14	79° 0,11' N	4° 29,66' E	2544,0	NNW 8	340,3	0,6	CTD/rosette	CTD/RO	surface	
PS64/133-1	22.04.03	12:25	79° 0,17' N	4° 29,51' E	2543,6	N 9	223,1	0,2	CTD/rosette	CTD/RO	at depth	
PS64/133-1	22.04.03	12:39	79° 0,16' N	4° 29,05' E	2547,6	N 8	155,7	0,5	CTD/rosette	CTD/RO	on deck	
PS64/133-2	22.04.03	12:50	79° 0,10' N	4° 28,90' E	2550,8	N 7	269,5	0,8	Multiple net	MN	surface	
PS64/133-2	22.04.03	13:43	78° 59,69' N	4° 27,52' E	2574,4	NNW 8	222,0	0,5	Multiple net	MN	at depth	
PS64/133-2	22.04.03	13:44	78° 59,69' N	4° 27,49' E	2574,4	N 8	208,0	0,5	Multiple net	MN	Hoisting	
PS64/133-2	22.04.03	14:38	78° 59,28' N	4° 26,49' E	2591,6	NNW 9	205,3	0,5	Multiple net	MN	on deck	
PS64/134-1	22.04.03	15:55	79° 4,01' N	3° 42,68' E	2899,3	NNW 9	223,7	0,3	CTD/rosette	CTD/RO	surface	
PS64/134-1	22.04.03	16:03	79° 3,99' N	3° 42,47' E	2919,1	N 9	238,9	0,3	CTD/rosette	CTD/RO	at depth	296m geste
PS64/134-1	22.04.03	16:10	79° 3,96' N	3° 42,39' E	2937,6	NNW 8	176,8	0,4	CTD/rosette	CTD/RO	on deck	
PS64/134-2	22.04.03	16:18	79° 3,95' N	3° 42,30' E	2935,6	NNW 8	274,6	0,2	Multi corer	MUC	surface	
PS64/134-2	22.04.03	17:14	79° 3,77' N	3° 41,62' E	3003,2	N 8	215,6	0,3	Multi corer	MUC	at sea botto	2962m
PS64/134-2	22.04.03	18:17	79° 3,65' N	3° 40,81' E	3038,0	N 7	337,1	0,0	Multi corer	MUC	on deck	
PS64/135-1	22.04.03	18:51	79° 3,49' N	3° 28,73' E	3995,6	N 7	191,7	0,2	CTD/rosette	CTD/RO	surface	
PS64/135-1	22.04.03	18:57	79° 3,47' N	3° 28,65' E	4006,4	N 8	235,8	0,2	CTD/rosette	CTD/RO	at depth	304 m
PS64/135-1	22.04.03	19:08	79° 3,42' N	3° 28,46' E	4025,2	NNW 7	211,8	0,4	CTD/rosette	CTD/RO	on deck	
PS64/135-2	22.04.03	19:18	79° 3,48' N	3° 28,33' E	4036,0	NNW 6	356,4	1,0	Multi corer	MUC	surface	
PS64/135-2	22.04.03	20:38	79° 3,62' N	3° 28,23' E	4067,2	N 7	177,2	0,2	Multi corer	MUC	at sea botto	4051 m
PS64/135-2	22.04.03	22:21	79° 3,89' N	3° 27,82' E	3990,0	N 8	4,7	0,1	Multi corer	MUC	on deck	
PS64/136-1	23.04.03	00:30	79° 5,77' N	4° 40,01' E	2014,0	N 7	193,1	0,8	Multi corer	MUC	surface	
PS64/136-1	23.04.03	00:37	79° 5,73' N	4° 39,82' E	2037,2	N 8	202,1	0,7	Multi corer	MUC	on deck	Galgenbloc
PS64/136-1	23.04.03	00:41	79° 5,68' N	4° 39,68' E	2046,0	N 8	229,2	0,4	Multi corer	MUC	surface	Block wiede
PS64/136-1	23.04.03	01:22	79° 5,96' N	4° 39,88' E	1959,2	N 8	153,7	0,2	Multi corer	MUC	at sea bottom	
PS64/136-1	23.04.03	02:14	79° 6,10' N	4° 39,19' E	1949,1	NNW 7	197,6	0,4	Multi corer	MUC	on deck	
PS64/128-3	23.04.03	04:37	79° 8,25' N	6° 5,30' E	1290,4	NNW 9	352,7	0,3	Trap, fish	TRAPF	Hydrophon	to the wate
PS64/128-3	23.04.03	04:43	79° 8,23' N	6° 5,24' E	1290,0	N 8	142,9	0,3	Trap, fish	TRAPF	Information	Propellerwe
PS64/128-3	23.04.03	04:47	79° 8,21' N	6° 5,36' E	1289,6	N 9	127,1	0,5	Trap, fish	TRAPF	released	
PS64/128-3	23.04.03	04:49	79° 8,20' N	6° 5,42' E	1289,6	N 8	119,0	0,4	Trap, fish	TRAPF	Hydrophon	out of the w
PS64/128-3	23.04.03	05:45	79° 8,47' N	6° 5,45' E	1296,8	NNW 4	354,6	0,2	Trap, fish	TRAPF	on deck	

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am - 2 Persons

n zur Tomate Auftanken etc

mast abbergen

/chair tomato team 7 personen

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Tilt&Strainmeter, Observation durch Meteogruppe

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Test nicht erfolgreich - abgebrochen

ntfalle UKWSender 160,725 funktioniert

),725 MHz getestet, o.B.
r

ort, nochmaliger Test an Deck
r
ply

85 KHz Test erfolgreich

t 6 gelbe, 6 orange Benthoskugeln

Ankerstein voran über Stb.
nthos z.W. ; 150m
lle z.W.,

Benthos z.W.
edimentfalle z.W.

enthos, ARGOS-Topeinheit z.W.

eckt

k fest gefroren
er gangbar

r
ellen ausgekuppelt

ater