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The Expedition of the Research Vessel "Polarstern" to the ARCTIC in 2005 (ARK-XXI/1 a and b)

Edited by
Gereon Budéus, Eberhard Fahrbach and Peter Lemke
with contributions of the participants

HELMHOLTZ
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Bremerhaven - Longyearbyen

Fahrtleiter / Chief Scientist:

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1. ZUSAMMENFASSUNG UND FAHRTVERLAUF

Gereon Budéus
Alfred-Wegener-Institut

Der erste Fahrtabschnitt der 21. *Polarstern*-Expedition in die Arktis begann am 21.7.2005 in Bremerhaven. Das Forschungsschiff *Polarstern* nahm direkt Kurs auf das westliche Ende eines Langzeit-Schnittes über den Grönlandsee-Wirbel und lief bei der Shannon Insel dicht vor der grönländischen Küste in eisbedeckte Gewässer. Dort wurde eine mehrfache Querung des Ostgrönlandstroms vermessen. Auf diesem sowie auf einem zonalen Schnitt entlang dem 75. Breitenkreis wurde eine Vielzahl von chemischen, optischen, biologischen und physikalischen Untersuchungen durchgeführt. Dieser große Zonalschnitt verlief von der Küste Grönlands bis zur Bäreninsel. Er wurde unterbrochen durch die Auswechslung von autonom profilierenden Tiefsee-Verankerungen mit einem integrierten akustischen Experiment sowie durch eine Exkursion zu einem kleinskaligen (Durchmesser 20 km), langlebigen, kohärenten Wirbel, der zunächst gefunden werden musste. Das Einlaufen im Hafen von Longyearbyen fand am 13. August statt.

Die Forschungsaktivitäten bezogen sich überwiegend auf die Eigenschaften der Wassermassen. Die chemischen Arbeiten umfassten sowohl üblichere Untersuchungen der Wassersäule als auch spezialisierte geochemische Analysen. Die Bestimmungen von Nährstoff- und Sauerstoffkonzentrationen standen in engem Zusammenhang mit den hydrographischen und planktologischen Untersuchungen. Zum einen spiegeln die Nährsalz- und Sauerstoffkonzentrationen die Entwicklung des Phytoplanktons wieder, und zum anderen eignen sie sich als "Tracer" für die Identifizierung und Verfolgung von Wassermassen, insbesondere für die Bestimmung von pazifischen Wasseranteilen im Ostgrönlandstrom. Die geochemischen Forschungen untersuchten den Kreislauf des klimarelevanten Methans und nutzen die Elemente Radon und Radium um die Süßwasserzirkulation in der Arktis detailliert zu bestimmen. Die bio-optischen Messungen werden der Validierung der Farbsensorik auf SeaWiFS und MoDIS dienen, welche Biomassenkonzentrationen und physiologische Parameter im Ozean vom Weltraum aus messen. Während die bis hierher genannten Untersuchungen die gesamte Wassersäule bis zum Meeresboden beprobten, nutzten Studien zur paläontologischen Proxy-Validierung unter Verwendung von Foraminiferen und Coccolithophoren die Seewasserversorgung des Schiffes, um die Hauptwassermassen entlang des Schiffsweges zu beproben. Die Verteilung von Seevögeln und marinen Säugern wurde ebenfalls entlang des Schiffsweges in der Grönlandsee bestimmt.

Die vier Schnitte über das grönländische Schelf und den Ostgrönlandstrom wurden unter guten Bedingungen und vergleichsweise moderaten Eiskonzentrationen durchgeführt. Das Fehlen von pazifischen Wassermassen, die durch die Beringstraße in die Arktis einströmen, durch die Framstraße in die Grönlandsee gelangen und dort in den 90er Jahren ein deutliches Signal bildeten, ist ein erstes Resultat. Der Schnitt entlang 75°N wird seit einigen Jahren jährlich wiederholt, da man erkannt hat, daß auch die arktischen Gewässer durch hohe Dynamik gekennzeichnet sind und die komplexen Veränderungen, bedingt durch Konvektion und Austausch mit den Randwassermassen, nur mit Hilfe langer Zeitreihen konsistenter Qualität richtig erklärt werden können. Geringe Konvektionstiefen und fast statische Bedingungen im tiefen Wasser sind hier als erstes aktuelles Ergebnis zu nennen. Alle Verankerung wurden intakt geborgen und wieder ausgelegt. Die Suche nach einer Wirbelstruktur gestaltete sich aufwändig. Nach mehrtägiger Suche gelang jedoch eine sehr detaillierte Vermessung. Auch im Wirbelkern ist eine sehr geringe Konvektionstiefe zu konstatieren, so dass der Wirbel im Winter nicht rehomogenisiert und damit neu angetrieben wurde.

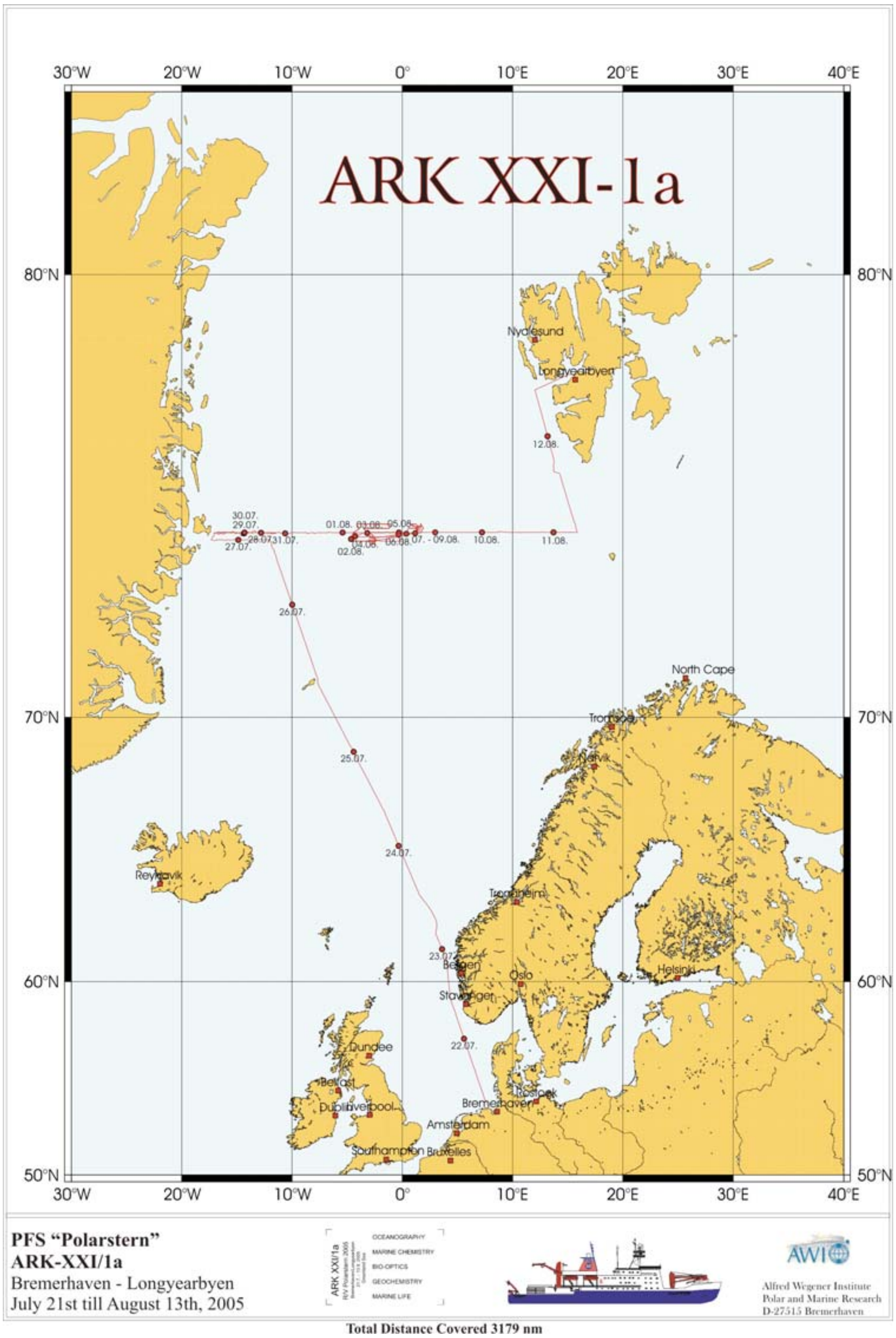

Abb. 1.1: Karte des Fahrtgebiets und Fahrtroute der FS Polarstern-Reise ARK-XXI/1a vom 21. Juli 2005 - 13. August 2005

Fig. 1.1: Map of the area of observations and cruise track during RV Polarstern leg ARK-XXI/1a from 21 July 2005 - 13 August 2005

CRUISE SUMMARY AND ITINERARY

The start of the first leg of the 21st *Polarstern* expedition to the Arctic was on 21 July, 2005. The ship headed directly to the western end of a long term transect in the Greenland Sea and entered ice covered waters close to Shannon Island and the Greenland coast. A quadruple crossing of the East Greenland Current was performed there. On these transects, as well as on the following stations, a large number of chemical, optical, biological, and physical measurements was performed. A long zonal transect extended from the Greenland coast to Bear Island. It was interrupted by the exchange of autonomously profiling deep sea moorings with integrated acoustics and by an excursion to a small scale (20 km diameter) long lived coherent eddy that first had to be found. We called at the port of Longyearbyen on 13 August.

Research activities were mainly related to water properties. The chemical work comprised familiar research in the water column as well as specialized geochemical investigations. The determinations of nutrients and oxygen are closely connected with the physical and planktological investigations. Also, nutrients and oxygen are very suitable as tracers for the identification of water masses, in particular for the detection of Pacific waters in the East Greenland Current. Geochemical research investigated the important methane pathways in the subarctic, and used radon and radium concentrations to identify freshwater circulation. Bio-optics will contribute to the validation of remote sensing algorithms applied to the colour sensors on SeaWiFS and MoDIS for deriving biomass concentrations and physiological parameters from space. While the above investigations all used water from full ocean depth, proxy validation studies by sampling of foraminifera and coccolithophores used the ship's sea water supply to acquire on track samples of the main water masses present in the region. The distribution of higher trophic levels (seabirds and marine mammals) was also quantified at sea as a function of the main hydrological parameters.

The four transects across the Greenland shelf and the East Greenland Current were performed under good conditions and relatively low ice concentrations. The complete absence of Pacific waters which flow into the central Arctic through the Bering Strait and used to exit it through Fram Strait is a first result. During the 90s this was a prominent signal within the East Greenland Current. The transect at 75° N has been repeated annually for a number of years as it has been recognised that the Arctic waters experience highly dynamic changes and that complex modifications by convection and exchange with the surrounding waters can be correctly explained only with the aid of high quality, consistent, long term time series. Shallow convection depths and almost static conditions in the deep waters can be stated as an actual first result. All moorings were recovered without loss and redeployed. The search for the eddy structure was time consuming. After several days a very detailed survey was performed. In the eddy core, too, a very shallow convection depth was identified, showing that the eddy was not rehomogenised and newly forced during the last winter.

2. METEOROLOGICAL CONDITIONS

Hilger Erdmann, Klaus Buldt
Deutscher Wetterdienst

After leaving Bremerhaven the weather was dominated by the rear of a strong low which moved from South Norway to the south-eastern Baltic. In consequence north-westerly gale was noticed all over German Bight with sometimes heavy rain, low ceiling and poor visibility. On 22 July the pressure gradient decreased what caused the wind to become light to moderate. The weather turned more anticyclonic and the sun came out. Near Svinöy a strong northerly low-level flow took influence to RV *Polarstern* with intermediate high sea.

North of 62°N the wind turned northeast and decreased again. Some showers were observed within the unstable layered cold air mass of polar origin.

A strong anticyclone over Greenland moved slowly eastward. Approaching the Isle of Jan Mayen the pressure gradient became little stronger and the wind increased up to Bft 6.

In the evening of 26 July, RV *Polarstern* passed the ice edge east of Greenland and the air temperature went below 0° C. Fog patches dominated the weather within the ice between 75°N 12°W and Shannon Island. Due to most anticyclonic influence the light to moderate wind varied from northwest to southwest during the following days. Warm advection draw near the research area in the upper levels of the troposphere caused by a strong cyclonic vortex over Svalbard and Barents Sea. That's why snowfall and poor visibility was observed.

On 31 July RV *Polarstern* crossed the ice edge to open water again close to 75°N 10°W with westerly winds of Bft 4 and fog patches due to remaining light anticyclonic influence. During the next four days the weather stayed mostly light anticyclonic as the dominating lows remained far away over Svalbard. On board RV *Polarstern* only moderate westerly winds of Bft 3 to 5 were measured along with mainly good visibility and sea state about 2 m. Sometimes the sun came out and the air temperature increased above 5° C.

A new strong high developed over Iceland on 6 August and moved slowly northeast. The research area near 75°N 02°W was influenced by this anticyclone. Due to this the weather changed sunny for nearly one day with very good visibility and light winds and seas.

It remained calmed as the main part of that high pressure area moved to Northeast-Scandinavia and Barents Sea. As the wind changed most southerly with Bft 2 to 3 moist air influenced the Greenland Sea more and more. In the consequence low level laid stratus with intermediate fog was noticed on board.

On 9 August the vessel passed 0 degrees longitude to the east and slight sea.

In the meantime a new low developed little east of Poland separating warm and moist air in the east and cold air of polar origin over Central Europe. The low started to move north but slowly and the pressure gradient strengthened mainly between North Scandinavia and Bear Island. Therefore the easterly wind increased bft 4 to 6 at the operation area of RV *Polarstern* northwest of Bear Island where the transact finished.

The weather turned more anticyclonic again when the cruise ended at Longyearbyen.

3. LONG TERM VARIABILITY OF THE HYDROGRAPHIC STRUCTURE, CONVECTION AND TRANSPORTS IN THE GREENLAND SEA

Gereon Budéus[1)], Stefanie Ronski[1)], Rainer Plugge[1)], Florian Greil[1)], Kerstin Hans[1)], Lisa Kattner[1)], Alexander Nauels[1)], Ulrik Poppe[1)], Juliane Wischnewski[1)], Arthus Kaletzky[2)]

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[2)]University of Cambridge, UK

Objectives

Bottom water renewal in the Greenland Sea by deep convection in interplay with ice coverage and atmospheric forcing is a major element of the water mass modification in the Arctic Mediterranean. Effects influence both the central Arctic Ocean and the overflow waters into the Atlantic. Since the hydrographic observations became more frequent in the late 1980s, no bottom water renewal by winter convection took place, however. Under these conditions, the deep water properties change towards higher temperatures and salinities. Furthermore, the doming structure in the Greenland Gyre, as it was observed in the mid-80s, was superseded by an essentially 2-layered water mass arrangement with a marked density step separating the two layers presently at about 1,800 m. The specific objectives of the project are to investigate the relative importance of atmospheric forcing parameters for winter convection, to clarify whether or not ice formation is needed for deep convection, to build a long term observational basis about deep water changes in the Greenland Gyre, and to contribute to the decision which deep water exchange mechanisms are at work under the absence of bottom reaching winter convection. A special focus is put on the observations of a long lived Coherent Vortex (CV) in an international cooperation. Within these eddies, winter convection penetrates usually to considerably greater depths (about 2,600 m) than in the surrounding waters. The CVs possess a diameter of only 20 km, and as they show no surface signal during summer they are difficult to detect.

Work at sea

On the East Greenland shelf three transects have been performed across the East Greenland Current in order to investigate temporal variability. Thereafter, a long term zonal CTD transect at 75° N has been performed across the central Greenland Sea with a regular station spacing of 10 nautical miles. This distance has not been reduced at frontal zones in order to gain time for a couple of stations dedicated to the search and investigation of the CV. CTD and water sampler (SBE 911+ with duplicate sensors, SBE Carousel 24 bottles of 12 l each) worked faultlessly. Additional sensors were attached for oxygen concentrations, transmission, chlorophyll fluorescence, and Gelbstoff fluorescence.

It is not possible to describe the full details of calibration and data procedures here. A few hints may suffice to give an idea about the general procedure. We use the same sensors already for a number of years and checked for their performance with respect to unwanted cross dependencies. According to this, one of the temperature sensors shows a pressure sensitivity of roughly 1.5 mK/4000 dbar while no unspecified pressure or temperature dependence of the conductivity sensors could be found. To identify the latter is close to impossible in the field (within the polar oceans) because of the high gradients in the upper water column where suitable temperature differences occur. The locations of in-situ comparisons for temperature and salinity have been chosen carefully by checking for each data point whether a comparison is allowed or inhibited. Time alignment has been optimized for each flow path separately and will be applied together with final post cruise calibration. The difference between pre-cruise and post-cruise calibration is normally in the range of a few mK and a few 1/1000 in salinity. Bottle sample salinities were determined immediately on board. Salinities have been corrected by 0.004. Oxygen samples were taken regularly. Also routinely, water samples were used for nutrient analysis. Occasionally, water was used for a number of additional investigations, which are described in the chapters of their own.

The three in house developed EP/CC (externally powered/compressibility compensated) Jojo-moorings have been exchanged and the time series was thus successfully extended. A shallow water jojo (APV), which had been attached to the top buoyancy of one mooring was lost. This type of instrument will not be used in the future, and a different approach is planned to be used in order to monitor the uppermost 100 m of the water column. On one mooring, a sound source was included, and two additional moorings were redeployed which host hydrophones to apply the shadowgraph technique newly developed by DAMTP, Uni-Cambridge.

The search for the CV was performed in two areas. At first an area close to the zero meridian was surveyed by a triangle XBT grid, but with no positive result. But at least this action provided enough time to allow an inspection of the recorded mooring profiles. These showed an eddy passing through the mooring a number of times. Consequently, we performed a second search grid in the vicinity of this mooring and in fact detected the CV there. After having found its centre, we performed a transect across it with a station distance of only 1.2 miles, appropriate for the size of the structure. The complete set of water analysis expertise on board was in use. Apart from the physical parameters, different nutrients, oxygen, bacteriae, plankton and various tracers were investigated. The research time within the eddy was limited by the remaining part of the large zonal transect, but we were happy enough to be able to perform stations over the full diameter of the eddy. The eddy core was located at about 74° 49' N, 02° 39'W on 07 August 2005.

First results

The general situation was characterized by summer conditions with a relatively warm surface layer. The subsurface layer was heavily influenced by Atlantic water with extended areas filled with salinities exceeding 34.9. The layer above the intermediate temperature maximum showed higher temperatures than in 2004. Since the winter ventilation introduced colder waters in a mixed layer like ventilation process (visible in the autonomous profiler data), this increase must be attributed to lateral advective processes. At first sight, convection seems to have affected only the upper 700 m what is even less than the 1,000 m of the preceding year. The bottom water temperature increase continued, and amounts again to about 10 mK between 2004 and 2005. The most outstanding single feature of the survey was certainly the Coherent Vortex. These features represent the deepest convection level observed in recent years. The eddy structure we observed was not vertically homogeneous but showed several vertical layers probably indicating the convection depth of several preceding winters. The eddy core was definitely not rehomogenized during the last winter. This finding gives a hint about the much discussed lifetime of the CV, which amounts to several years if our first interpretation is correct.

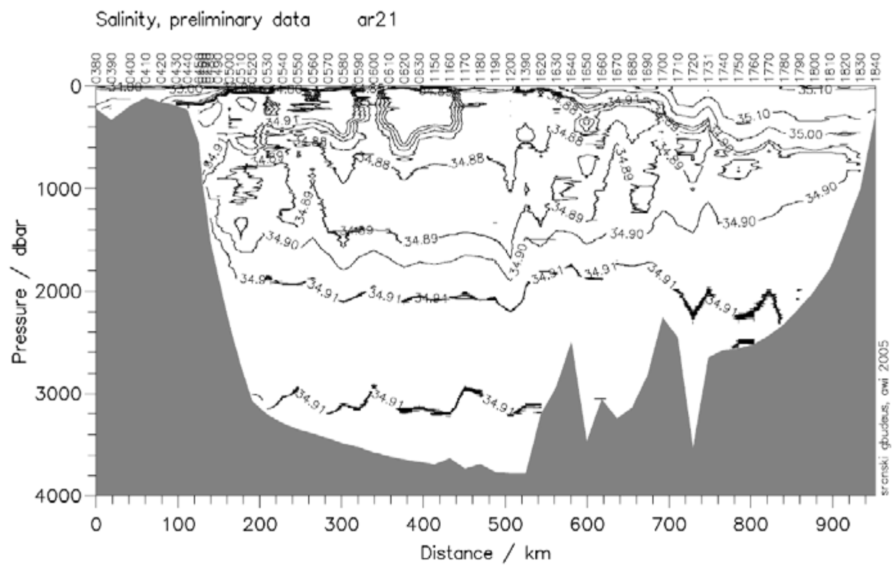

Fig. 3.1: Salinity on the zonal transect on 75°N

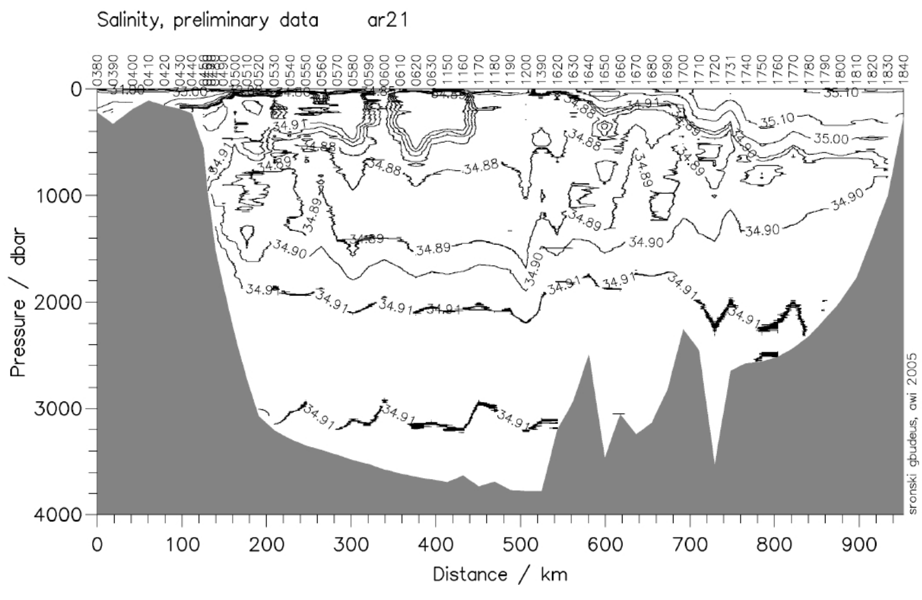

Fig. 3.2: Potential temperature on the zonal transect on 75°N

4. BIOGEOCHEMISTRY

4.1 Recent change in the Arctic: feedbacks to geochemical pathways in seawater

Ingrid Vöge, Meike Liebehentschel, Niko Klassen
Alfred-Wegener-Institut

4.1.1 Air-sea flux of methane in an eddy structure

Recent change in the Arctic may have profound effect on natural biogeochemical cycles in seawater. Especial feedback effects to pathways of climatically relevant biogases like methane will loom large in the equation of change. The present marine methane cycle is influenced by atmospheric methane transported by downward diffusion and convective ventilation into the deeper ocean, by fossil methane released from gas venting sites at the sea floor, microbial in-situ methane production in the upper ocean and microbial oxidation in the whole water column. With this expedition we expect to expand the knowledge about the flux of atmospheric methane in an eddy structure to the upper water column. The methane inventory in the eddy structure and in the laterally stratified water column will be estimated.

Work at sea

Methane concentrations were measured at the eddy station and a reference station as well. Water samples were collected in Niskin bottles mounted on a rosette sampler from bottom water depths up to the surface (0.5 m). The dissolved gases were immediately extracted from the water and were analysed for methane by gas chromatograph equipped with a flame ionization detector (FID) on board ship. Gas samples were stored for investigations of the $\delta^{13}C_{CH4}$values in the home laboratory. Furthermore at both station samples for the analyses of DMSP (p), DMSP (d), $\delta^{13}C_{DIC}$ and $\delta^{18}O_{H2O}$ were taken, which will be analyzed in the home lab.

Preliminary results

In surface water at both stations the methane concentrations are in equilibrium with the atmosphere while in water depths greater 200 m the methane concentration starts to be different between both stations. At the reference station the concentration is decreasing up to 2,000 m up to more than 50 % related to the surface concentration, in the eddy structure the concentration remains in equilibrium with the atmosphere down to 2,000 m water depth. These data show that an eddy structure may create a pathway for flux of atmospheric methane to the deeper ocean.

4.1.2 Tracing water masses with natural radionuclides

Within the realm of the GEOTRACES initiative, we aimed to use natural radionuclides as tracers for water masses in the East Greenland current during ARK-XXI/1a. We tested whether the $^{228}Ra/^{226}Ra$ activity ratio can be used as a tracer for identifying the input of freshwater from the Greenland glaciers versus the freshwater input from the Arctic into the East Greenland Current. Commonly, the ^{228}Ra /^{226}Ra activity ratio used as a tracer for identifying river water hundreds to thousands of kilometres from its riverine source. ^{228}Ra is supplied by desorption from river-borne particles and by release from river and shelf sediments (half-life 5.7 years). ^{226}Ra is primarily supplied by desorption from river-borne particles. Shelf sediments are a negligible source because of the time required to generate new ^{226}Ra (half-life 1600 years). Unlike their precursors ^{232}Th and ^{230}Th which are common in rocks and sediments, $^{228}Ra/^{226}Ra$ are soluble in seawater. As in the river, the contact of ice and water with rocks and sediments on the downside of the glacier is supposed to be a source of radium. Then, when the water leaves continent and shelf, the ratio will only change by decay of ^{228}Ra and mixing. Hence, we expect a decrease of the $^{228}Ra/^{226}Ra$ ratio with increasing salinity and distance from the meltwater input. In other words, we expect the $^{228}Ra/^{226}Ra$ ratio to decrease with decreasing percentage of glacier melt water.

Sampling was done within the East Greenland Current as close as possible to the vicinity of Greenland. Ice samples and a glacier ice sample were taken to get source values for Radium. Surface water samples were taken from the ship's sea water supply, passed through a pre-filter and MnO_2 coated cartridge absorbers. 200 l to 800 l where passed through the absorbers. The cartridges where put in plastic bags, sealed and transported to the AWI lab for further analysis. In parallel, 20 l water samples where taken to measure the precise Radium concentration to calibrate the absorber's efficiency. Radium in the water samples was co-precipitated with $BaSO_4$ by adding a few drops of H_2SO_4 and a standard amount of $BaCl_2$. The $BaSO_4$ precipitate was taken to AWI for further processing and measuring ^{228}Ra and ^{226}Ra by gamma spectroscopy. Since the leaching of the cartridges and the gamma counting are time consuming procedures, first results are expected in about one year's time from sampling time.

Table 4.1: Sampling list

station	mon/day/yr	hh:mm	Lon (°E)	Lat (°N)
PS68/002	07/26/2005	23:27	12.05610	74.49841
PS68/005	07/27/2005	05:45	13.20372	74.50003
PS68/008	07/27/2005	11:34	14.50012	74.49906
PS68/011	07/27/2005	17:11	16.21261	74.49947
PS68/013	07/27/2005	20:08	17.19443	74.49857
PS68/014	07/27/2005	22:01	17.54530	74.59939
PS68/016	07/28/2005	02:33	15.40697	75.03210
PS68/020	07/28/2005	11:03	13.86220	74.59984
PS68/023	07/28/2005	14:34	12.20025	74.59913
PS68/028	07/28/2005	02:01	12.92220	75.00340

station	mon/day/yr	hh:mm	Lon (°E)	Lat (°N)
PS68/031	07/29/2005	06:06	12.43954	74.59741
PS68/034	07/29/2005	12:07	14.19704	74.59962
PS680/32-3	07/29/2005	07:58	13.95300	74.59760
PS680/35-4	07/29/2005	16:00	15.25100	74.59170
PS68/37	07/29/2005	21:00	16.24997	74.59570
PS68/38	07/30/2005	00:10	17.49200	75.00500
PS68/41	07/30/2005	07:36	15.22540	75.04090
PS68/44	07/30/2005	17:00	13.92060	75.00550
Glacier ice		12.25730	78.52474	

4.2 Nutrients, oxygen and dissolved organic matter

Eva Falk[1)], Gerhard Kattner[2)], Kai-Uwe Ludwichowski[2)], Theo Ridder[2)], Ines Vogel[2)]

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Objectives

The determinations of nutrients and oxygen are closely connected with the physical and biological processes, and therefore these parameters are well suited as tracers for the identification of water masses. One major objective was to trace water masses of Pacific origin which are known to exit the Arctic Ocean through the Canadian Archipelago and the Fram Strait with the East Greenland Current. Especially the nitrate to phosphate ratio is a good tracer to follow the outflow of Pacific water along the Greenland continental shelf and slope. In addition, Upper Halocline Water is especially rich in silicate compared to Atlantic waters. In the 1980s and 1990s water masses of Pacific origin occurred usually in the shelf and slope regions of the Fram Strait and further south on the shelf of the Greenland Sea. Because this water mass was not found in 2004 in the Fram Strait we were especially interested to see whether the disappearance was only restricted to last year.

The distribution of nutrients and oxygen of the entire Greenland Sea transect along 75°N will be compared with similar transects in former years to determine the seasonal and interannual variability. The data from this expedition will show whether there are further modifications of the water masses exiting the Arctic Ocean.

In addition, dissolved organic matter (DOM), extracted from seawater, will be taken for chemical characterisation and determination of sources and modifications. DOM in the oceans contains about the same amount of carbon as the global biomass or atmospheric CO_2 and exhibits an average age of several thousand years. Source, diagenesis and preservation mechanisms of DOM remain elemental questions in contemporary marine sciences and represent a missing link in models of global elemental cycles. High amounts of terrestrial organic matter are discharged by the huge Russian Rivers into the Arctic Ocean and are partially transported via the Transpolar Drift towards the Fram Strait and further south along the Greenland shelf.

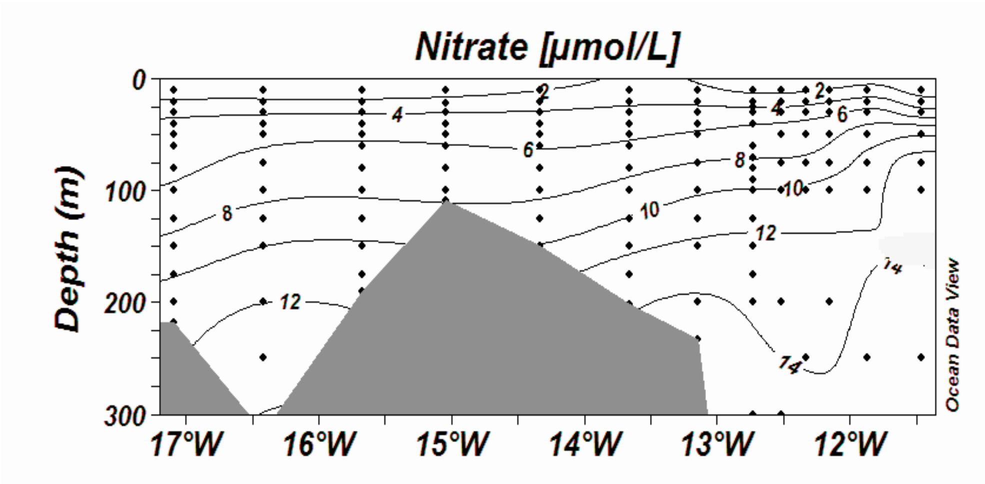
Work at sea

From all water samples taken with the rosette sampler at different depth, the nutrients - nitrate, nitrite, phosphate and silicate - were determined immediately on board with an Autoanalyser-system (Alliance, France) according to standard seawater methods. Oxygen was measured by the Winkler method.

On the Greenland shelf large volume water samples were taken at station 42 which was representative to follow the outflow of water masses transporting terrestrial organic matter from the Siberian rivers. Sampling was decided from results of the fluorescence profiles. In the Greenland Sea samples were taken from the different water layers. 100 to 120 l of seawater were particle-free filtered and extracted with a PPL adsorber (polystyrene cross-linked with divinylbenzene) and eluted with methanol. The chemical characterisation of DOM will be performed at the home labs in Bremerhaven.

Preliminary results

The change in nutrient and oxygen concentrations was followed during the Greenland Sea transect, especially across the Greenland shelf and slope. Four transects on the Greenland shelf were conducted to monitor the variability of the water masses transported with the East Greenland Current southwards. The preliminary results show that the variability in time and space was small. As in 2004, there was again no sign of Pacific Water at 75°N (Fig. 4.1). We will repeat this study further north during the next leg. Low silicate values in about 75 m depth might be due to a layer of water of Atlantic origin, perhaps Knee Water, which is one of the water masses belonging to the Polar Water. This finding has however to be confirmed with the detailed hydrographical data. Another water body which was characterized by a clear signal of the fluorescence probe was sampled for detailed chemical analyses. These so-called "yellow substances" are indicative of a riverine freshwater contribution to the polar water.



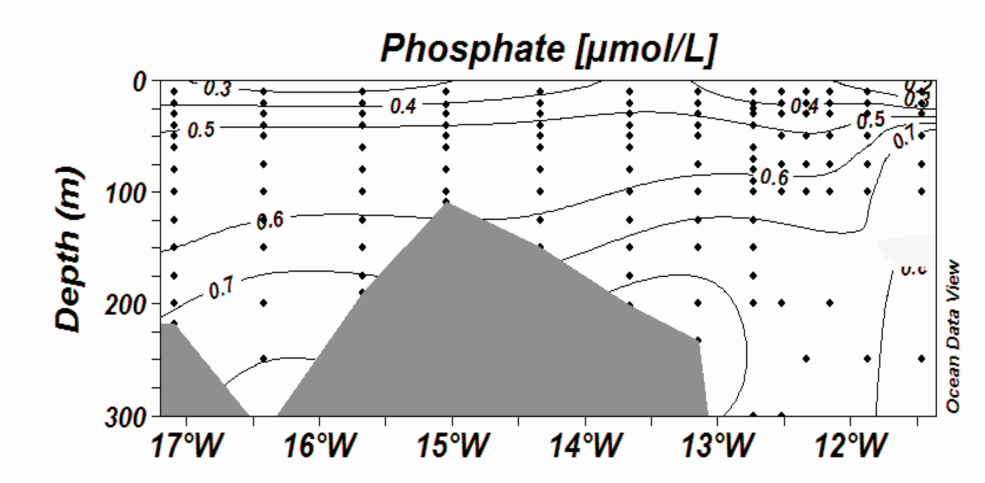


Fig. 4.1:. Distribution of nutrients and the proportion of Pacific Water along the second transect (75°N) on the Greenland shelf (preliminary data)

5. OCEAN OPTICS

Jill Schwarz[1)], Beeke v. Seggern[1)], Niko Klassen[1)], Jürgen Wohlenberg[2)], Meike Liebehentschel[1)], Lisa Kattner[1)], Theo Ridder[1)]

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Objectives
The variability in optically active parameters (OAPs) is being investigated with the aim of improving algorithms for retrieval of parameters such as concentrations of chlorophyll-a, particulate and dissolved organic carbon and inorganic sediment in polar waters. Given a good knowledge of this variability for different seasons and different biogeochemical provinces, forward bio-optical models can be adapted to the region, and model inversion applied to generate satellite algorithms.

Work at sea
During this cruise leg, the variability in OAPs in the marginal ice zone and central Greenland Sea during the summer was expanded, complementing existing datasets from spring and early summer (2003/2004).

Additionally, a fast repetition rate fluorometer (FRRF) was deployed. The FRRF provides a measure of the physiological state of the phytoplankton community, from which total primary production can be calculated. For this purpose, the FRRF also measures photosynthetically active radiation (PAR, 400 to 700 nm).

Finally, two secchi discs were deployed, with the aim of comparing secchi depth to the depth at which irradiance reaches 1 % of it's surface value, and against the attenuation coefficient, both of which can be calculated from the PAR data. The first ('Italian', constructed on R.R.S *Discovery*) disc was a black/white chequered disc which, deployed with a heavy weight, was most consistently measured in strong currents with no angle on the rope. The second ('German' – belonging to RV *Polarstern*) disc was a larger, white disc with a ring of holes offset 10 cm from the centre. The depth at which the disc disappeared was estimated to the nearest 0.5 m, always with 2 observers conferring. Typically, the German disc was visible 1.5 to 2.0 metres deeper than the Italian disc. Table 5.1 includes the Italian Secchi depths.

Samples collected for analysis in the home laboratory were:

- Phytoplankton pigments (HPLC: high performance liquid chromatography)
- Absorption by pigments/non-pigmented particles (Aphy: spectrophotometry)
- Particulate organic carbon (POC)
- Dissolved organic carbon (DOC)
- Absorption by dissolved substances (Acdom: spectrophotometry)
- Excitation-Emission Matrices for dissolved substances (EEM: spectrofluorometry)
- Total organic/inorganic suspended particulates (SPM: weight)

- Particle size distribution (PSD: Coulter counter)
- Phytoplankton taxonomy (TAX: light/electron microscope)

Table 5.1: List of samples taken

Station	Depth	HPLC	Aphy	POC	DOC/ Acdom/ EEM	SPM	PSD/ TAX	FRRF	Secchi Depth
1	10	X	X	X	X	X	X		
	50	X							
	75	X							
2	10	X	X	X	X	X			
	16	X	X				X		
3	10	X	X	X	X	X			
	30	X	X	X	X		X		
4	10	X		X	X				
5	10	X	X	X	X	X			
6	10	X	X	X	X	X			
7	10	X	X	X	X	X			6.5
8	10	X	X	X	X	X			7.5
9	10	X	X	X	X				7.0
10	10	X	X	X	X	X	X		7.0
11	10	X		X	X	X			7.5
12	10	X	X	X	X	X			8.0
13	10	X	X	X	X	X			9.0
	25	X		X			X		
14	10	X	X	X	X	X			
	15	X		X					
15	10	X	X	X	X	X			
	20	X		X					
16	10	X	X	X	X	X			
	20	X	X	X	X				
	30	X	X	X	X		X		
	50	X	X	X	X				
	80	X	X	X	X				
17	10	X	X	X	X				
	22	X							
18	10	X		X		X			8.0
	Cmax	X							
19	10	X	X	X	X	X	X		6.5
20	10	X	X	X	X	X			
21	10	X	X	X	X	X			11.5
	25	X							
22	10	X	X	X	X	X	X		12.0
23	10	X		X	X	X			9.5
	20	X		X					
	30	X							
	50	X							
	75	X							
	100	X							
24	10	X	X	X	X	X			9.5
	20	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
25	10	X	X	X	X	X			9.5
	20	X		X					
	125	X		X					
26	10	X	X	X	X	X			11.0
	20	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
27	10	X	X	X	X	X			
	30	X		X					
28	10	X	X	X	X	X			

Station	Depth	HPLC	Aphy	POC	DOC/ Acdom/ EEM	SPM	PSD/ TAX	FRRF	Secchi Depth
	30	X		X					
29	10	X		X	X	X			
30	10	X	X	X	X	X			
	30	X		X					
31	10	X	X	X	X	X			10.0
	25	X		X					
32	10	X	X	X	X	X			9.0
	Cmax	X		X					
33	10	X		X	X				9.0
34	10	X	X	X	X	X	X		12.0
	15	X		X					
	30	X		X					
	50	X		X					
35	10	X	X	X	X	X		X	10.0
	25	X		X					
	30	X		X					
	50	X		X					
	80	X		X					
	100	X		X					
36	10	X	X	X	X	X			6.5
	20	X		X					
	40	X		X					
	30	X		X					
	50	X		X					
	60	X		X					
37	10	X	X	X	X	X			
	20	X		X					
	40	X		X					
38	10	X	X	X	X	X		X	10.0
	25	X		X			X		
	50	X		X					
39	10	X	X	X	X	X		X	7.5
	20	X		X					
	30	X		X					
	40	X		X					
40	10	X	X	X	X	X			
	20	X		X					
	40	X		X					
	60	X		X					
	100	X		X					
41	10	X	X	X	X	X	X		8.0
	25	X		X					
	30	X		X					
	50	X		X					
	80	X		X					
	100	X		X					
42	10	X	X	X	X	X		X	11.0
	20	X		X					
	30	X		X					
	50	X		X					
	80	X		X					
	100	X		X					
43	10	X	X	X	X	X		X	9.0
	20	X		X					
44	10	X	X	X	X	X		X	9.5
	25	X		X					
	50	X		X					
45	10	X	X	X	X	X		X	8.0
46	10	X	X	X	X	X		X	9.0
	20	X		X			X		
47	10	X	X	X	X	X		X	9.0
	20	X		X					
	50	X		X					
48	10	X	X		X	X		X	9.0
	20	X							
50	10	X	X	X	X	X			
	30	X		X			X		
	50	X		X					

Station	Depth	HPLC	Aphy	POC	DOC/ Acdom/ EEM	SPM	PSD/ TAX	FRRF	Secchi Depth
51	10	X	X	X	X	X		X	10.5
	25	X		X					
	300	X		X					
52	10	X	X	X	X	X			11.5
	20	X		X					
53	10	X	X	X	X	X		X	12.0
	40	X		X			X		
	50	X		X					
54	10	X	X	X	X	X		X	12.5
	30	X		X					
	50	X		X					
55	10	X	X	X	X	X		X	9.0
	Cmax	X		X					
56	10	X	X	X	X	X		X	10.0
57	10	X	X	X	X	X		X	
58	10	X	X	X	X	X			14.0
59	10	X	X	X	X	X			12.5
60	10	X	X	X	X	X	X	X	9.5
61	10	X	X	X	X	X			10.0
62	10	X	X	X	X	X		X	10.5
63	10	X	X	X	X	X		X	
115	10	X	X	X	X	X		X	
	30	X		X			X		
116	10	X	X	X	X	X		X	9.0
117	10	X	X	X	X	X		X	8.5
118	10	X	X	X	X	X		X	13.5
119	10	X	X	X	X	X	X	X	14.0
120	10	X	X	X	X	X		X	12.5
139	10	X	X	X	X	X	X	X	
140	10	X	X	X	X	X		X	12.0
	20	X		X					
	30	X		X					
	50	X		X					
141	10	X	X	X	X	X		X	
	40	X		X					
142	10	X	X	X	X	X		X	11.0
	20	X		X					
143	10	X		X				X	11.0
	20	X		X					
144	10	X		X				X	11.0
	20	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
145	10	X	X	X	X	X		X	10.0
	20	X		X					
	30	X		X					
	50	X		X					
146	10	X	X	X	X	X		X	10.0
147	10	X		X				X	
	20	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
152	10	X		X				X	12.0
	20	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
153	10	X		X				X	11.5
	25	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					

Station	Depth	HPLC	Aphy	POC	DOC/ Acdom/ EEM	SPM	PSD/ TAX	FRRF	Secchi Depth
154	10	X		X				X	10.0
	15	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
155	10	X		X				X	11.5
	20	X		X					
	30	X		X					
	40	X		X					
	75	X		X					
	100	X		X					
156	10	X		X				X	12.0
	20	X		X			X		
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
157	10	X		X				X	11.0
	20	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
158	10	X		X				X	11.0
	20	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
159	10	X		X				X	10.5
	20	X		X					
	30	X		X					
	50	X		X					
	75	X		X					
	100	X		X					
162	10	X	X		X	X			10.5
	20	X		X					
163	10	X	X	X	X	X		X	
	Cmax	X		X					
164	10	X	X	X	X	X		X	
	15	X		X			X		
165	10	X	X	X	X	X		X	9.0
	25	X		X					
166	10	X	X	X	X	X		X	9.5
	25	X		X					
167	10	X	X	X	X	X		X	
	40	X		X					
168	10	X	X	X	X	X		X	12.0
	40	X		X					
169	10	X	X	X	X	X		X	14.0
	40	X		X					
170	10	X	X	X	X	X		X	13.0
	30	X		X					
171	10	X	X	X	X	X		X	
	35	X		X					
172	10	X	X	X	X	X		X	
173	10	X	X	X	X	X		X	13.5
	20	X		X					
174	10	X	X	X	X	X		X	
	20	X		X					
175	10	X	X	X	X	X		X	10.5
	30	X		X					
176	10	X	X	X	X	X		X	
	20	X		X					
177	10	X	X	X	X	X		X	11.0
	20	X		X					
178	10	X	X	X	X	X		X	10.0

Station	Depth	HPLC	Aphy	POC	DOC/ Acdom/ EEM	SPM	PSD/ TAX	FRRF	Secchi Depth
	20	X		X					
179	10	X	X	X	X	X		X	10.0
	20	X		X					
	30	X		X					
180	10	X	X	X	X	X		X	10.0
	20	X		X					
181	10	X	X	X	X	X		X	9.0
	25	X		X					
182	10	X	X	X	X	X		X	9.5
	25	X		X					
183	10	X	X	X	X	X		X	8.0
	20	X		X					
	30	X		X					
	40	X		X					
	50	X		X					
	75	X		X					
184	10	X	X	X	X	X	X	X	7.0
	20	X		X					
	30	X		X					
	40	X		X					
	50	X		X					
	70	X		X					

6. SAMPLING OF PLANKTONIC FORAMINIFERA AND COCCOLITOPHORES FOR PROXY VALIDATION STUDIES

Miguel Angél Martínez Botí, Alfredo Martínez Garcia
Institute of Environmental Science and Technology, University of Barcelona

During the *Polarstern* Expedition ARK-XXI/1a, a set of samples of planktonic foraminifera and coccolithophores was successfully taken from the ship's sea water supply, covering a wide range of sea water conditions (temperature, salinity, nutrients). The method used has enabled sampling of large volumes of water from different water masses in the Nordic Seas, paying special attention to the transition across the Arctic and Polar Fronts.

This set of samples will allow the study of the spatial variability of algal lipid (alkenones) and coccolithophore distributions, in order to improve the calibration of biomarker proxies for reconstruction of past sea surface temperature (SST) and salinity (SSS) in high latitude oceanic settings.

Moreover, it will allow the refinement of the planktonic foraminiferal-based geochemical proxies (Mg/Ca and Sr/Ca ratios) against temperature and potentially against other variables (especially nutrient availability).

Alkenones and Mg/Ca are two of the most successfully used proxies for the reconstruction of past climatic and oceanographic conditions. Nevertheless, their use in high latitudes (low temperatures) presents several difficulties in both proxies: non-linear response in the relationship between alkenone composition and SST, and low sensitivity of Mg/Ca and Sr/Ca composition. Thus, calibration studies in the Nordic Seas, as in the present project, are of great importance for paleo-oceanographic studies and will improve the knowledge of the different factors that affect these paleothermometers.

7. HIGHER TROPHIC LEVELS: AT-SEA DISTRIBUTION OF SEABIRDS AND MARINE MAMMALS

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Laboratory for Ecotoxicology and Polar Ecology, University of Brussels

Transect counts were realized on a continuous basis, i.e. when RV *Polarstern* was moving, resulting in more than 500 half hour counts. Other snap shot counts were also obtained by stationary ship, but will of course be treated separately.

The general conclusion is confirming the very low numbers encountered in open sea: basically fulmars and a few kittiwakes, often accompanying the ship.

Some observations, mainly noted in limited areas only, deserve attention. It is important to note that items 1 to 3 were confirmed by different, independent, observations:

1. In the pack ice during the short transects at 74°50 and 75°N, 12° to 17°W, a clear structure appeared in the distribution, mainly with high concentrations of little auk and seals (harp, hooded and ringed) in the outer marginal ice zone (OMIZ). This was especially obvious at the eastern end of the transect, but also detectable at the western one. Logically, polar bears were also present, with a total of 12 animals: this very high density is probably to be explained by the poor ice conditions, causing their grouping on a reduced surface of pack ice.

2. At different occasions, an important flux of little auks flying from the Jan Mayen breeding grounds towards the pack ice was detected towards East Greenland and the Spitsbergen area respectively, concerning hundreds of birds per half-hour and a distance of hundreds of nmiles. This might reflect that they massively were leaving Jan Mayen after a reproduction failure, e.g. due to the abnormally long distances between colony and feeding grounds in the OMIZ.

3. As far as cetaceans are concerned, the observations were also obtained from limited zones: sperm whales and orca's near to station 01 (6 individuals and 5 pods of 4 to 6 individuals respectively). A huge feeding ground for large baleen whales was detected between 75° and 75°10'N, and 00°30' and 03°30'E (stations 122 to 139). They were met again on the large 75°N transect (stations 162 to 165), with total figures as high as 5 blue whales, 45 fin whales, and a few minke whales.

4. More East, data concerned more than 15 minke whales, as well as a large group of 100+ white-sided dolphins just before the front between the arctic and Atlantic domains (east of station 169).

A more detailed discussion and interpretation of these data will include the fronts detected from salinity and water temperature, but also with data obtained by the other teams: O_2, chlorophyll and nutrients, and possibly bathymetry in the case of the whale feeding ground (at the slope between depths of 3,700 and 2,000 m). Preliminary contacts reflect indeed very fruitful comparisons.

Other species regularly encountered in small numbers were: ivory gull in pack ice, alcids (Brünnich’s guillemot, puffin, black guillemot), arctic tern, the 4 skua species, and glaucous gull at the end of the long transect.

Curiosities for the ornithologist: 2 contacts with sooty shearwater, far north of its expected range (75°N: stations 118 and 127), and 2 very rare Sabine’s gulls, an adult and a juvenile.

8. BETEILIGTE INSTITUTE / PARTICIPATING INSTITUTIONS

	Address
AWI	Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz-Gemeinschaft Postfach 12 01 61 27515 Bremerhaven / Germany
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University of Bergen	University of Bergen P.O. Box 7800 N-5020 Bergen / Norway
University of Cambridge	University of Cambridge Dept. of Applied Mathematics and Theoretical Physics, Cambridge CB30WA/ UK
VUB	Laboratory for Ecotoxicology and Polar Ecology Free University of Brussels (VUB) Pleinlaan 2, B-1050 Brussels /Belgium

9. FAHRTTEILNEHMER / PARTICIPANTS

Name	Vorname/ First Name	Institut/ Institute	Beruf / Profession
Briga	Michael	VUB	Student
Budéus	Gereon	AWI	Chief Scientist
Büchner	Jürgen	HeliTransair	Pilot
Buldt	Klaus	DWD	Technician
Erdmann	Hilger	DWD	Meteorolgist
Falck	Eva	Uni Bergen	Scientist
Fuhs	Elisabeth	HeliTransair	Inspector
Gielen	Robin	VUB Brüssel	Student
Greil	Florian	AWI	Student
Hans	Kerstin	AWI	Student
Heckmann	Hans Hilmar	HeliTransair	Pilot
Joiris	Claude	VUB Brüssel	Biologist
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Kattner	Lisa	AWI	Student
Klassen	Niko	AWI	Apprentice
Liebehentschel	Meike	AWI	Apprentice
Ludwichowski	Kai-Uwe	AWI	Engineer
Martinez Botí	Miguel Angél	UAB	Student
Martinez Garcia	Alfredo	UAB	Student
Nauels	Alexander	AWI	Student
Plugge	Rainer	AWI	Technician
Poppe	Ulrike	AWI	Student
Ridder	Theo	AWI	Student
Ronski	Stephanie	AWI	Scientist
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Seggern, von	Beeke	AWI	CTA
Stimac	Mihael	HeliTransair	Inspector
Vöge	Ingrid	AWI	CTA
Vogel	Ines	AWI	CTA
Wischnewski	Juliane	AWI	Student
Wohlenberg	Jürgen	exRWTH Aachen	Prof. em.

10. SCHIFFSBESATZUNG / SHIP'S CREW

No.	Name	Rank
01.	Schwarze, Stefan	Master
02.	Grundmann, Uwe	1.Offc.
03.	Farysch, Bernd	Ch. Eng.
04.	Fallei, Holger	2. Offc.
05.	Peine, Lutz	2.Offc.
06.	Wunderlich, Thomas	2.Offc.
07.	Uhlig, Heinz-Jürgen	Doctor
08.	Hecht, Andreas	R.Offc.
09.	Erreth, Gyula	1.Eng.
10.	Minzlaff, Hans-Ulrich	2.Eng.
11.	Sümnicht, Stefan	3.Eng.
12.	Scholz, Manfred	Elec.Tech.
13.	Feiertag, Thomas	ELO
13.	Nasis, Ilias	ELO
14.	Schulz, Harry	ELO
15.	Verhoeven, Roger	ELO
16.	Loidl, Reiner	Boatsw.
17.	Reise, Lutz	Carpenter
18.	Bäcker, Andreas	A.B.
19.	Guse, Hartmut	A.B.
20.	Hagemann, Manfred	A.B.
21.	Hartwig-Labahn, Andreas	A.B.
22.	Lamm, Gerd	A.B.
23.	Schmidt, Uwe	A.B.
24.	Vehlow, Ringo	A.B.
25.	Winkler, Michael	A.B.
26.	Preußner, Jörg	Storek.
27.	Elsner, Klaus	Mot-man
28.	Grafe, Jens	Mot-man
29.	Hartmann,Ernst-Uwe	Mot-man
30.	Ipsen, Michael	Mot-man
31.	Voy, Bernd	Mot-man
32.	Müller-Homburg, Ralf-Dieter	Cook
33.	Silinski, Frank	Cooksmate
34.	Völske, Thomas	Cooksmate
35.	Jürgens, Monika	1.Stwdess
36.	Wöckener, Martina	Stwdss/KS
39.	Czyborra, Bärbel	2.Stwdess
40.	Gaude, Hans-Jürgen	2.Steward
41.	Huang, Wu-Mei	2.Steward
42.	Möller, Wolfgang	2.Steward
43.	Silinski, Carmen	2.Stwdess
44.	Yu, Kwok Yuen	Laundrym.

A.1 STATION LIST

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/001-1	25.07.05	08:07	68° 52,09' N	4° 22,58' W	3619,2	CTD/RO
PS68/001-1	25.07.05	09:13	68° 52,22' N	4° 22,08' W	3620,4	CTD/RO
PS68/001-1	25.07.05	11:20	68° 52,57' N	4° 21,66' W	3611,6	CTD/RO
PS68/002-1	26.07.05	23:20	74° 49,89' N	12° 0,38' W	2226,4	CTD/RO
PS67/251-2	26.07.05	23:32	74° 49,77' N	12° 0,70' W	2226,4	FRRF
PS67/251-2	26.07.05	23:42	74° 49,66' N	12° 0,80' W	2230,0	FRRF
PS67/251-2	26.07.05	23:52	74° 49,54' N	12° 0,97' W	2230,8	FRRF
PS68/002-1	27.07.05	00:05	74° 49,44' N	12° 0,89' W	2235,6	CTD/RO
PS68/002-1	27.07.05	00:46	74° 48,97' N	12° 1,77' W	2234,4	CTD/RO
PS68/003-1	27.07.05	01:42	74° 50,06' N	12° 26,83' W	1712,8	CTD/RO
PS68/003-1	27.07.05	02:17	74° 49,94' N	12° 28,67' W	1689,2	CTD/RO
PS68/003-1	27.07.05	02:50	74° 49,69' N	12° 30,56' W	1668,8	CTD/RO
PS68/004-1	27.07.05	03:55	74° 50,22' N	12° 50,51' W	1182,0	CTD/RO
PS68/004-1	27.07.05	04:18	74° 50,20' N	12° 50,90' W	1174,4	CTD/RO
PS68/004-1	27.07.05	04:41	74° 50,16' N	12° 51,03' W	1175,2	CTD/RO
PS68/005-1	27.07.05	05:44	74° 50,01' N	13° 20,38' W	460,0	CTD/RO
PS68/005-1	27.07.05	05:54	74° 49,97' N	13° 20,41' W	459,6	CTD/RO
PS68/005-1	27.07.05	06:09	74° 49,95' N	13° 20,42' W	459,6	CTD/RO
PS68/006-1	27.07.05	07:26	74° 49,95' N	13° 49,66' W	204,8	CTD/RO
PS68/006-1	27.07.05	07:36	74° 49,88' N	13° 49,53' W	210,4	CTD/RO
PS68/006-1	27.07.05	07:44	74° 49,88' N	13° 49,44' W	211,6	CTD/RO
PS68/007-1	27.07.05	09:18	74° 49,57' N	14° 19,33' W	178,0	CTD/RO
PS68/007-1	27.07.05	09:24	74° 49,56' N	14° 19,12' W	177,6	CTD/RO
PS68/007-1	27.07.05	09:31	74° 49,54' N	14° 18,90' W	176,8	CTD/RO
PS68/008-1	27.07.05	11:28	74° 49,97' N	14° 50,20' W	192,4	CTD/RO
PS68/008-2	27.07.05	11:33	74° 49,92' N	14° 50,12' W	191,6	SD
PS68/008-1	27.07.05	11:36	74° 49,91' N	14° 50,02' W	191,6	CTD/RO
PS68/008-2	27.07.05	11:39	74° 49,89' N	14° 49,96' W	193,2	SD
PS68/008-1	27.07.05	11:46	74° 49,84' N	14° 49,93' W	192,0	CTD/RO
PS68/009-1	27.07.05	13:27	74° 49,99' N	15° 20,23' W	202,4	CTD/RO
PS68/009-2	27.07.05	13:31	74° 50,00' N	15° 20,27' W	202,4	SD
PS68/009-1	27.07.05	13:34	74° 50,00' N	15° 20,29' W	202,8	CTD/RO
PS68/009-2	27.07.05	13:37	74° 49,98' N	15° 20,36' W	202,4	SD
PS68/009-1	27.07.05	13:42	74° 49,97' N	15° 20,47' W	203,2	CTD/RO
PS68/010-1	27.07.05	15:23	74° 49,82' N	15° 50,76' W	273,2	CTD/RO
PS68/010-2	27.07.05	15:27	74° 59,79' N	15° 50,80' W	273,6	SD
PS68/010-2	27.07.05	15:29	74° 49,84' N	15° 50,81' W	274,4	SD
PS68/010-1	27.07.05	15:31	74° 49,84' N	15° 50,79' W	274,8	CTD/RO
PS68/010-1	27.07.05	15:41	74° 49,79' N	15° 50,63' W	274,0	CTD/RO
PS68/011-1	27.07.05	17:15	74° 49,86' N	16° 21,68' W	346,4	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/011-2	27.07.05	17:18	74° 49,84' N	16° 21,63' W	346,4	SD
PS68/011-1	27.07.05	17:26	74° 49,78' N	16° 21,60' W	346,0	CTD/RO
PS68/011-2	27.07.05	17:27	74° 49,78' N	16° 21,60' W	346,0	SD
PS68/011-1	27.07.05	17:40	74° 49,70' N	16° 21,44' W	346,0	CTD/RO
PS68/012-1	27.07.05	18:42	74° 49,89' N	16° 49,94' W	399,6	CTD/RO
PS68/012-1	27.07.05	18:54	74° 49,79' N	16° 49,84' W	398,8	CTD/RO
PS68/012-1	27.07.05	19:10	74° 49,71' N	16° 49,84' W	400,0	CTD/RO
PS68/013-1	27.07.05	20:09	74° 49,86' N	17° 19,94' W	341,2	CTD/RO
PS68/013-1	27.07.05	20:20	74° 49,87' N	17° 19,80' W	340,4	CTD/RO
PS68/013-1	27.07.05	20:34	74° 49,90' N	17° 19,67' W	340,0	CTD/RO
PS68/014-1	27.07.05	21:54	74° 59,94' N	17° 5,37' W	238,4	CTD/RO
PS68/014-1	27.07.05	22:02	74° 59,94' N	17° 5,45' W	238,0	CTD/RO
PS68/014-1	27.07.05	22:13	74° 59,99' N	17° 5,49' W	236,8	CTD/RO
PS68/015-1	28.07.05	00:12	74° 59,98' N	16° 25,03' W	337,6	CTD/RO
PS68/015-1	28.07.05	00:22	74° 59,98' N	16° 25,44' W	335,6	CTD/RO
PS68/015-1	28.07.05	00:34	74° 59,99' N	16° 25,72' W	336,8	CTD/RO
PS68/016-1	28.07.05	02:28	75° 0,27' N	15° 40,52' W	205,2	CTD/RO
PS68/016-1	28.07.05	02:35	75° 0,32' N	15° 40,70' W	206,0	CTD/RO
PS68/016-1	28.07.05	02:47	75° 0,43' N	15° 40,86' W	206,4	CTD/RO
PS68/017-1	28.07.05	05:56	75° 0,18' N	15° 2,45' W	125,2	CTD/RO
PS68/017-1	28.07.05	06:00	75° 0,20' N	15° 2,39' W	124,0	CTD/RO
PS68/017-1	28.07.05	06:05	75° 0,22' N	15° 2,40' W	120,8	CTD/RO
PS68/018-1	28.07.05	07:52	74° 59,95' N	14° 20,11' W	163,2	CTD/RO
PS68/018-1	28.07.05	07:59	74° 59,96' N	14° 20,27' W	162,8	CTD/RO
PS68/018-1	28.07.05	08:06	75° 0,04' N	14° 20,10' W	162,0	CTD/RO
PS68/019-1	28.07.05	09:44	75° 0,27' N	13° 39,44' W	202,8	CTD/RO
PS68/019-1	28.07.05	09:52	75° 0,19' N	13° 39,15' W	202,0	CTD/RO
PS68/019-1	28.07.05	09:59	75° 0,16' N	13° 38,93' W	200,4	CTD/RO
PS68/020-1	28.07.05	11:04	74° 59,98' N	13° 8,62' W	248,4	CTD/RO
PS68/020-2	28.07.05	11:07	74° 59,96' N	13° 8,60' W	248,8	SD
PS68/020-2	28.07.05	11:11	74° 59,95' N	13° 8,54' W	249,2	SD
PS68/020-1	28.07.05	11:11	74° 59,95' N	13° 8,54' W	249,2	CTD/RO
PS68/020-1	28.07.05	11:21	74° 59,88' N	13° 8,33' W	253,6	CTD/RO
PS68/021-1	28.07.05	12:11	74° 60,00' N	12° 43,67' W	455,6	CTD/RO
PS68/021-2	28.07.05	12:13	75° 0,00' N	12° 43,61' W	488,8	SD
PS68/021-2	28.07.05	12:19	75° 0,01' N	12° 43,50' W	405,2	SD
PS68/021-1	28.07.05	12:30	74° 59,97' N	12° 43,42' W	426,0	CTD/RO
PS68/021-1	28.07.05	12:49	74° 59,88' N	12° 43,30' W	404,0	CTD/RO
PS68/022-1	28.07.05	13:22	75° 0,04' N	12° 31,00' W	1010,4	CTD/RO
PS68/022-1	28.07.05	13:44	74° 59,89' N	12° 30,94' W	1024,8	CTD/RO
PS68/022-2	28.07.05	13:47	74° 59,86' N	12° 30,99' W	1024,8	SD
PS68/022-2	28.07.05	13:53	74° 59,81' N	12° 31,14' W	1022,8	SD
PS68/022-1	28.07.05	14:03	74° 59,72' N	12° 31,13' W	1031,2	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/023-1	28.07.05	14:39	74° 59,88' N	12° 20,08' W	1293,6	CTD/RO
PS68/023-2	28.07.05	14:49	74° 59,79' N	12° 20,18' W	1297,6	SD
PS68/023-2	28.07.05	14:56	74° 59,73' N	12° 20,20' W	1300,0	SD
PS68/023-1	28.07.05	15:05	74° 59,63' N	12° 20,41' W	1304,8	CTD/RO
PS68/023-1	28.07.05	15:33	74° 59,38' N	12° 21,02' W	1316,4	CTD/RO
PS68/024-1	28.07.05	16:13	74° 59,94' N	12° 9,27' W	1538,0	CTD/RO
PS68/024-2	28.07.05	16:26	74° 59,73' N	12° 9,63' W	1545,6	SD
PS68/024-2	28.07.05	16:29	74° 59,69' N	12° 9,71' W	1547,6	SD
PS68/024-1	28.07.05	16:47	74° 59,50' N	12° 10,41' W	1544,0	CTD/RO
PS68/024-1	28.07.05	17:18	74° 59,16' N	12° 11,60' W	1538,8	CTD/RO
PS68/025-1	28.07.05	18:21	74° 59,78' N	11° 52,41' W	1914,4	CTD/RO
PS68/025-2	28.07.05	18:33	74° 59,59' N	11° 52,57' W	1924,8	SD
PS68/025-2	28.07.05	18:38	74° 59,51' N	11° 52,59' W	1928,0	SD
PS68/025-1	28.07.05	19:01	74° 59,24' N	11° 52,79' W	1931,6	CTD/RO
PS68/025-1	28.07.05	19:35	74° 58,89' N	11° 53,23' W	1936,4	CTD/RO
PS68/026-1	28.07.05	20:54	74° 59,93' N	11° 27,81' W	2342,0	CTD/RO
PS68/026-2	28.07.05	21:16	74° 59,83' N	11° 27,84' W	2344,8	SD
PS68/026-2	28.07.05	21:22	74° 59,82' N	11° 27,89' W	2344,0	SD
PS68/026-1	28.07.05	21:41	74° 59,73' N	11° 27,83' W	2348,4	CTD/RO
PS68/026-1	28.07.05	22:20	74° 59,51' N	11° 27,75' W	2359,6	CTD/RO
PS68/027-1	28.07.05	23:39	74° 59,94' N	11° 52,23' W	1905,6	CTD/RO
PS68/027-1	29.07.05	00:18	74° 59,31' N	11° 53,15' W	1922,0	CTD/RO
PS68/027-1	29.07.05	00:55	74° 58,65' N	11° 53,75' W	1940,4	CTD/RO
PS68/028-1	29.07.05	01:56	75° 0,14' N	12° 9,12' W	1528,8	CTD/RO
PS68/028-1	29.07.05	02:28	74° 59,70' N	12° 9,18' W	1555,6	CTD/RO
PS68/028-1	29.07.05	02:55	74° 59,36' N	12° 9,08' W	1582,4	CTD/RO
PS68/029-1	29.07.05	03:47	74° 59,87' N	12° 22,49' W	1236,4	CTD/RO
PS68/029-1	29.07.05	04:13	74° 59,67' N	12° 22,81' W	1246,0	CTD/RO
PS68/029-1	29.07.05	04:34	74° 59,53' N	12° 23,20' W	1250,8	CTD/RO
PS68/030-1	29.07.05	04:59	75° 0,16' N	12° 31,48' W	988,0	CTD/RO
PS68/030-1	29.07.05	05:20	75° 0,02' N	12° 31,79' W	991,6	CTD/RO
PS68/030-1	29.07.05	05:37	74° 59,92' N	12° 32,21' W	986,0	CTD/RO
PS68/031-1	29.07.05	06:06	74° 59,74' N	12° 43,91' W	644,8	CTD/RO
PS68/031-1	29.07.05	06:21	74° 59,69' N	12° 44,21' W	638,0	CTD/RO
PS68/031-1	29.07.05	06:39	74° 59,67' N	12° 44,74' W	622,0	CTD/RO
PS68/031-2	29.07.05	06:40	74° 59,67' N	12° 44,73' W	622,4	SD
PS68/031-2	29.07.05	06:44	74° 59,63' N	12° 44,65' W	628,4	SD
PS68/032-1	29.07.05	07:42	74° 59,81' N	13° 9,65' W	246,4	CTD/RO
PS68/032-2	29.07.05	07:43	74° 59,81' N	13° 9,65' W	246,4	SD
PS68/032-2	29.07.05	07:48	74° 59,79' N	13° 9,59' W	247,6	SD
PS68/032-1	29.07.05	07:49	74° 59,79' N	13° 9,58' W	247,6	CTD/RO
PS68/032-1	29.07.05	07:58	74° 59,76' N	13° 9,53' W	248,4	CTD/RO
PS68/032-3	29.07.05	07:58	74° 59,76' N	13° 9,53' W	248,4	EF

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/032-3	29.07.05	08:19	74° 59,79' N	13° 9,60' W	247,2	EF
PS68/033-1	29.07.05	10:26	74° 59,97' N	13° 40,01' W	201,2	CTD/RO
PS68/033-2	29.07.05	10:27	74° 59,96' N	13° 40,05' W	202,4	SD
PS68/033-1	29.07.05	10:37	74° 59,90' N	13° 39,93' W	202,4	CTD/RO
PS68/033-2	29.07.05	10:38	74° 59,89' N	13° 39,90' W	202,0	SD
PS68/033-1	29.07.05	10:47	74° 59,83' N	13° 39,75' W	202,0	CTD/RO
PS68/034-1	29.07.05	12:09	74° 59,93' N	14° 19,66' W	165,6	CTD/RO
PS68/034-2	29.07.05	12:10	74° 59,92' N	14° 19,62' W	163,2	SD
PS68/034-1	29.07.05	12:15	74° 59,89' N	14° 19,46' W	164,8	CTD/RO
PS68/034-2	29.07.05	12:22	74° 59,85' N	14° 19,17' W	166,0	SD
PS68/034-1	29.07.05	12:23	74° 59,85' N	14° 19,15' W	165,6	CTD/RO
PS68/035-1	29.07.05	15:04	74° 59,55' N	15° 2,00' W	124,8	CTD/RO
PS68/035-2	29.07.05	15:08	74° 59,53' N	15° 1,97' W	124,4	SD
PS68/035-2	29.07.05	15:10	74° 59,52' N	15° 1,94' W	123,2	SD
PS68/035-1	29.07.05	15:10	74° 59,52' N	15° 1,94' W	123,2	CTD/RO
PS68/035-1	29.07.05	15:17	74° 59,50' N	15° 1,77' W	120,0	CTD/RO
PS68/035-3	29.07.05	15:24	74° 59,48' N	15° 1,72' W	119,6	FRRF
PS68/035-3	29.07.05	15:43	74° 59,36' N	15° 1,61' W	124,0	FRRF
PS68/035-3	29.07.05	15:50	74° 59,31' N	15° 1,65' W	116,0	FRRF
PS68/035-4	29.07.05	16:00	74° 59,17' N	15° 2,51' W	124,4	EF
PS68/035-4	29.07.05	16:33	74° 59,10' N	15° 2,52' W	118,0	EF
PS68/036-1	29.07.05	18:41	75° 0,01' N	15° 40,15' W	202,4	CTD/RO
PS68/036-2	29.07.05	18:42	75° 0,01' N	15° 40,17' W	202,8	SD
PS68/036-1	29.07.05	18:49	74° 60,00' N	15° 40,22' W	206,0	CTD/RO
PS68/036-2	29.07.05	18:50	74° 60,00' N	15° 40,22' W	208,0	SD
PS68/036-1	29.07.05	18:59	74° 59,95' N	15° 40,16' W	209,6	CTD/RO
PS68/037-1	29.07.05	20:57	74° 59,62' N	16° 24,69' W	333,2	CTD/RO
PS68/037-1	29.07.05	21:08	74° 59,53' N	16° 25,21' W	331,2	CTD/RO
PS68/037-1	29.07.05	21:20	74° 59,37' N	16° 25,63' W	329,2	CTD/RO
PS68/038-1	30.07.05	00:11	75° 0,06' N	17° 4,80' W	234,4	CTD/RO
PS68/038-1	30.07.05	00:19	75° 0,05' N	17° 4,92' W	236,8	CTD/RO
PS68/038-1	30.07.05	00:30	75° 0,05' N	17° 5,00' W	236,0	CTD/RO
PS68/038-2	30.07.05	00:36	75° 0,03' N	17° 5,35' W	235,2	FRRF
PS68/038-2	30.07.05	00:45	74° 59,96' N	17° 5,74' W	236,4	FRRF
PS68/038-3	30.07.05	00:45	74° 59,96' N	17° 5,74' W	236,4	SD
PS68/038-3	30.07.05	00:49	74° 59,92' N	17° 5,80' W	240,8	SD
PS68/038-2	30.07.05	00:52	74° 59,90' N	17° 5,88' W	238,0	FRRF
PS68/039-1	30.07.05	02:18	74° 59,98' N	16° 24,58' W	346,8	CTD/RO
PS68/039-1	30.07.05	02:28	74° 59,98' N	16° 24,71' W	345,6	CTD/RO
PS68/039-1	30.07.05	02:41	74° 59,95' N	16° 24,85' W	340,0	CTD/RO
PS68/039-2	30.07.05	02:46	74° 59,95' N	16° 24,94' W	339,6	FRRF
PS68/039-3	30.07.05	02:54	74° 59,93' N	16° 24,88' W	339,6	SD
PS68/039-3	30.07.05	02:59	74° 59,95' N	16° 24,99' W	338,0	SD

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/039-2	30.07.05	03:00	74° 59,94' N	16° 24,99' W	337,6	FRRF
PS68/039-2	30.07.05	03:04	74° 59,93' N	16° 24,92' W	338,8	FRRF
PS68/040-1	30.07.05	05:03	75° 0,66' N	15° 40,00' W	199,2	CTD/RO
PS68/040-1	30.07.05	05:14	75° 0,66' N	15° 39,99' W	198,8	CTD/RO
PS68/040-1	30.07.05	05:22	75° 0,65' N	15° 40,04' W	200,0	CTD/RO
PS68/040-2	30.07.05	05:32	75° 0,63' N	15° 40,19' W	200,0	FRRF
PS68/040-2	30.07.05	05:45	75° 0,62' N	15° 40,12' W	200,4	FRRF
PS68/040-2	30.07.05	05:49	75° 0,65' N	15° 40,10' W	199,6	FRRF
PS68/041-1	30.07.05	07:37	75° 0,41' N	15° 2,28' W	224,0	CTD/RO
PS68/041-1	30.07.05	07:42	75° 0,40' N	15° 2,22' W	120,0	CTD/RO
PS68/041-1	30.07.05	07:47	75° 0,39' N	15° 2,17' W	120,8	CTD/RO
PS68/041-2	30.07.05	07:50	75° 0,38' N	15° 2,14' W	120,4	SD
PS68/041-2	30.07.05	07:54	75° 0,38' N	15° 2,11' W	118,4	SD
PS68/042-1	30.07.05	10:52	74° 59,96' N	14° 20,23' W	162,0	CTD/RO
PS68/042-2	30.07.05	10:53	74° 59,95' N	14° 20,27' W	163,2	SD
PS68/042-2	30.07.05	10:59	74° 59,88' N	14° 20,46' W	165,2	SD
PS68/042-1	30.07.05	10:59	74° 59,88' N	14° 20,46' W	165,2	CTD/RO
PS68/042-1	30.07.05	11:08	74° 59,78' N	14° 20,82' W	166,4	CTD/RO
PS68/042-1	30.07.05	11:33	74° 59,53' N	14° 21,54' W	162,0	EF
PS68/042-1	30.07.05	12:09	74° 59,19' N	14° 22,22' W	162,8	EF
PS68/042-1	30.07.05	12:26	74° 59,10' N	14° 22,71' W	162,4	CTD/RO
PS68/042-1	30.07.05	12:33	74° 59,03' N	14° 22,99' W	163,6	CTD/RO
PS68/042-1	30.07.05	12:41	74° 58,94' N	14° 23,32' W	165,2	CTD/RO
PS68/042-4	30.07.05	12:47	74° 58,85' N	14° 23,55' W	168,8	FRRF
PS68/042-4	30.07.05	12:59	74° 58,71' N	14° 24,03' W	173,6	FRRF
PS68/042-4	30.07.05	13:04	74° 58,64' N	14° 24,22' W	172,4	FRRF
PS68/043-1	30.07.05	15:18	74° 59,77' N	13° 40,53' W	201,2	CTD/RO
PS68/043-2	30.07.05	15:21	74° 59,79' N	13° 40,44' W	201,2	SD
PS68/043-2	30.07.05	15:25	74° 59,77' N	13° 40,44' W	200,0	SD
PS68/043-1	30.07.05	15:25	74° 59,77' N	13° 40,44' W	200,0	CTD/RO
PS68/043-1	30.07.05	15:35	74° 59,74' N	13° 40,39' W	200,4	CTD/RO
PS68/043-3	30.07.05	15:41	74° 59,73' N	13° 40,31' W	201,2	FRRF
PS68/043-3	30.07.05	15:51	74° 59,72' N	13° 40,30' W	200,4	FRRF
PS68/043-3	30.07.05	15:53	74° 59,71' N	13° 40,29' W	200,0	FRRF
PS68/044-1	30.07.05	17:02	75° 0,04' N	13° 9,21' W	0,0	CTD/RO
PS68/044-2	30.07.05	17:05	75° 0,03' N	13° 9,24' W	0,0	SD
PS68/044-1	30.07.05	17:10	75° 0,02' N	13° 9,25' W	0,0	CTD/RO
PS68/044-2	30.07.05	17:11	75° 0,02' N	13° 9,24' W	0,0	SD
PS68/044-1	30.07.05	17:21	75° 0,10' N	13° 9,22' W	241,6	CTD/RO
PS68/044-3	30.07.05	17:25	75° 0,12' N	13° 9,24' W	240,4	FRRF
PS68/044-3	30.07.05	17:37	75° 0,03' N	13° 9,46' W	240,8	FRRF
PS68/044-3	30.07.05	17:40	75° 0,05' N	13° 9,48' W	240,8	FRRF
PS68/045-1	30.07.05	18:44	75° 0,21' N	12° 44,56' W	584,4	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/045-2	30.07.05	18:48	75° 0,19' N	12° 44,77' W	580,4	FRRF
PS68/045-3	30.07.05	18:52	75° 0,19' N	12° 44,91' W	577,2	SD
PS68/045-3	30.07.05	18:57	75° 0,18' N	12° 45,08' W	574,8	SD
PS68/045-2	30.07.05	18:58	75° 0,17' N	12° 45,11' W	572,8	FRRF
PS68/045-2	30.07.05	19:00	75° 0,16' N	12° 45,14' W	570,8	FRRF
PS68/045-1	30.07.05	19:00	75° 0,16' N	12° 45,14' W	570,8	CTD/RO
PS68/045-1	30.07.05	19:18	75° 0,09' N	12° 45,69' W	560,0	CTD/RO
PS68/046-1	30.07.05	20:11	75° 0,06' N	12° 31,69' W	991,6	CTD/RO
PS68/046-2	30.07.05	20:12	75° 0,06' N	12° 31,76' W	989,6	FRRF
PS68/046-3	30.07.05	20:19	74° 59,99' N	12° 32,09' W	987,2	SD
PS68/046-3	30.07.05	20:24	74° 59,94' N	12° 32,29' W	981,6	SD
PS68/046-2	30.07.05	20:27	74° 59,92' N	12° 32,41' W	977,6	FRRF
PS68/046-2	30.07.05	20:29	74° 59,88' N	12° 32,50' W	976,0	FRRF
PS68/046-1	30.07.05	20:33	74° 59,85' N	12° 32,59' W	976,0	CTD/RO
PS68/046-1	30.07.05	20:55	74° 59,57' N	12° 33,12' W	994,4	CTD/RO
PS68/047-1	30.07.05	21:26	75° 0,07' N	12° 21,91' W	1231,6	CTD/RO
PS68/047-2	30.07.05	21:29	75° 0,03' N	12° 22,06' W	1232,4	FRRF
PS68/047-3	30.07.05	21:35	74° 60,00' N	12° 22,24' W	1232,8	SD
PS68/047-3	30.07.05	21:40	74° 59,93' N	12° 22,39' W	1234,4	SD
PS68/047-2	30.07.05	21:49	74° 59,86' N	12° 22,61' W	1235,6	FRRF
PS68/047-2	30.07.05	21:53	74° 59,88' N	12° 22,75' W	1232,0	FRRF
PS68/047-1	30.07.05	21:54	74° 59,88' N	12° 22,79' W	1230,8	CTD/RO
PS68/047-1	30.07.05	22:22	74° 59,72' N	12° 23,65' W	1223,2	CTD/RO
PS68/048-1	30.07.05	23:06	75° 0,03' N	12° 8,88' W	1542,4	CTD/RO
PS68/048-2	30.07.05	23:09	75° 0,02' N	12° 9,00' W	1540,0	FRRF
PS68/048-3	30.07.05	23:14	74° 59,98' N	12° 9,24' W	1536,4	SD
PS68/048-3	30.07.05	23:19	74° 59,98' N	12° 9,50' W	1530,0	SD
PS68/048-2	30.07.05	23:29	74° 59,89' N	12° 9,86' W	1528,8	FRRF
PS68/048-2	30.07.05	23:32	74° 59,87' N	12° 9,99' W	1528,0	FRRF
PS68/048-1	30.07.05	23:38	74° 59,82' N	12° 10,34' W	1525,6	CTD/RO
PS68/048-1	31.07.05	00:10	74° 59,55' N	12° 12,09' W	1499,6	CTD/RO
PS68/049-1	31.07.05	00:57	74° 59,97' N	11° 52,91' W	1892,4	CTD/RO
PS68/049-2	31.07.05	01:00	74° 59,95' N	11° 53,11' W	1890,8	FRRF
PS68/049-2	31.07.05	01:19	74° 59,69' N	11° 54,11' W	1887,2	FRRF
PS68/049-2	31.07.05	01:23	74° 59,65' N	11° 54,34' W	1882,4	FRRF
PS68/049-1	31.07.05	01:37	74° 59,52' N	11° 55,20' W	1866,8	CTD/RO
PS68/049-1	31.07.05	02:14	74° 59,03' N	11° 57,40' W	1848,8	CTD/RO
PS68/050-1	31.07.05	04:00	74° 59,36' N	11° 28,60' W	2354,4	CTD/RO
PS68/050-1	31.07.05	04:45	74° 59,06' N	11° 31,01' W	2337,6	CTD/RO
PS68/050-1	31.07.05	05:22	74° 58,79' N	11° 33,17' W	2302,0	CTD/RO
PS68/051-1	31.07.05	07:10	74° 59,48' N	11° 2,07' W	2757,2	CTD/RO
PS68/051-2	31.07.05	07:14	74° 59,45' N	11° 2,28' W	2756,0	SD
PS68/051-2	31.07.05	07:18	74° 59,45' N	11° 2,44' W	2754,0	SD

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/051-3	31.07.05	07:23	74° 59,46' N	11° 2,68' W	2750,8	FRRF
PS68/051-3	31.07.05	07:35	74° 59,45' N	11° 3,17' W	2742,8	FRRF
PS68/051-3	31.07.05	07:37	74° 59,45' N	11° 3,33' W	2740,4	FRRF
PS68/051-1	31.07.05	08:02	74° 59,32' N	11° 4,53' W	2724,8	CTD/RO
PS68/051-1	31.07.05	08:44	74° 59,14' N	11° 6,40' W	2697,2	CTD/RO
PS68/052-1	31.07.05	10:10	74° 59,89' N	10° 36,19' W	3073,6	CTD/RO
PS68/052-2	31.07.05	10:17	74° 59,84' N	10° 36,47' W	3074,8	SD
PS68/052-2	31.07.05	10:23	74° 59,79' N	10° 36,65' W	3075,6	SD
PS68/052-1	31.07.05	11:07	74° 59,46' N	10° 36,97' W	3086,0	CTD/RO
PS68/052-1	31.07.05	11:56	74° 59,09' N	10° 37,33' W	3097,2	CTD/RO
PS68/053-1	31.07.05	13:20	75° 0,07' N	9° 56,64' W	3220,8	CTD/RO
PS68/053-2	31.07.05	13:22	75° 0,07' N	9° 56,50' W	3220,8	SD
PS68/053-3	31.07.05	13:34	75° 0,03' N	9° 56,56' W	3222,4	FRRF
PS68/053-2	31.07.05	13:36	75° 0,02' N	9° 56,54' W	3222,0	SD
PS68/053-3	31.07.05	13:44	75° 0,01' N	9° 56,40' W	3222,4	FRRF
PS68/053-3	31.07.05	13:46	75° 0,01' N	9° 56,36' W	3222,4	FRRF
PS68/053-1	31.07.05	14:21	75° 0,04' N	9° 55,64' W	3221,6	CTD/RO
PS68/053-1	31.07.05	15:16	75° 0,02' N	9° 55,80' W	3222,0	CTD/RO
PS68/054-1	31.07.05	16:24	74° 59,84' N	9° 18,88' W	3299,6	CTD/RO
PS68/054-2	31.07.05	16:43	74° 59,85' N	9° 19,01' W	3298,8	FRRF
PS68/054-2	31.07.05	17:01	74° 59,82' N	9° 18,93' W	3300,0	FRRF
PS68/054-2	31.07.05	17:03	74° 59,82' N	9° 18,94' W	3300,0	FRRF
PS68/054-3	31.07.05	17:07	74° 59,81' N	9° 18,97' W	3300,4	SD
PS68/054-3	31.07.05	17:15	74° 59,83' N	9° 19,18' W	3298,4	SD
PS68/054-1	31.07.05	17:30	74° 59,84' N	9° 19,09' W	3298,8	CTD/RO
PS68/054-1	31.07.05	18:25	74° 59,87' N	9° 19,81' W	3295,2	CTD/RO
PS68/055-1	31.07.05	19:31	75° 0,07' N	8° 40,04' W	3360,8	CTD/RO
PS68/055-2	31.07.05	19:36	75° 0,03' N	8° 39,90' W	3361,2	SD
PS68/055-2	31.07.05	19:41	75° 0,01' N	8° 39,83' W	3361,2	SD
PS68/055-3	31.07.05	19:45	74° 59,99' N	8° 39,79' W	3361,6	FRRF
PS68/055-3	31.07.05	20:00	74° 59,88' N	8° 39,64' W	3362,0	FRRF
PS68/055-3	31.07.05	20:03	74° 59,85' N	8° 39,63' W	3362,0	FRRF
PS68/055-1	31.07.05	20:38	74° 59,59' N	8° 39,54' W	3364,0	CTD/RO
PS68/055-1	31.07.05	21:37	74° 58,93' N	8° 39,33' W	3367,2	CTD/RO
PS68/056-1	31.07.05	22:45	75° 0,05' N	8° 1,04' W	3399,6	CTD/RO
PS68/056-2	31.07.05	23:01	74° 59,84' N	8° 1,04' W	3399,6	FRRF
PS68/056-3	31.07.05	23:03	74° 59,82' N	8° 1,04' W	3399,6	SD
PS68/056-3	31.07.05	23:05	74° 59,82' N	8° 0,99' W	3399,6	SD
PS68/056-2	31.07.05	23:15	74° 59,78' N	8° 0,77' W	3399,6	FRRF
PS68/056-2	31.07.05	23:18	74° 59,74' N	8° 0,77' W	3399,6	FRRF
PS68/056-1	31.07.05	23:53	74° 59,42' N	8° 0,68' W	3398,8	CTD/RO
PS68/056-1	01.08.05	00:50	74° 59,04' N	8° 0,87' W	3396,0	CTD/RO
PS68/057-1	01.08.05	02:12	75° 0,03' N	7° 21,91' W	3438,8	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/057-2	01.08.05	02:19	75° 0,04' N	7° 21,93' W	3438,8	FRRF
PS68/057-2	01.08.05	02:34	75° 0,04' N	7° 21,90' W	3438,8	FRRF
PS68/057-2	01.08.05	02:37	75° 0,04' N	7° 21,91' W	3438,8	FRRF
PS68/057-1	01.08.05	03:14	75° 0,09' N	7° 22,01' W	3438,8	CTD/RO
PS68/057-1	01.08.05	04:13	75° 0,12' N	7° 22,83' W	3438,0	CTD/RO
PS68/058-1	01.08.05	05:29	75° 0,05' N	6° 42,87' W	3488,4	CTD/RO
PS68/058-1	01.08.05	06:36	75° 0,09' N	6° 42,89' W	3488,4	CTD/RO
PS68/058-2	01.08.05	07:00	75° 0,13' N	6° 43,07' W	3488,4	SD
PS68/058-2	01.08.05	07:06	75° 0,14' N	6° 43,16' W	3488,4	SD
PS68/058-1	01.08.05	07:31	75° 0,20' N	6° 43,33' W	3488,0	CTD/RO
PS68/059-1	01.08.05	08:43	74° 59,99' N	6° 4,07' W	3524,4	CTD/RO
PS68/059-2	01.08.05	08:48	74° 59,94' N	6° 4,06' W	3526,8	SD
PS68/059-2	01.08.05	08:54	74° 59,92' N	6° 4,15' W	3520,4	SD
PS68/059-1	01.08.05	09:50	74° 59,80' N	6° 4,69' W	3525,6	CTD/RO
PS68/059-1	01.08.05	10:47	74° 59,87' N	6° 5,01' W	3525,2	CTD/RO
PS68/060-1	01.08.05	12:03	75° 0,20' N	5° 24,70' W	3576,4	CTD/RO
PS68/060-2	01.08.05	12:05	75° 0,19' N	5° 24,57' W	3576,7	SD
PS68/060-3	01.08.05	12:13	75° 0,19' N	5° 24,17' W	3576,8	FRRF
PS68/060-2	01.08.05	12:19	75° 0,16' N	5° 23,89' W	3577,2	SD
PS68/060-3	01.08.05	12:33	75° 0,18' N	5° 23,30' W	3577,6	FRRF
PS68/060-3	01.08.05	12:35	75° 0,17' N	5° 23,19' W	3576,7	FRRF
PS68/060-1	01.08.05	13:13	75° 0,17' N	5° 23,74' W	3577,6	CTD/RO
PS68/060-1	01.08.05	14:14	75° 0,20' N	5° 24,90' W	3576,0	CTD/RO
PS68/061-1	01.08.05	15:40	75° 0,05' N	4° 46,94' W	3613,6	CTD/RO
PS68/061-2	01.08.05	16:12	75° 0,11' N	4° 46,94' W	3613,2	SD
PS68/061-2	01.08.05	16:18	75° 0,13' N	4° 46,95' W	3613,2	SD
PS68/061-1	01.08.05	16:49	75° 0,14' N	4° 46,80' W	3613,2	CTD/RO
PS68/061-1	01.08.05	17:50	75° 0,24' N	4° 45,95' W	3614,0	CTD/RO
PS68/062-1	01.08.05	19:08	75° 0,01' N	4° 8,22' W	3641,6	CTD/RO
PS68/062-2	01.08.05	19:13	75° 0,02' N	4° 8,25' W	3641,6	SD
PS68/062-2	01.08.05	19:17	75° 0,02' N	4° 8,21' W	3641,6	SD
PS68/062-3	01.08.05	19:21	75° 0,01' N	4° 8,17' W	3641,6	FRRF
PS68/062-3	01.08.05	19:33	74° 60,00' N	4° 8,19' W	3641,6	FRRF
PS68/062-3	01.08.05	19:36	74° 60,00' N	4° 8,23' W	3642,0	FRRF
PS68/062-1	01.08.05	20:16	74° 59,94' N	4° 8,88' W	3641,6	CTD/RO
PS68/062-1	01.08.05	21:08	74° 59,77' N	4° 9,00' W	3640,8	CTD/RO
PS68/063-1	01.08.05	22:32	74° 59,96' N	3° 30,50' W	3667,2	CTD/RO
PS68/063-2	01.08.05	22:36	74° 59,97' N	3° 30,59' W	3667,2	SD
PS68/063-2	01.08.05	22:42	74° 59,95' N	3° 30,63' W	3667,2	SD
PS68/063-3	01.08.05	22:46	74° 59,93' N	3° 30,59' W	3667,2	FRRF
PS68/063-3	01.08.05	23:05	74° 59,89' N	3° 30,69' W	3667,2	FRRF
PS68/063-3	01.08.05	23:08	74° 59,89' N	3° 30,75' W	3667,2	FRRF
PS68/063-1	01.08.05	23:39	74° 59,89' N	3° 31,46' W	3666,4	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/063-1	02.08.05	00:39	74° 59,93' N	3° 32,23' W	3665,6	CTD/RO
PS68/064-1	02.08.05	02:32	74° 52,95' N	4° 24,74' W	3625,6	CTD/RO
PS68/064-1	02.08.05	02:58	74° 52,86' N	4° 25,46' W	3624,8	CTD/RO
PS68/064-1	02.08.05	03:19	74° 52,78' N	4° 25,83' W	3624,4	CTD/RO
PS68/065-1	02.08.05	04:04	74° 51,16' N	4° 37,54' W	3617,2	MOR
PS68/065-1	02.08.05	04:07	74° 51,14' N	4° 37,49' W	3617,2	MOR
PS68/065-1	02.08.05	04:14	74° 51,14' N	4° 37,66' W	3617,2	MOR
PS68/065-1	02.08.05	04:24	74° 51,11' N	4° 37,57' W	3617,2	MOR
PS68/065-1	02.08.05	04:27	74° 51,08' N	4° 37,45' W	3617,2	MOR
PS68/065-1	02.08.05	04:30	74° 51,06' N	4° 37,39' W	3617,2	MOR
PS68/066-1	02.08.05	04:48	74° 53,19' N	4° 37,63' W	3615,2	MOR
PS68/066-1	02.08.05	04:50	74° 53,21' N	4° 37,64' W	3614,8	MOR
PS68/066-1	02.08.05	04:51	74° 53,20' N	4° 37,65' W	3614,8	MOR
PS68/066-1	02.08.05	04:52	74° 53,20' N	4° 37,64' W	3615,2	MOR
PS68/066-1	02.08.05	05:06	74° 53,19' N	4° 38,45' W	3614,4	MOR
PS68/066-1	02.08.05	05:27	74° 53,14' N	4° 38,13' W	3614,8	MOR
PS68/066-1	02.08.05	05:48	74° 53,12' N	4° 37,96' W	3615,2	MOR
PS68/066-1	02.08.05	06:03	74° 53,10' N	4° 37,98' W	3615,2	MOR
PS68/065-2	02.08.05	06:37	74° 51,34' N	4° 38,23' W	3616,8	MOR
PS68/065-2	02.08.05	06:39	74° 51,33' N	4° 38,23' W	3616,8	MOR
PS68/066-3	02.08.05	06:44	74° 51,33' N	4° 38,28' W	3616,8	SD
PS68/066-3	02.08.05	06:46	74° 51,34' N	4° 38,29' W	3617,3	SD
PS68/065-2	02.08.05	06:52	74° 51,37' N	4° 38,27' W	3617,2	MOR
PS68/067-1	02.08.05	07:45	74° 54,97' N	4° 37,60' W	3613,9	MOR
PS68/067-1	02.08.05	07:49	74° 54,96' N	4° 37,77' W	3614,1	MOR
PS68/067-1	02.08.05	07:50	74° 54,95' N	4° 37,80' W	3613,9	MOR
PS68/067-1	02.08.05	07:52	74° 54,94' N	4° 37,84' W	3614,4	MOR
PS68/067-1	02.08.05	08:01	74° 55,03' N	4° 38,44' W	3613,6	MOR
PS68/067-1	02.08.05	08:08	74° 55,01' N	4° 38,52' W	3613,6	MOR
PS68/067-1	02.08.05	08:15	74° 54,99' N	4° 38,40' W	3613,6	MOR
PS68/067-1	02.08.05	08:50	74° 54,93' N	4° 39,10' W	3613,7	MOR
PS68/065-3	02.08.05	09:34	74° 51,56' N	4° 38,45' W	3618,4	MOR
PS68/065-3	02.08.05	09:57	74° 51,25' N	4° 37,98' W	3618,1	MOR
PS68/065-3	02.08.05	10:30	74° 51,30' N	4° 38,07' W	3618,1	MOR
PS68/065-3	02.08.05	10:49	74° 51,12' N	4° 38,36' W	3617,9	MOR
PS68/065-3	02.08.05	10:58	74° 51,21' N	4° 38,21' W	3617,1	MOR
PS68/065-3	02.08.05	11:03	74° 51,22' N	4° 38,19' W	3617,3	MOR
PS68/065-3	02.08.05	11:18	74° 51,16' N	4° 38,56' W	3616,8	MOR
PS68/065-3	02.08.05	11:43	74° 51,13' N	4° 38,63' W	3617,2	MOR
PS68/065-3	02.08.05	11:59	74° 51,18' N	4° 38,65' W	3616,7	MOR
PS68/065-3	02.08.05	12:37	74° 51,40' N	4° 38,81' W	3616,7	MOR
PS68/065-3	02.08.05	13:06	74° 51,35' N	4° 38,90' W	3616,9	MOR
PS68/065-3	02.08.05	13:08	74° 51,34' N	4° 38,90' W	3616,8	MOR

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/065-3	02.08.05	13:45	74° 51,09' N	4° 38,99' W	3616,3	MOR
PS68/065-3	02.08.05	13:53	74° 51,08' N	4° 38,96' W	3616,7	MOR
PS68/065-3	02.08.05	14:00	74° 50,99' N	4° 39,04' W	3616,5	MOR
PS68/065-3	02.08.05	14:40	74° 50,82' N	4° 38,00' W	3618,0	MOR
PS68/065-3	02.08.05	15:01	74° 50,90' N	4° 37,90' W	3617,3	MOR
PS68/065-3	02.08.05	15:04	74° 50,90' N	4° 37,91' W	3617,1	MOR
PS68/065-3	02.08.05	15:04	74° 50,90' N	4° 37,91' W	3617,1	MOR
PS68/068-1	02.08.05	15:57	74° 54,02' N	4° 22,49' W	3628,3	XBT
PS68/069-1	02.08.05	16:03	74° 54,05' N	4° 20,36' W	3630,8	XBT
PS68/070-1	02.08.05	16:39	74° 54,04' N	3° 58,72' W	3638,4	XBT
PS68/071-1	02.08.05	17:24	74° 54,04' N	3° 31,42' W	3666,8	XBT
PS68/072-1	02.08.05	18:12	74° 54,04' N	3° 3,46' W	3683,2	XBT
PS68/073-1	02.08.05	18:59	74° 54,04' N	2° 37,16' W	3698,8	XBT
PS68/074-1	02.08.05	19:47	74° 54,02' N	2° 9,45' W	3714,0	XBT
PS68/075-1	02.08.05	20:34	74° 54,03' N	1° 43,51' W	3553,6	XBT
PS68/076-1	02.08.05	21:24	74° 54,05' N	1° 15,06' W	3755,2	XBT
PS68/077-1	02.08.05	22:10	74° 54,04' N	0° 49,69' W	3757,2	XBT
PS68/078-1	02.08.05	23:00	74° 54,06' N	0° 21,89' W	3766,4	XBT
PS68/079-1	02.08.05	23:51	74° 48,28' N	0° 8,04' W	3702,8	XBT
PS68/080-1	03.08.05	00:46	74° 47,96' N	0° 32,70' W	3660,4	XBT
PS68/080-2	03.08.05	00:52	74° 47,95' N	0° 34,67' W	3765,2	XBT
PS68/081-1	03.08.05	01:39	74° 47,97' N	0° 59,91' W	3754,8	XBT
PS68/082-1	03.08.05	02:42	74° 47,98' N	1° 30,77' W	3688,0	XBT
PS68/083-1	03.08.05	03:30	74° 47,95' N	1° 56,44' W	3682,4	XBT
PS68/084-1	03.08.05	04:27	74° 50,28' N	2° 28,50' W	3698,8	MOR
PS68/084-1	03.08.05	04:29	74° 50,27' N	2° 28,61' W	3698,8	MOR
PS68/084-1	03.08.05	04:31	74° 50,24' N	2° 28,64' W	3698,8	MOR
PS68/084-1	03.08.05	04:31	74° 50,24' N	2° 28,64' W	3698,8	MOR
PS68/084-1	03.08.05	04:40	74° 50,27' N	2° 28,72' W	3698,8	MOR
PS68/084-1	03.08.05	04:45	74° 50,19' N	2° 28,73' W	3699,2	MOR
PS68/084-1	03.08.05	04:47	74° 50,18' N	2° 28,73' W	3698,8	MOR
PS68/084-1	03.08.05	05:27	74° 49,78' N	2° 28,96' W	3698,4	MOR
PS68/084-1	03.08.05	05:28	74° 49,77' N	2° 28,96' W	3697,6	MOR
PS68/084-1	03.08.05	05:30	74° 49,75' N	2° 28,97' W	3698,0	MOR
PS68/085-1	03.08.05	06:38	74° 50,36' N	2° 28,55' W	3699,2	MOR
PS68/085-1	03.08.05	06:43	74° 50,38' N	2° 28,50' W	3699,2	MOR
PS68/085-1	03.08.05	07:48	74° 50,38' N	2° 28,59' W	3699,6	MOR
PS68/085-1	03.08.05	08:06	74° 50,38' N	2° 28,56' W	3699,6	MOR
PS68/085-1	03.08.05	08:10	74° 50,37' N	2° 28,57' W	3699,2	MOR
PS68/085-1	03.08.05	08:10	74° 50,37' N	2° 28,57' W	3699,2	MOR
PS68/086-1	03.08.05	08:30	74° 51,45' N	2° 28,79' W	3701,6	CTD/RO
PS68/086-1	03.08.05	09:26	74° 51,40' N	2° 28,55' W	3702,0	CTD/RO
PS68/086-1	03.08.05	10:11	74° 51,47' N	2° 28,21' W	3702,0	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/087-1	03.08.05	10:41	74° 51,42' N	2° 44,20' W	3696,8	XBT
PS68/087-2	03.08.05	10:46	74° 51,43' N	2° 45,74' W	3695,2	XBT
PS68/088-1	03.08.05	12:48	75° 4,88' N	3° 26,96' W	3668,8	MOR
PS68/088-1	03.08.05	12:49	75° 4,88' N	3° 26,97' W	3668,8	MOR
PS68/088-1	03.08.05	12:50	75° 4,88' N	3° 26,96' W	3668,8	MOR
PS68/088-1	03.08.05	12:51	75° 4,87' N	3° 26,94' W	3668,8	MOR
PS68/088-1	03.08.05	13:00	75° 4,94' N	3° 27,03' W	3668,4	MOR
PS68/088-1	03.08.05	13:02	75° 4,94' N	3° 27,00' W	3668,8	MOR
PS68/088-1	03.08.05	13:08	75° 4,88' N	3° 26,91' W	3668,8	MOR
PS68/088-1	03.08.05	13:55	75° 4,45' N	3° 26,40' W	3670,4	MOR
PS68/088-1	03.08.05	13:58	75° 4,43' N	3° 26,42' W	3670,4	MOR
PS68/088-1	03.08.05	14:02	75° 4,38' N	3° 26,46' W	3670,4	MOR
PS68/088-1	03.08.05	14:03	75° 4,37' N	3° 26,47' W	3670,8	MOR
PS68/089-1	03.08.05	14:36	75° 4,95' N	3° 27,19' W	3668,4	MOR
PS68/089-1	03.08.05	14:40	75° 4,95' N	3° 27,13' W	3668,4	MOR
PS68/089-1	03.08.05	15:58	75° 4,93' N	3° 27,22' W	3668,0	MOR
PS68/089-1	03.08.05	16:13	75° 4,93' N	3° 27,13' W	3668,0	MOR
PS68/089-1	03.08.05	16:15	75° 4,93' N	3° 27,09' W	3668,0	MOR
PS68/089-1	03.08.05	16:20	75° 4,93' N	3° 27,16' W	3668,0	MOR
PS68/089-1	03.08.05	16:21	75° 4,93' N	3° 27,15' W	3668,0	MOR
PS68/089-1	03.08.05	16:22	75° 4,93' N	3° 27,13' W	3668,0	MOR
PS68/090-1	03.08.05	16:43	75° 5,41' N	3° 29,68' W	3665,6	XBT
PS68/091-1	03.08.05	17:36	75° 6,04' N	3° 3,53' W	3683,6	XBT
PS68/092-1	03.08.05	17:42	75° 6,01' N	3° 1,53' W	3684,8	XBT
PS68/093-1	03.08.05	18:26	75° 5,88' N	2° 36,11' W	3616,8	XBT
PS68/094-1	03.08.05	19:13	75° 6,03' N	2° 9,60' W	3681,2	XBT
PS68/095-1	03.08.05	20:08	75° 6,05' N	1° 41,82' W	3730,8	XBT
PS68/096-1	03.08.05	20:55	75° 6,03' N	1° 16,68' W	3738,0	XBT
PS68/096-2	03.08.05	21:07	75° 5,98' N	1° 12,96' W	3738,4	XBT
PS68/097-1	03.08.05	21:59	75° 11,85' N	1° 3,62' W	3748,4	XBT
PS68/098-1	03.08.05	22:42	75° 11,97' N	1° 27,65' W	3688,4	XBT
PS68/099-1	03.08.05	23:35	75° 12,12' N	1° 55,03' W	3732,0	XBT
PS68/100-1	04.08.05	00:24	75° 11,98' N	2° 20,75' W	3729,2	XBT
PS68/101-1	04.08.05	01:13	75° 11,96' N	2° 48,06' W	3696,8	XBT
PS68/102-1	04.08.05	02:04	75° 11,95' N	3° 15,85' W	3677,6	XBT
PS68/103-1	04.08.05	02:52	75° 11,97' N	3° 42,05' W	3660,0	XBT
PS68/104-1	04.08.05	03:36	75° 12,01' N	4° 6,45' W	3638,0	XBT
PS68/105-1	04.08.05	04:25	75° 6,43' N	3° 58,10' W	3647,6	XBT
PS68/106-1	04.08.05	05:38	75° 0,37' N	4° 26,21' W	3627,2	XBT
PS68/107-1	04.08.05	06:34	74° 54,95' N	4° 33,39' W	3618,0	MOR
PS68/107-1	04.08.05	06:41	74° 54,96' N	4° 33,41' W	3617,2	MOR
PS68/107-1	04.08.05	07:42	74° 55,03' N	4° 32,94' W	3618,8	MOR
PS68/107-1	04.08.05	07:51	74° 55,02' N	4° 32,98' W	3618,8	MOR

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/107-1	04.08.05	08:08	74° 55,00' N	4° 32,98' W	3618,4	MOR
PS68/107-1	04.08.05	08:11	74° 55,01' N	4° 32,99' W	3618,4	MOR
PS68/107-1	04.08.05	08:14	74° 55,00' N	4° 32,98' W	3618,4	MOR
PS68/108-1	04.08.05	08:44	74° 55,03' N	4° 24,83' W	3626,0	MOR
PS68/108-1	04.08.05	09:53	74° 55,01' N	4° 25,24' W	3626,0	MOR
PS68/108-1	04.08.05	10:02	74° 55,02' N	4° 25,31' W	3625,6	MOR
PS68/108-1	04.08.05	10:27	74° 55,02' N	4° 25,37' W	3625,6	MOR
PS68/108-1	04.08.05	10:27	74° 55,02' N	4° 25,37' W	3625,6	MOR
PS68/108-1	04.08.05	10:34	74° 55,00' N	4° 25,37' W	3625,6	MOR
PS68/108-1	04.08.05	10:40	74° 54,98' N	4° 25,60' W	3625,6	MOR
PS68/109-1	04.08.05	11:31	74° 55,01' N	4° 17,57' W	3634,0	MOR
PS68/109-1	04.08.05	11:34	74° 55,02' N	4° 17,55' W	3634,4	MOR
PS68/109-1	04.08.05	12:44	74° 55,01' N	4° 17,68' W	3634,0	MOR
PS68/109-1	04.08.05	12:51	74° 55,01' N	4° 17,65' W	3634,0	MOR
PS68/109-1	04.08.05	13:05	74° 55,01' N	4° 17,60' W	3634,0	MOR
PS68/109-1	04.08.05	13:06	74° 55,01' N	4° 17,59' W	3634,4	MOR
PS68/109-1	04.08.05	13:13	74° 55,01' N	4° 17,66' W	3634,0	MOR
PS68/109-1	04.08.05	13:15	74° 55,00' N	4° 17,64' W	3634,0	MOR
PS68/109-1	04.08.05	13:15	74° 55,00' N	4° 17,64' W	3634,0	MOR
PS68/110-1	04.08.05	14:03	74° 48,35' N	4° 10,55' W	3637,6	XBT
PS68/111-1	04.08.05	14:56	74° 48,05' N	3° 44,98' W	3654,4	XBT
PS68/112-1	04.08.05	15:50	74° 48,04' N	3° 16,24' W	3677,2	XBT
PS68/113-1	04.08.05	16:38	74° 48,05' N	2° 51,29' W	3687,6	XBT
PS68/114-1	04.08.05	17:36	74° 48,12' N	2° 22,27' W	3696,8	XBT
PS68/115-1	04.08.05	19:20	75° 0,01' N	2° 51,31' W	3692,4	CTD/RO
PS68/115-2	04.08.05	19:46	75° 0,05' N	2° 50,73' W	3692,0	FRRF
PS68/115-2	04.08.05	20:06	75° 0,07' N	2° 50,26' W	3692,0	FRRF
PS68/115-2	04.08.05	20:08	75° 0,07' N	2° 50,22' W	3692,0	FRRF
PS68/115-1	04.08.05	20:28	75° 0,09' N	2° 49,84' W	3692,0	CTD/RO
PS68/115-1	04.08.05	21:20	75° 0,11' N	2° 48,80' W	3692,4	CTD/RO
PS68/116-1	04.08.05	22:27	75° 0,08' N	2° 13,18' W	3638,4	CTD/RO
PS68/116-2	04.08.05	22:36	75° 0,10' N	2° 13,09' W	3635,6	FRRF
PS68/116-2	04.08.05	22:54	75° 0,16' N	2° 12,92' W	3630,8	FRRF
PS68/116-2	04.08.05	22:56	75° 0,16' N	2° 12,91' W	3631,2	FRRF
PS68/116-3	04.08.05	23:02	75° 0,15' N	2° 12,93' W	3631,6	SD
PS68/116-3	04.08.05	23:04	75° 0,15' N	2° 12,94' W	3631,6	SD
PS68/116-1	04.08.05	23:35	75° 0,25' N	2° 13,09' W	3632,4	CTD/RO
PS68/116-1	05.08.05	00:33	75° 0,41' N	2° 12,94' W	3611,2	CTD/RO
PS68/117-1	05.08.05	01:40	75° 0,03' N	1° 35,10' W	3731,2	CTD/RO
PS68/117-2	05.08.05	01:47	75° 0,06' N	1° 34,98' W	3731,2	FRRF
PS68/117-3	05.08.05	01:52	75° 0,06' N	1° 35,03' W	3731,2	SD
PS68/117-3	05.08.05	01:54	75° 0,06' N	1° 35,01' W	3731,2	SD
PS68/117-2	05.08.05	02:07	75° 0,01' N	1° 34,95' W	3731,2	FRRF

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/117-2	05.08.05	02:09	75° 0,02' N	1° 34,95' W	3731,2	FRRF
PS68/117-1	05.08.05	02:49	75° 0,21' N	1° 35,45' W	3730,8	CTD/RO
PS68/117-1	05.08.05	03:44	75° 0,36' N	1° 35,71' W	3730,8	CTD/RO
PS68/118-1	05.08.05	04:56	75° 0,05' N	0° 55,97' W	3683,6	CTD/RO
PS68/118-2	05.08.05	05:03	75° 0,07' N	0° 56,03' W	3681,6	FRRF
PS68/118-2	05.08.05	05:16	75° 0,05' N	0° 56,22' W	3678,8	FRRF
PS68/118-2	05.08.05	05:18	75° 0,05' N	0° 56,25' W	3672,0	FRRF
PS68/118-3	05.08.05	05:25	75° 0,04' N	0° 56,31' W	3670,8	SD
PS68/118-3	05.08.05	05:30	75° 0,05' N	0° 56,35' W	3668,4	SD
PS68/118-1	05.08.05	06:06	74° 59,97' N	0° 56,79' W	3656,0	CTD/RO
PS68/118-1	05.08.05	07:13	75° 0,07' N	0° 57,35' W	3630,8	CTD/RO
PS68/119-1	05.08.05	08:19	74° 59,93' N	0° 18,10' W	3764,8	CTD/RO
PS68/119-2	05.08.05	08:24	74° 59,97' N	0° 18,02' W	3764,8	SD
PS68/119-2	05.08.05	08:30	74° 59,98' N	0° 18,05' W	3764,8	SD
PS68/119-3	05.08.05	08:34	74° 59,99' N	0° 18,06' W	3764,8	FRRF
PS68/119-3	05.08.05	08:48	75° 0,04' N	0° 18,09' W	3764,8	FRRF
PS68/119-3	05.08.05	08:52	75° 0,07' N	0° 18,10' W	3764,8	FRRF
PS68/119-1	05.08.05	10:16	75° 0,48' N	0° 18,83' W	3764,4	CTD/RO
PS68/119-4	05.08.05	10:44	75° 0,08' N	0° 18,11' W	3765,2	CTD/RO
PS68/119-4	05.08.05	11:39	75° 0,27' N	0° 18,44' W	3765,2	CTD/RO
PS68/119-4	05.08.05	12:26	75° 0,35' N	0° 18,57' W	3764,8	CTD/RO
PS68/120-1	05.08.05	13:31	75° 0,08' N	0° 20,82' E	3773,2	CTD/RO
PS68/120-2	05.08.05	13:47	75° 0,01' N	0° 21,23' E	3773,6	SD
PS68/120-2	05.08.05	13:53	74° 59,97' N	0° 21,31' E	3773,6	SD
PS68/120-3	05.08.05	13:57	74° 59,94' N	0° 21,37' E	3773,6	FRRF
PS68/120-3	05.08.05	14:12	74° 59,97' N	0° 21,43' E	3773,6	FRRF
PS68/120-3	05.08.05	14:15	74° 59,99' N	0° 21,43' E	3773,2	FRRF
PS68/120-1	05.08.05	14:33	74° 59,92' N	0° 21,56' E	3773,6	CTD/RO
PS68/120-1	05.08.05	15:32	74° 59,79' N	0° 22,35' E	3773,6	CTD/RO
PS68/121-1	05.08.05	16:24	75° 6,11' N	0° 33,27' E	3773,2	CTD
PS68/122-1	05.08.05	17:14	75° 6,02' N	1° 0,62' E	3773,2	XBT
PS68/123-1	05.08.05	17:55	75° 6,03' N	1° 25,18' E	3058,4	XBT
PS68/124-1	05.08.05	18:51	75° 11,95' N	1° 13,14' E	3293,6	XBT
PS68/125-1	05.08.05	19:34	75° 11,97' N	0° 47,51' E	3772,4	XBT
PS68/126-1	05.08.05	21:08	75° 6,07' N	1° 26,85' E	3109,2	XBT
PS68/127-1	05.08.05	22:00	75° 0,05' N	1° 13,54' E	3777,2	XBT
PS68/128-1	05.08.05	22:46	75° 0,04' N	1° 39,32' E	3074,0	XBT
PS68/129-1	05.08.05	23:37	75° 5,76' N	1° 53,23' E	2140,8	XBT
PS68/130-1	06.08.05	00:28	75° 11,58' N	1° 41,22' E	2112,0	XBT
PS68/130-2	06.08.05	00:36	75° 12,07' N	1° 40,05' E	2178,4	XBT
PS68/131-1	06.08.05	01:29	75° 6,40' N	1° 40,66' E	2664,0	XBT
PS68/132-1	06.08.05	01:56	75° 3,32' N	1° 34,59' E	3078,8	XBT
PS68/133-1	06.08.05	02:24	75° 3,03' N	1° 21,65' E	3570,8	XBT

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/134-1	06.08.05	02:51	75° 5,73' N	1° 13,97' E	3322,0	XBT
PS68/135-1	06.08.05	03:22	75° 9,00' N	1° 20,52' E	3134,0	XBT
PS68/136-1	06.08.05	03:45	75° 9,07' N	1° 32,38' E	2538,0	XBT
PS68/137-1	06.08.05	04:07	75° 9,00' N	1° 40,40' E	1792,8	CTD/RO
PS68/137-1	06.08.05	04:37	75° 9,04' N	1° 40,43' E	1792,4	CTD/RO
PS68/137-1	06.08.05	05:00	75° 9,04' N	1° 40,49' E	1789,2	CTD/RO
PS68/138-1	06.08.05	05:36	75° 5,98' N	1° 26,85' E	3140,0	CTD/RO
PS68/138-1	06.08.05	06:27	75° 5,85' N	1° 26,90' E	3160,0	CTD/RO
PS68/138-1	06.08.05	07:04	75° 5,90' N	1° 26,31' E	3135,2	CTD/RO
PS68/139-1	06.08.05	08:04	74° 59,93' N	0° 59,10' E	3775,2	CTD/RO
PS68/139-1	06.08.05	09:03	74° 59,72' N	0° 58,84' E	3775,6	CTD/RO
PS68/139-1	06.08.05	09:57	74° 59,64' N	0° 57,97' E	3775,6	CTD/RO
PS68/140-1	06.08.05	15:51	74° 51,48' N	2° 45,85' W	3694,4	CTD/RO
PS68/140-2	06.08.05	16:05	74° 51,38' N	2° 45,36' W	3694,4	FRRF
PS68/140-2	06.08.05	16:25	74° 51,28' N	2° 44,31' W	3695,2	FRRF
PS68/140-2	06.08.05	16:29	74° 51,28' N	2° 44,08' W	3695,2	FRRF
PS68/140-3	06.08.05	16:30	74° 51,27' N	2° 44,02' W	3695,2	SD
PS68/140-3	06.08.05	16:35	74° 51,26' N	2° 43,74' W	3695,2	SD
PS68/140-1	06.08.05	16:49	74° 51,22' N	2° 43,70' W	3695,2	CTD/RO
PS68/140-1	06.08.05	17:37	74° 51,16' N	2° 43,79' W	3694,8	CTD/RO
PS68/141-1	06.08.05	18:07	74° 54,42' N	2° 38,60' W	3698,0	CTD/RO
PS68/141-2	06.08.05	18:14	74° 54,38' N	2° 38,34' W	3698,0	FRRF
PS68/141-2	06.08.05	18:33	74° 54,30' N	2° 38,04' W	3698,0	FRRF
PS68/141-2	06.08.05	18:35	74° 54,30' N	2° 38,00' W	3698,0	FRRF
PS68/141-1	06.08.05	19:10	74° 54,31' N	2° 38,56' W	3697,6	CTD/RO
PS68/141-1	06.08.05	19:55	74° 54,17' N	2° 38,75' W	3697,2	CTD/RO
PS68/142-1	06.08.05	20:28	74° 54,50' N	2° 52,58' W	3690,8	CTD/RO
PS68/142-2	06.08.05	20:37	74° 54,49' N	2° 52,58' W	3690,8	FRRF
PS68/142-3	06.08.05	20:46	74° 54,48' N	2° 52,70' W	3690,8	SD
PS68/142-3	06.08.05	20:50	74° 54,46' N	2° 52,77' W	3690,8	SD
PS68/142-2	06.08.05	20:58	74° 54,43' N	2° 52,92' W	3690,8	FRRF
PS68/142-2	06.08.05	21:01	74° 54,43' N	2° 52,97' W	3690,8	FRRF
PS68/142-1	06.08.05	21:32	74° 54,31' N	2° 53,59' W	3690,0	CTD/RO
PS68/142-1	06.08.05	22:18	74° 54,23' N	2° 53,35' W	3690,4	CTD/RO
PS68/143-1	06.08.05	22:48	74° 51,52' N	3° 0,09' W	3687,2	CTD/RO
PS68/143-2	06.08.05	22:56	74° 51,52' N	3° 0,02' W	3687,2	FRRF
PS68/143-3	06.08.05	23:06	74° 51,49' N	3° 0,03' W	3687,2	SD
PS68/143-2	06.08.05	23:12	74° 51,50' N	2° 59,97' W	3687,2	FRRF
PS68/143-3	06.08.05	23:14	74° 51,50' N	2° 59,95' W	3687,6	SD
PS68/143-2	06.08.05	23:16	74° 51,50' N	2° 59,93' W	3687,6	FRRF
PS68/143-1	06.08.05	23:52	74° 51,47' N	3° 0,10' W	3687,2	CTD/RO
PS68/143-1	07.08.05	00:34	74° 51,52' N	2° 59,51' W	3687,6	CTD/RO
PS68/144-1	07.08.05	01:04	74° 48,56' N	2° 53,11' W	3687,2	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/144-2	07.08.05	01:14	74° 48,58' N	2° 53,21' W	3687,2	FRRF
PS68/144-3	07.08.05	01:16	74° 48,58' N	2° 53,29' W	3687,2	SD
PS68/144-3	07.08.05	01:20	74° 48,57' N	2° 53,41' W	3687,2	SD
PS68/144-2	07.08.05	01:35	74° 48,62' N	2° 53,48' W	3687,2	FRRF
PS68/144-2	07.08.05	01:37	74° 48,63' N	2° 53,47' W	3687,2	FRRF
PS68/144-1	07.08.05	01:42	74° 48,67' N	2° 53,40' W	3687,2	CTD/RO
PS68/144-1	07.08.05	02:15	74° 48,70' N	2° 52,81' W	3687,6	CTD/RO
PS68/144-4	07.08.05	02:36	74° 48,40' N	2° 52,00' W	3688,0	CTD/RO
PS68/144-4	07.08.05	03:31	74° 48,63' N	2° 52,97' W	3687,2	CTD/RO
PS68/144-4	07.08.05	04:28	74° 48,80' N	2° 53,01' W	3687,2	CTD/RO
PS68/145-1	07.08.05	05:02	74° 48,48' N	2° 38,66' W	3692,4	CTD/RO
PS68/145-1	07.08.05	05:58	74° 48,48' N	2° 38,97' W	3691,6	CTD/RO
PS68/145-2	07.08.05	06:03	74° 48,48' N	2° 39,06' W	3691,6	FRRF
PS68/145-2	07.08.05	06:14	74° 48,48' N	2° 39,18' W	3691,6	FRRF
PS68/145-2	07.08.05	06:16	74° 48,48' N	2° 39,20' W	3691,6	FRRF
PS68/145-3	07.08.05	06:22	74° 48,47' N	2° 39,27' W	3691,6	SD
PS68/145-3	07.08.05	06:26	74° 48,46' N	2° 39,34' W	3691,6	SD
PS68/145-1	07.08.05	06:57	74° 48,39' N	2° 39,75' W	3691,2	CTD/RO
PS68/146-1	07.08.05	07:35	74° 48,48' N	2° 24,42' W	3697,2	CTD/RO
PS68/146-2	07.08.05	07:42	74° 48,43' N	2° 24,46' W	3696,8	FRRF
PS68/146-2	07.08.05	07:55	74° 48,36' N	2° 24,03' W	3696,0	FRRF
PS68/146-2	07.08.05	07:57	74° 48,34' N	2° 23,97' W	3696,4	FRRF
PS68/146-3	07.08.05	08:01	74° 48,32' N	2° 23,96' W	3696,4	SD
PS68/146-3	07.08.05	08:04	74° 48,31' N	2° 24,01' W	3696,4	SD
PS68/146-1	07.08.05	08:28	74° 48,17' N	2° 24,76' W	3696,0	CTD/RO
PS68/146-1	07.08.05	09:24	74° 47,93' N	2° 24,70' W	3695,2	CTD/RO
PS68/147-1	07.08.05	09:59	74° 46,02' N	2° 35,37' W	3691,6	CTD/RO
PS68/147-2	07.08.05	10:35	74° 46,00' N	2° 35,86' W	3691,6	FRRF
PS68/147-2	07.08.05	10:48	74° 46,00' N	2° 36,03' W	3692,0	FRRF
PS68/147-2	07.08.05	10:50	74° 46,00' N	2° 36,05' W	3692,0	FRRF
PS68/147-1	07.08.05	10:56	74° 46,00' N	2° 36,14' W	3691,6	CTD/RO
PS68/147-1	07.08.05	11:51	74° 46,06' N	2° 36,86' W	3691,6	CTD/RO
PS68/148-1	07.08.05	12:27	74° 45,40' N	2° 32,56' W	3690,4	CTD/RO
PS68/148-1	07.08.05	13:25	74° 45,26' N	2° 33,02' W	3689,6	CTD/RO
PS68/148-2	07.08.05	14:00	74° 45,28' N	2° 33,14' W	3690,0	SD
PS68/148-2	07.08.05	14:04	74° 45,31' N	2° 33,13' W	3690,0	SD
PS68/148-1	07.08.05	14:22	74° 45,31' N	2° 33,27' W	3690,4	CTD/RO
PS68/149-1	07.08.05	15:03	74° 42,36' N	2° 25,01' W	3690,0	CTD/RO
PS68/149-2	07.08.05	15:11	74° 42,36' N	2° 25,23' W	3690,0	SD
PS68/149-2	07.08.05	15:17	74° 42,37' N	2° 25,25' W	3690,0	SD
PS68/149-1	07.08.05	15:58	74° 42,34' N	2° 25,63' W	3690,0	CTD/RO
PS68/149-1	07.08.05	16:53	74° 42,25' N	2° 25,89' W	3690,0	CTD/RO
PS68/150-1	07.08.05	18:19	74° 45,51' N	2° 45,72' W	3686,4	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/150-2	07.08.05	18:49	74° 45,56' N	2° 46,30' W	3686,0	SD
PS68/150-2	07.08.05	18:53	74° 45,57' N	2° 46,30' W	3686,0	SD
PS68/150-1	07.08.05	19:18	74° 45,58' N	2° 46,48' W	3686,0	CTD/RO
PS68/150-1	07.08.05	20:11	74° 45,63' N	2° 47,28' W	3686,0	CTD/RO
PS68/151-1	07.08.05	20:44	74° 42,45' N	2° 53,12' W	3679,2	CTD/RO
PS68/151-1	07.08.05	21:43	74° 42,60' N	2° 53,38' W	3680,0	CTD/RO
PS68/151-1	07.08.05	22:40	74° 42,73' N	2° 53,45' W	3680,4	CTD/RO
PS68/152-1	07.08.05	23:14	74° 45,49' N	3° 0,15' W	3681,6	CTD/RO
PS68/152-2	07.08.05	23:36	74° 45,60' N	3° 0,26' W	3682,0	FRRF
PS68/152-3	07.08.05	23:36	74° 45,60' N	3° 0,26' W	3682,0	SD
PS68/152-3	07.08.05	23:41	74° 45,63' N	3° 0,24' W	3682,0	SD
PS68/152-2	07.08.05	23:50	74° 45,69' N	3° 0,24' W	3682,0	FRRF
PS68/152-2	07.08.05	23:52	74° 45,70' N	3° 0,24' W	3682,4	FRRF
PS68/152-1	08.08.05	00:13	74° 45,76' N	3° 0,35' W	3682,4	CTD/RO
PS68/152-1	08.08.05	01:08	74° 45,91' N	3° 0,37' W	3683,6	CTD/RO
PS68/153-1	08.08.05	01:40	74° 48,49' N	3° 7,09' W	3683,6	CTD/RO
PS68/153-2	08.08.05	01:49	74° 48,54' N	3° 7,08' W	3683,2	FRRF
PS68/153-3	08.08.05	01:51	74° 48,55' N	3° 7,08' W	3683,6	SD
PS68/153-3	08.08.05	01:57	74° 48,61' N	3° 7,05' W	3683,6	SD
PS68/153-2	08.08.05	02:04	74° 48,69' N	3° 6,98' W	3683,6	FRRF
PS68/153-2	08.08.05	02:09	74° 48,72' N	3° 6,94' W	3683,6	FRRF
PS68/153-1	08.08.05	02:38	74° 48,84' N	3° 6,80' W	3684,0	CTD/RO
PS68/153-1	08.08.05	03:39	74° 49,09' N	3° 5,30' W	3684,4	CTD/RO
PS68/154-1	08.08.05	04:06	74° 48,42' N	3° 2,25' W	3486,4	CTD/RO
PS68/154-2	08.08.05	04:13	74° 48,46' N	3° 2,17' W	3493,2	SD
PS68/154-3	08.08.05	04:13	74° 48,46' N	3° 2,17' W	3493,2	FRRF
PS68/154-2	08.08.05	04:20	74° 48,45' N	3° 2,13' W	3491,2	SD
PS68/154-3	08.08.05	04:23	74° 48,49' N	3° 2,11' W	3490,4	FRRF
PS68/154-3	08.08.05	04:26	74° 48,51' N	3° 2,07' W	3502,4	FRRF
PS68/154-1	08.08.05	05:00	74° 48,60' N	3° 1,69' W	3522,8	CTD/RO
PS68/154-1	08.08.05	05:52	74° 48,63' N	3° 2,21' W	3576,0	CTD/RO
PS68/155-1	08.08.05	06:16	74° 48,66' N	2° 57,43' W	3296,8	CTD/RO
PS68/155-2	08.08.05	06:28	74° 48,70' N	2° 57,15' W	3252,4	FRRF
PS68/155-3	08.08.05	06:30	74° 48,69' N	2° 57,14' W	3271,6	SD
PS68/155-3	08.08.05	06:34	74° 48,66' N	2° 57,09' W	3282,8	SD
PS68/155-2	08.08.05	06:44	74° 48,64' N	2° 57,04' W	3336,0	FRRF
PS68/155-1	08.08.05	07:12	74° 48,57' N	2° 56,96' W	3483,2	CTD/RO
PS68/155-1	08.08.05	08:01	74° 48,54' N	2° 56,69' W	3469,2	CTD/RO
PS68/156-1	08.08.05	08:32	74° 48,51' N	2° 47,97' W	3688,4	CTD/RO
PS68/156-2	08.08.05	08:53	74° 48,46' N	2° 47,96' W	3688,0	FRRF
PS68/156-3	08.08.05	08:54	74° 48,46' N	2° 47,97' W	3688,4	SD
PS68/156-3	08.08.05	08:59	74° 48,46' N	2° 47,98' W	3688,0	SD
PS68/156-2	08.08.05	09:06	74° 48,47' N	2° 47,99' W	3688,0	FRRF

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/156-2	08.08.05	09:09	74° 48,46' N	2° 48,00' W	3688,0	FRRF
PS68/156-1	08.08.05	09:29	74° 48,42' N	2° 48,24' W	3688,4	CTD/RO
PS68/156-1	08.08.05	10:26	74° 48,35' N	2° 48,06' W	3688,4	CTD/RO
PS68/157-1	08.08.05	10:59	74° 48,50' N	2° 43,88' W	3690,8	CTD/RO
PS68/157-2	08.08.05	11:02	74° 48,50' N	2° 43,78' W	3690,4	SD
PS68/157-2	08.08.05	11:08	74° 48,50' N	2° 43,70' W	3690,4	SD
PS68/157-3	08.08.05	11:17	74° 48,52' N	2° 43,43' W	3690,8	FRRF
PS68/157-3	08.08.05	11:33	74° 48,52' N	2° 43,65' W	3690,4	FRRF
PS68/157-3	08.08.05	11:35	74° 48,52' N	2° 43,63' W	3690,4	FRRF
PS68/157-1	08.08.05	11:59	74° 48,53' N	2° 43,37' W	3690,8	CTD/RO
PS68/157-1	08.08.05	13:00	74° 48,58' N	2° 43,91' W	3691,2	CTD/RO
PS68/158-1	08.08.05	14:09	74° 48,53' N	2° 34,01' W	3694,8	CTD/RO
PS68/158-2	08.08.05	14:13	74° 48,54' N	2° 34,02' W	3694,8	SD
PS68/158-2	08.08.05	14:18	74° 48,54' N	2° 34,02' W	3694,4	SD
PS68/158-3	08.08.05	14:21	74° 48,54' N	2° 33,99' W	3694,8	FRRF
PS68/158-3	08.08.05	14:37	74° 48,58' N	2° 33,83' W	3694,4	FRRF
PS68/158-3	08.08.05	14:38	74° 48,58' N	2° 33,82' W	3694,8	FRRF
PS68/158-1	08.08.05	15:08	74° 48,55' N	2° 33,44' W	3694,8	CTD/RO
PS68/158-1	08.08.05	16:15	74° 48,48' N	2° 33,97' W	3694,4	CTD/RO
PS68/159-1	08.08.05	16:50	74° 48,48' N	2° 29,59' W	3696,4	CTD/RO
PS68/159-2	08.08.05	16:58	74° 48,46' N	2° 29,55' W	3696,4	SD
PS68/159-2	08.08.05	17:02	74° 48,44' N	2° 29,55' W	3696,4	SD
PS68/159-3	08.08.05	17:16	74° 48,42' N	2° 29,39' W	3696,4	FRRF
PS68/159-3	08.08.05	17:31	74° 48,39' N	2° 29,06' W	3696,4	FRRF
PS68/159-3	08.08.05	17:34	74° 48,36' N	2° 29,06' W	3696,4	FRRF
PS68/159-1	08.08.05	17:48	74° 48,17' N	2° 29,14' W	3695,2	CTD/RO
PS68/159-1	08.08.05	18:47	74° 48,06' N	2° 29,25' W	3695,2	CTD/RO
PS68/160-1	08.08.05	19:16	74° 48,45' N	2° 20,15' W	3699,2	CTD/RO
PS68/160-1	08.08.05	20:16	74° 48,37' N	2° 20,38' W	3698,8	CTD/RO
PS68/160-1	08.08.05	21:38	74° 48,18' N	2° 20,74' W	3698,4	CTD/RO
PS68/161-1	08.08.05	22:00	74° 48,45' N	2° 15,61' W	3700,8	CTD/RO
PS68/161-1	08.08.05	23:02	74° 48,35' N	2° 15,73' W	3700,8	CTD/RO
PS68/161-1	09.08.05	00:11	74° 48,29' N	2° 16,62' W	3701,2	CTD/RO
PS68/162-1	09.08.05	06:19	75° 0,12' N	1° 38,25' E	3117,1	CTD/RO
PS68/162-2	09.08.05	06:30	75° 0,11' N	1° 38,07' E	3125,9	SD
PS68/162-2	09.08.05	06:35	75° 0,09' N	1° 37,92' E	3131,2	SD
PS68/162-1	09.08.05	07:13	75° 0,13' N	1° 38,06' E	3128,0	CTD/RO
PS68/162-1	09.08.05	08:27	75° 0,25' N	1° 38,32' E	3113,5	CTD/RO
PS68/163-1	09.08.05	12:30	74° 60,00' N	2° 17,11' E	2953,2	CTD/RO
PS68/163-2	09.08.05	12:39	75° 0,02' N	2° 17,08' E	2951,6	FRRF
PS68/163-2	09.08.05	12:56	74° 59,99' N	2° 17,25' E	2953,3	FRRF
PS68/163-2	09.08.05	12:59	75° 0,01' N	2° 17,29' E	2950,0	FRRF
PS68/163-1	09.08.05	13:16	75° 0,01' N	2° 17,33' E	2948,4	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/163-1	09.08.05	14:08	75° 0,05' N	2° 17,41' E	2942,1	CTD/RO
PS68/164-1	09.08.05	15:24	75° 0,04' N	2° 56,09' E	2513,5	CTD/RO
PS68/164-2	09.08.05	15:34	75° 0,05' N	2° 56,05' E	2512,8	FRRF
PS68/164-2	09.08.05	15:51	75° 0,03' N	2° 55,96' E	2514,4	FRRF
PS68/164-2	09.08.05	15:52	75° 0,03' N	2° 55,95' E	2516,4	FRRF
PS68/164-1	09.08.05	16:08	75° 0,05' N	2° 56,04' E	2512,4	CTD/RO
PS68/164-1	09.08.05	16:53	75° 0,06' N	2° 56,59' E	2518,0	CTD/RO
PS68/165-1	09.08.05	18:04	74° 59,94' N	3° 34,65' E	3475,2	CTD/RO
PS68/165-2	09.08.05	18:12	74° 59,92' N	3° 34,65' E	3474,8	SD
PS68/165-3	09.08.05	18:15	74° 59,92' N	3° 34,62' E	3474,8	FRRF
PS68/165-2	09.08.05	18:20	74° 59,93' N	3° 34,53' E	3474,8	SD
PS68/165-3	09.08.05	18:29	74° 59,94' N	3° 34,42' E	3472,4	FRRF
PS68/165-3	09.08.05	18:32	74° 59,95' N	3° 34,39' E	3472,4	FRRF
PS68/165-1	09.08.05	18:59	74° 59,93' N	3° 34,42' E	3472,4	CTD/RO
PS68/165-1	09.08.05	19:53	74° 59,80' N	3° 34,39' E	3472,4	CTD/RO
PS68/166-1	09.08.05	21:06	75° 0,21' N	4° 13,80' E	3073,6	CTD/RO
PS68/166-2	09.08.05	21:16	75° 0,27' N	4° 13,56' E	3068,0	FRRF
PS68/166-3	09.08.05	21:18	75° 0,27' N	4° 13,47' E	3068,8	SD
PS68/166-3	09.08.05	21:24	75° 0,27' N	4° 13,34' E	3067,6	SD
PS68/166-2	09.08.05	21:30	75° 0,27' N	4° 13,29' E	3067,2	FRRF
PS68/166-2	09.08.05	21:34	75° 0,26' N	4° 13,28' E	3067,6	FRRF
PS68/166-1	09.08.05	21:54	75° 0,20' N	4° 13,44' E	3075,6	CTD/RO
PS68/166-1	09.08.05	22:44	75° 0,21' N	4° 13,28' E	3075,2	CTD/RO
PS68/167-1	09.08.05	23:59	75° 0,04' N	4° 51,71' E	3244,8	CTD/RO
PS68/167-2	10.08.05	00:05	75° 0,06' N	4° 51,76' E	3243,2	FRRF
PS68/167-2	10.08.05	00:22	75° 0,02' N	4° 51,87' E	3240,4	FRRF
PS68/167-2	10.08.05	00:26	75° 0,01' N	4° 51,87' E	3240,8	FRRF
PS68/167-1	10.08.05	00:51	75° 0,03' N	4° 52,01' E	3238,0	CTD/RO
PS68/167-1	10.08.05	01:43	74° 59,93' N	4° 52,17' E	3232,0	CTD/RO
PS68/168-1	10.08.05	02:55	75° 0,06' N	5° 30,13' E	3123,2	CTD/RO
PS68/168-2	10.08.05	03:02	75° 0,06' N	5° 30,17' E	3124,8	FRRF
PS68/168-2	10.08.05	03:14	75° 0,08' N	5° 30,18' E	3125,6	FRRF
PS68/168-2	10.08.05	03:18	75° 0,08' N	5° 30,26' E	3129,2	FRRF
PS68/168-1	10.08.05	03:42	75° 0,08' N	5° 30,49' E	3137,6	CTD/RO
PS68/168-1	10.08.05	04:33	75° 0,00' N	5° 30,85' E	3152,0	CTD/RO
PS68/169-1	10.08.05	05:38	75° 0,02' N	6° 7,92' E	2842,8	CTD/RO
PS68/169-2	10.08.05	06:01	75° 0,08' N	6° 8,02' E	2833,2	FRRF
PS68/169-3	10.08.05	06:01	75° 0,08' N	6° 8,02' E	2833,2	SD
PS68/169-3	10.08.05	06:09	75° 0,08' N	6° 7,97' E	2835,6	SD
PS68/169-2	10.08.05	06:14	75° 0,10' N	6° 7,98' E	2833,2	FRRF
PS68/169-2	10.08.05	06:16	75° 0,11' N	6° 7,99' E	2832,0	FRRF
PS68/169-1	10.08.05	06:23	75° 0,14' N	6° 8,00' E	2830,0	CTD/RO
PS68/169-1	10.08.05	07:07	75° 0,03' N	6° 7,39' E	2861,6	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/170-1	10.08.05	08:13	75° 0,09' N	6° 46,75' E	2273,6	CTD/RO
PS68/170-2	10.08.05	08:27	75° 0,12' N	6° 46,86' E	2261,2	FRRF
PS68/170-3	10.08.05	08:29	75° 0,12' N	6° 46,86' E	2261,2	SD
PS68/170-3	10.08.05	08:34	75° 0,13' N	6° 46,83' E	2263,6	SD
PS68/170-2	10.08.05	08:40	75° 0,14' N	6° 46,79' E	2262,0	FRRF
PS68/170-2	10.08.05	08:42	75° 0,14' N	6° 46,78' E	2262,0	FRRF
PS68/170-1	10.08.05	08:50	75° 0,15' N	6° 46,72' E	2264,0	CTD/RO
PS68/170-1	10.08.05	09:26	75° 0,22' N	6° 46,64' E	2255,6	CTD/RO
PS68/171-1	10.08.05	10:31	74° 59,99' N	7° 25,54' E	2478,8	CTD/RO
PS68/171-2	10.08.05	10:43	75° 0,09' N	7° 25,53' E	2477,2	FRRF
PS68/171-3	10.08.05	10:49	75° 0,08' N	7° 25,47' E	2477,6	SD
PS68/171-3	10.08.05	10:51	75° 0,08' N	7° 25,44' E	2477,2	SD
PS68/171-2	10.08.05	11:00	75° 0,10' N	7° 25,33' E	2477,6	FRRF
PS68/171-2	10.08.05	11:02	75° 0,10' N	7° 25,31' E	2477,6	FRRF
PS68/171-1	10.08.05	11:13	75° 0,11' N	7° 25,14' E	2478,4	CTD/RO
PS68/171-1	10.08.05	11:59	75° 0,24' N	7° 24,49' E	2480,4	CTD/RO
PS68/172-1	10.08.05	13:08	74° 60,00' N	8° 4,92' E	3533,6	CTD/RO
PS68/172-2	10.08.05	13:17	74° 59,94' N	8° 5,09' E	3533,2	FRRF
PS68/172-2	10.08.05	13:37	74° 59,82' N	8° 5,40' E	3530,4	FRRF
PS68/172-2	10.08.05	13:40	74° 59,79' N	8° 5,47' E	3530,0	FRRF
PS68/172-1	10.08.05	14:05	74° 59,81' N	8° 5,51' E	3530,4	CTD/RO
PS68/172-1	10.08.05	15:04	74° 59,71' N	8° 5,54' E	3528,8	CTD/RO
PS68/173-1	10.08.05	16:12	75° 0,13' N	8° 44,02' E	2670,8	CTD/RO
PS68/173-3	10.08.05	16:20	75° 0,19' N	8° 43,92' E	2670,4	FRRF
PS68/173-2	10.08.05	16:21	75° 0,20' N	8° 43,91' E	2670,0	SD
PS68/173-2	10.08.05	16:26	75° 0,27' N	8° 43,91' E	2670,0	SD
PS68/173-3	10.08.05	16:38	75° 0,33' N	8° 44,09' E	2670,4	FRRF
PS68/173-3	10.08.05	16:41	75° 0,32' N	8° 44,04' E	2670,0	FRRF
PS68/173-1	10.08.05	17:03	75° 0,31' N	8° 43,80' E	2669,6	CTD/RO
PS68/173-1	10.08.05	17:55	75° 0,55' N	8° 43,21' E	2666,8	CTD/RO
PS68/173-4	10.08.05	18:13	75° 0,31' N	8° 43,27' E	2668,0	CTD/RO
PS68/173-4	10.08.05	18:46	75° 0,64' N	8° 43,39' E	2666,4	CTD/RO
PS68/173-4	10.08.05	19:15	75° 0,89' N	8° 42,78' E	2662,0	CTD/RO
PS68/174-1	10.08.05	20:26	75° 0,06' N	9° 21,78' E	2596,0	CTD/RO
PS68/174-2	10.08.05	20:36	75° 0,17' N	9° 21,71' E	2596,8	FRRF
PS68/174-2	10.08.05	20:51	75° 0,15' N	9° 21,98' E	2596,0	FRRF
PS68/174-2	10.08.05	20:54	75° 0,16' N	9° 21,98' E	2596,0	FRRF
PS68/174-1	10.08.05	21:09	75° 0,27' N	9° 21,77' E	2597,2	CTD/RO
PS68/174-1	10.08.05	21:52	75° 0,37' N	9° 21,82' E	2598,0	CTD/RO
PS68/175-1	10.08.05	23:03	75° 0,03' N	9° 59,71' E	2579,2	CTD/RO
PS68/175-2	10.08.05	23:14	75° 0,07' N	9° 59,86' E	2578,8	FRRF
PS68/175-3	10.08.05	23:14	75° 0,07' N	9° 59,86' E	2578,8	SD
PS68/175-3	10.08.05	23:21	75° 0,09' N	9° 59,97' E	2578,4	SD

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/175-2	10.08.05	23:27	75° 0,04' N	9° 59,97' E	2578,8	FRRF
PS68/175-2	10.08.05	23:29	75° 0,02' N	9° 59,96' E	2578,8	FRRF
PS68/175-1	10.08.05	23:45	75° 0,07' N	9° 59,82' E	2578,8	CTD/RO
PS68/175-1	11.08.05	00:33	74° 60,00' N	9° 59,28' E	2580,8	CTD/RO
PS68/176-1	11.08.05	01:44	74° 59,93' N	10° 38,96' E	2535,6	CTD/RO
PS68/176-2	11.08.05	01:53	74° 59,87' N	10° 39,44' E	2535,2	FRRF
PS68/176-2	11.08.05	02:06	74° 59,81' N	10° 39,82' E	2534,4	FRRF
PS68/176-2	11.08.05	02:08	74° 59,80' N	10° 39,89' E	2534,0	FRRF
PS68/176-1	11.08.05	02:27	74° 59,74' N	10° 40,37' E	2533,6	CTD/RO
PS68/176-1	11.08.05	03:14	74° 59,43' N	10° 41,43' E	2532,4	CTD/RO
PS68/177-1	11.08.05	04:18	75° 0,11' N	11° 18,11' E	2455,6	CTD/RO
PS68/177-2	11.08.05	04:28	75° 0,14' N	11° 18,20' E	2455,2	FRRF
PS68/177-3	11.08.05	04:30	75° 0,16' N	11° 18,23' E	2454,8	SD
PS68/177-3	11.08.05	04:34	75° 0,18' N	11° 18,28' E	2454,4	SD
PS68/177-2	11.08.05	04:45	75° 0,17' N	11° 18,41' E	2454,4	FRRF
PS68/177-2	11.08.05	04:47	75° 0,18' N	11° 18,43' E	2454,0	FRRF
PS68/177-1	11.08.05	04:59	75° 0,22' N	11° 18,62' E	2452,8	CTD/RO
PS68/177-1	11.08.05	05:41	75° 0,40' N	11° 18,82' E	2451,2	CTD/RO
PS68/178-1	11.08.05	06:50	75° 0,05' N	11° 55,59' E	2335,6	CTD/RO
PS68/178-2	11.08.05	07:01	75° 0,09' N	11° 55,77' E	2334,8	FRRF
PS68/178-3	11.08.05	07:02	75° 0,09' N	11° 55,79' E	2334,8	SD
PS68/178-3	11.08.05	07:08	75° 0,11' N	11° 55,86' E	2334,8	SD
PS68/178-2	11.08.05	07:14	75° 0,11' N	11° 55,89' E	2334,4	FRRF
PS68/178-2	11.08.05	07:15	75° 0,11' N	11° 55,89' E	2334,4	FRRF
PS68/178-1	11.08.05	07:35	75° 0,12' N	11° 55,98' E	2334,0	CTD/RO
PS68/178-1	11.08.05	08:13	75° 0,19' N	11° 56,37' E	2333,2	CTD/RO
PS68/179-1	11.08.05	09:20	75° 0,03' N	12° 34,66' E	2181,2	CTD/RO
PS68/179-2	11.08.05	09:29	75° 0,08' N	12° 34,66' E	2180,4	FRRF
PS68/179-3	11.08.05	09:31	75° 0,09' N	12° 34,63' E	2180,4	SD
PS68/179-3	11.08.05	09:35	75° 0,12' N	12° 34,57' E	2180,8	SD
PS68/179-2	11.08.05	09:45	75° 0,19' N	12° 34,55' E	2180,0	FRRF
PS68/179-2	11.08.05	09:48	75° 0,21' N	12° 34,60' E	2179,6	FRRF
PS68/179-1	11.08.05	10:03	75° 0,30' N	12° 34,80' E	2178,8	CTD/RO
PS68/179-1	11.08.05	10:39	75° 0,53' N	12° 34,27' E	2175,6	CTD/RO
PS68/180-1	11.08.05	11:50	74° 59,99' N	13° 12,64' E	2015,2	CTD/RO
PS68/180-2	11.08.05	12:20	74° 60,00' N	13° 12,86' E	2014,0	FRRF
PS68/180-3	11.08.05	12:24	74° 59,99' N	13° 12,93' E	2014,0	SD
PS68/180-3	11.08.05	12:27	74° 59,99' N	13° 12,96' E	2014,0	SD
PS68/180-1	11.08.05	12:30	74° 59,98' N	13° 12,96' E	2014,0	CTD/RO
PS68/180-2	11.08.05	12:31	74° 59,98' N	13° 12,95' E	2014,0	FRRF
PS68/180-2	11.08.05	12:33	74° 59,98' N	13° 12,93' E	2014,0	FRRF
PS68/180-1	11.08.05	13:03	75° 0,01' N	13° 13,24' E	2011,2	CTD/RO
PS68/181-1	11.08.05	14:13	75° 0,06' N	13° 52,02' E	1799,6	CTD/RO

Station	Date	Time (UTC)	Position Lat	Position Lon	Depth [m]	Gear Abbreviation
PS68/181-2	11.08.05	14:19	75° 0,07' N	13° 52,04' E	1799,2	FRRF
PS68/181-3	11.08.05	14:21	75° 0,07' N	13° 52,03' E	1799,2	SD
PS68/181-3	11.08.05	14:27	75° 0,07' N	13° 52,03' E	1799,2	SD
PS68/181-2	11.08.05	14:31	75° 0,06' N	13° 52,12' E	1799,2	FRRF
PS68/181-2	11.08.05	14:35	75° 0,06' N	13° 52,24' E	1799,2	FRRF
PS68/181-1	11.08.05	14:47	75° 0,08' N	13° 52,28' E	1799,2	CTD/RO
PS68/181-1	11.08.05	15:20	75° 0,13' N	13° 52,82' E	1795,2	CTD/RO
PS68/182-1	11.08.05	16:26	75° 0,12' N	14° 30,93' E	1426,4	CTD/RO
PS68/182-2	11.08.05	16:36	75° 0,16' N	14° 30,87' E	1425,2	FRRF
PS68/182-3	11.08.05	16:37	75° 0,17' N	14° 30,89' E	1425,2	SD
PS68/182-3	11.08.05	16:43	75° 0,19' N	14° 30,98' E	1422,4	SD
PS68/182-2	11.08.05	16:49	75° 0,22' N	14° 31,09' E	1420,4	FRRF
PS68/182-2	11.08.05	16:51	75° 0,23' N	14° 31,14' E	1418,8	FRRF
PS68/182-1	11.08.05	16:53	75° 0,24' N	14° 31,21' E	1417,6	CTD/RO
PS68/182-1	11.08.05	17:25	75° 0,38' N	14° 31,22' E	1414,0	CTD/RO
PS68/183-1	11.08.05	18:37	74° 59,99' N	15° 9,90' E	1026,8	CTD/RO
PS68/183-2	11.08.05	18:45	75° 0,04' N	15° 10,02' E	1023,2	FRRF
PS68/183-3	11.08.05	18:46	75° 0,05' N	15° 10,03' E	1023,2	SD
PS68/183-3	11.08.05	18:50	75° 0,07' N	15° 10,04' E	1022,0	SD
PS68/183-2	11.08.05	18:56	75° 0,10' N	15° 10,06' E	1020,4	FRRF
PS68/183-1	11.08.05	18:58	75° 0,11' N	15° 10,07' E	1020,0	CTD/RO
PS68/183-2	11.08.05	18:58	75° 0,11' N	15° 10,07' E	1020,0	FRRF
PS68/183-1	11.08.05	19:18	75° 0,18' N	15° 10,31' E	1013,6	CTD/RO
PS68/184-1	11.08.05	20:36	75° 0,05' N	15° 49,58' E	271,6	CTD/RO
PS68/184-2	11.08.05	20:42	75° 0,06' N	15° 49,72' E	268,4	FRRF
PS68/184-3	11.08.05	20:43	75° 0,06' N	15° 49,74' E	266,8	SD
PS68/184-3	11.08.05	20:45	75° 0,06' N	15° 49,78' E	265,6	SD
PS68/184-1	11.08.05	20:45	75° 0,06' N	15° 49,78' E	265,6	CTD/RO
PS68/184-2	11.08.05	20:55	75° 0,07' N	15° 49,87' E	264,0	FRRF
PS68/184-2	11.08.05	20:58	75° 0,06' N	15° 49,92' E	264,0	FRRF
PS68/184-1	11.08.05	21:00	75° 0,06' N	15° 49,96' E	264,8	CTD/RO

The Expedition ARKTIS-XXI/1b

of the Research Vessel "Polarstern" in 2005

Edited by Eberhard Fahrbach and Peter Lemke

with contributions of the participants

ARK-XXI/1b

13 August - 19 September 2005
Longyearbyen - Bremerhaven

Fahrtleiter / Chief Scientists:
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Eberhard Fahrbach

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1. ZUSAMMENFASSUNG UND FAHRTVERLAUF

Eberhard Fahrbach und Peter Lemke
Alfred-Wegener-Institut

Am 13. August 2005 verließ dass Forschungsschiff *Polarstern* Longyearbyen. Aus dem Isfjord steuerten wir nach Süden zum Storfjord. An Bord waren 45 wissenschaftliche Fahrtteilnehmer und 44 Besatzungsmitglieder. Die Wissenschaftler, die einen weiten Bereich an Disziplinen abdeckten, stammten aus 11 Nationen und 10 Institutionen oder Organisationen. Ein Teil von ihnen war bereits während des vorhergehenden Fahrtabschnitts an Bord gewesen und setzte die Arbeiten im neuen Fahrtgebiet fort. Auf diesem Fahrtabschnitt konzentrierten sich die Arbeiten auf drei Gebiete: den Storfjord, die Framstraße und das Yermak-Plateau.

Die Arbeiten im Storfjord hatten den Schwerpunkt in der Biogeochemie. Die Messungen dienten dazu, Prozesse zu verstehen, die die Rolle des Ozeans bei der Freisetzung des Treibhausgases Methan in die Atmosphäre bestimmen. In diesem Zusammenhang wurden die mikrobielle *in-situ*-Erzeugung von Methan im oberflächennahen Ozean und die mikrobielle Oxidation in der gesamten Wassersäule gemessen. Während einer Winter-Expedition in den Storfjord, die 2003 stattgefunden hatte, war eine ausgedehnte Methan-Anomalie mit Konzentrationen gefunden worden, die deutlich die normalen Hintergrundswerte von <5 nM überschritten. Der Anstieg der Konzentrationen von der Meeresoberfläche zum Boden legt nahe, dass Methan am Meeresboden durch Resuspensionsereignisse aus dem Sediment freigesetzt wurde. Jedoch die Konzentration des Kohlenstoffisotops ^{13}C im Methan wies darauf hin, dass es kürzlich durch bakterielle Aktivitäten in der Wassersäule erzeugt worden war. Mit dieser Reise wurde gezeigt, dass die Methananomalie im Storfjord auch im Sommer besteht. Allerdings wurde das Maximum im Gegensatz zum Winter in der oberen Wassersäule beobachtet, was bestätigt, dass das Methan durch bakterielle Aktivität in der Wassersäule entsteht. Die Arbeiten im Storfjord wurden in der Nacht vom 15. zum 16. August beendet und *Polarstern* dampfte in die Framstraße.

Auf dem Weg nach Norden trafen wir das Segelschiff *Lovis*. An Bord war eine Schülergruppe des AWI-Schulprojekts HIGHSEA. Der Besuch auf der *Polarstern* war ein weiterer Höhepunkt ihrer spannenden Reise. Nach dem Treffen mit *Polarstern* führten sie ebenfalls Messungen im Storfjord aus und segelten anschließend nach Tromsø.

In der Framstraße wurden Messungen im Rahmen eines Langzeitprogramms der physikalischen Ozeanographie fortgesetzt. Verankerungen wurden ausgetauscht, die dazu dienen, den Wärmetransport aus dem Nordatlantik in den Arktischen Ozean auf einem ozeanographischen Schnitt entlang von 78°50'N zu erfassen. Sieben Verankerungen mit Strömungsmessern sowie Temperatur- und Salzgehaltssensoren wurden aufgenommen und wieder ausgelegt. Die Instrumente haben ausgezeichnet funktioniert. Die Daten wurden aus den Speichern ausgelesen und sind inzwischen aufgearbeitet. Zwei nach oben gerichtete Echolote mit Drucksensoren (PIES) wurden ebenfalls aufgenommen und wieder ausgelegt. Sie zeichnen den Druck am Meeresboden und die Laufzeit von Schallsignalen zur Meeresoberfläche und zurück auf. Diese Daten sollen es ermöglichen, die Veränderungen des Volumen- und des Wärmetransports durch die Framstraße abzuschätzen. Temperaturmessungen mit der CTD-Sonde (conductivity, temperature, depth) ergaben, dass sich die oberen Schichten des Westspitzbergenstroms wie bereits in den Vorjahren weiter erwärmt haben. Dagegen haben sich die Schichten in mittleren Tiefen wieder abgekühlt. Die Arbeiten der physikalischen Ozeanographie dauerten bis zum 19. August. Dann verließen wir den Schnitt bei 78°50'N und setzten die Arbeiten im *Hausgarten* der Tiefseebiologie fort.

Der *Hausgarten* liegt in der Framstraße und wird jedes Jahr besucht, um eine lange Zeitreihe fortzusetzen, die es ermöglichen soll, die Auswirkungen von Langzeitänderungen der ozeanischen Bedingungen auf die Tiefseefauna zu erkennen. In schneller Folge wurden Wasserproben mit der CTD/Rosette und Bodenproben mit dem Multicorer genommen sowie Hols mit dem Agassiz-Trawl ausgeführt. Alle Proben mussten sorgfältig aufbereitet werden. Drei Verankerungen mit Sinkstofffallen wurden aufgenommen und wieder ausgelegt. Lander, die mit Fallen, Kolonisationsexperimenten and simulierten "foodfalls" versehen waren, wurden ebenfalls aufgenommen und wieder ausgelegt. Ein neu ausgelegter Foodfall-Lander, der im September durch Tiefseebiologen, die auf dem französischen Forschungsschiff *Atalante* mitfahren werden, aufgenommen werden sollte, kam vorzeitig an die Oberfläche zurück und musste erneut ausgelegt werden. Nur eine Verankerung, die in der Nähe eines Strömungsexperiments ausgelegt worden war, konnte nicht ausgelöst werden. Das ROV (remotely operating vehicle) *Victor6000* an Bord der *Atalante* wird es ermöglichen, den Grund für das Versagen des Auslösers zu erfahren. Nach dem Abschluss der Arbeiten im *Hausgarten* am 26. August, konnten noch einige weitere ozeanographische Stationen ausgeführt werden, bevor *Polarstern* nach Longyearbyen ablief.

Das im Allgemeinen milde und ruhige Wetter war für den Fortschritt der Arbeiten sehr günstig. Nur am 27. August auf dem Weg zum und im Isfjord war es stürmisch. In der Nacht vom 20. zum 21. August, durchquerten wir einige offene Felder mit driftenden Eisschollen, die von einer üppigen Robbenpopulation bevölkert waren. Dies blieb die einzige Begegnung mit dem Meereis während dieses Teils der Reise.

In der Nacht zum 27. August wurden die wissenschaftlichen Arbeiten vorerst eingestellt und *Polarstern* kehrte nach Longyearbyen zurück. Am Abend des 27. August kamen drei zusätzliche Fahrtteilnehmer mit dem Helikopter an Bord. Teile der Ausrüstung der Tiefseebiologen wurden nach Longyearbyen geflogen. Am frühen Morgen des 28. August verließen 12 Wissenschaftler das Schiff. Die Tiefseebiologen stiegen auf das französische Forschungsschiff *Atalante* um, das den Unterwasserroboter *Victor6000* an Bord hatte. Die Fahrtleitung wechselte von Eberhard Fahrbach, der ausstieg und nach Bremerhaven zurückkehrte zu Peter Lemke, der an Bord kam. Dieser Wechsel war nötig, da die ursprünglich geplante Fahrtleiterin Ursula Schauer einen Unfall hatte und kurzfristig ersetzt werden musste.

Am 28. August dampfte *Polarstern* zurück ins Verankerungsgebiet in der Framstraße und nahm 12 weitere Verankerungen auf und legte sie wieder aus. Der Verankerungsaustausch verlief Dank des guten Wetters und der ausgezeichneten Zusammenarbeit zwischen Besatzung und Wissenschaft optimal. Die Rate von 97 % an aufgenommenen Geräten und registrierten Daten ist das beste Ergebnis seit 1997, dem Beginn der Verankerungsarbeiten in der Framstraße.

Nach dem Abschluss der Verankerungsarbeiten dampfte *Polarstern* bis auf 81°36'N durch dickes Packeis nach Norden, um an zwei geologischen Stationen Sedimentproben zu nehmen. Das Ziel dieses Teils der Reise war es, Meeresbodenproben mit dem Kastengreifer und dem Schwerelot zu gewinnen, um die Klimageschichte des Arktischen Ozeans zu erkunden. Die Anfahrt war schwierig, da auf dieser Breite der Winter bereits begonnen hatte. Bei Temperaturen von -9° C konnten die verschiedenen Stadien der Meereisbildung in allen Einzelheiten verfolgt werden. Trotzdem wurden die geologischen Arbeiten erfolgreich abgeschlossen und *Polarstern* dampfte zurück nach Süden, um den hydrographischen Schnitt zur Küste Grönlands fertig zu stellen. Wie auf dem Weg nach Norden, wurde ein CTD-Schnitt über den Hang des Yermak-Plateaus und durch den Eisrand ausgeführt. Die Analyse der Wasserproben zeigte eine erhöhte *in-situ*-Methanproduktion am Eisrand, wo die biologische Produktion höher als im offenen Ozean und in den Meereisgebieten war.

In diesem Jahr konnte der 79°N-Schnitt bis nach 17°30'W ausgeführt werden. Verglichen mit dem letzten Jahr hatten die Ozeanoberflächentemperaturen im Osten der Framstraße zugenommen und in der Mitte und im Westen abgenommen. Auch wurde auf dem Weg nach Grönland mehr Eis als im Vorjahr angetroffen. In mittleren Tiefen (50 - 500 m) setzte sich die Erwärmung in der gesamten Framstraße fort. Im Zentrum reichte die Erwärmung bis in eine Tiefe von mehr als 2000 Metern.

Zusätzlich zu den bisher aufgeführten Arbeiten wurden biogeochemische und bio-optische Untersuchungen ausgeführt. Ferner wurden in Fortsetzung zum vorhergehenden Abschnitt Vögel und Meeressäuger gezählt. Es wurden Wasserproben genommen, um die Verteilung von Plutoniumisotopen zu bestimmen, die auch als Tracer für die Pfade des Wassermassentransports zwischen dem Arktischen Ozean und dem Europäischen Nordmeer genutzt werden können. Planktonorganismen wurden aus den Wasserproben gefiltert, um Proxydaten für paläoozeanographische Untersuchungen der Temperaturverteilung in der Vergangenheit zu gewinnen.

An Hand von Bodenproben wurden die bio-geographischen Verteilungsmuster von Tiefsee-Foraminiferen untersucht. Sie werden mit ähnlichen Arten aus der Antarktis verglichen, um durch das Studium ihrer DNA zu erkennen, ob sie genetisch identisch sind. Diese Untersuchungen werden dazu beitragen, die Eigenschaften der Biodiversität und die Prozesse der Evolution des Lebens zu verstehen.

Nach dem Abschluss des hydrographischen Schnitts durch die Framstraße dampfte *Polarstern* nach Südosten, um den letzten Teil des Arbeitsprogramms zu erfüllen. Dies erfolgte am Håkon-Mosby-Schlamm-Vulkan, der 145 Seemeilen nordwestlich der nördlichen Spitze Norwegens liegt. Über dem Vulkan wurden Temperatur- und

Salzgehaltsprofile gemessen und Sedimentproben genommen. In der Nähe des Zentrums des Schlammvulkans wurde eine Temperaturlanze ausgebracht, um über längere Zeit die Temperatur im Boden zu messen. Sie wird ein Jahr lang im Sediment bleiben und während einer Expedition des französischen Forschungsschiffs *Pourquoi Pas?* im Sommer 2006 aufgenommen werden. Während dieser Zeit wird die *Lanze* Temperaturen im Sediment aufzeichnen, um tiefere Einsichten in die Aktivität des Schlammvulkans und die damit verbundenen Schlamm- und Flüssigkeitsströme zu erhalten.

Mit diesen Arbeiten wurde das wissenschaftliche Programm des Fahrtabschnitts ARK-XXI/1b abgeschlossen und *Polarstern* dampfte zurück nach Bremerhaven, wo sie am 18. September 2005 die Reise beendete.

Fig. 1: Cruise track during ARK-XXI/1b

SUMMARY AND ITINERARY

On 13 August 2005 RV *Polarstern* sailed as planned from Longyearbyen. We left the Isfjorden and turned south towards Storfjorden. There were 45 cruise participants and 44 crew members on board. The scientists came from 11 nations and 10 institutes or organisations and covered a wide range of disciplines. Part of the group have been also on board during the first leg and continued their work in the new area of operations. The cruise aimed essentially for three working areas: the Storfjorden, Fram Strait and Yermak Plateau.

In Storfjord work was focussed on biogeochemistry. Measurements were carried out to better understand the processes which determine the role of the ocean in releasing the greenhouse gas methane into the atmosphere. During this short leg, we investigated the microbial *in-situ* methane production in the upper ocean and the microbial oxidation in the whole water column. During the winter expedition in Storfjorden in 2003 an extended methane anomaly was detected with concentrations considerably exceeding the normal background values of <5 nM. The clear increase in concentrations from the sea surface to the sea floor suggested a release of methane from the sea bed during resuspension events of sediments. However, the concentration of the carbon isotope ^{13}C in the methane indicated that it originated from recent bacterial activity in the water column. During this cruise it was confirmed that the presence of the methane anomaly in Storfjorden occurs also during summer. However, in contrast to winter time the maxima were detected in the upper water column confirming that the methane originated by bacterial activity in the water column. The work in the Storfjorden was terminated in the night from 15 to 16 August and RV *Polarstern* moved into Fram Strait.

On the way to the North we met the sailing vessel *Lovis* with a group of students from the AWI school-project HIGHSEA on board. There is no doubt that the visit on RV *Polarstern* was a further highlight on their adventurous trip. Afterwards, they carried out measurements in Storfjord and then sailed to Tromsø.

In the Fram Strait a long term programme in physical oceanography was continued by measurements and mooring work to observe the heat transport from the North Atlantic into the Arctic Ocean on an oceanographic section along 78°50'N. Seven moorings with current meters as well as temperature and salinity sensors were recovered and redeployed. The instruments had worked perfectly. The data were read from the memories and have now been processed. Two inverted echo sounders with pressure recorders (PIES) were also recovered and redeployed. The data of bottom pressure and travel time of sound to the sea surface which they recorded will allow variations of the volume and heat transport through Fram Strait to be estimated. Temperature measurements with the CTD (conductivity, temperature, depth) sonde indicate that the upper layers of the Westspitsbergen Current continued to warm as was observed during recent years. However, in contrast to the year before, the intermediate layer had cooled again. The oceanography work kept on until the 19 August when we left the 78°50'N section for the *Hausgarten* of the deep-sea biology group.

The *Hausgarten* is located in the Fram Strait and is visited annually to keep up long–term time series to be able to detect effects of long term changes of oceanic condition on the deep-sea fauna. In rapid succession, water samples from the CTD/rosette, bottom samples from the multicorer and hauls with the Agassiz trawl were collected. All the samples had to be processed with great care. Three moorings with sediments traps were recovered and redeployed. Landers which were used with traps, colonisation experiments and simulated foodfalls, were recovered and deployed. The deployed foodfall lander which should have been recovered in September by our deep-sea biologists, who will shortly join the French research vessel *Atalante*, came prematurely to the surface and had to be redeployed. Only one mooring, which had been deployed next to a flume experiment, did not release. The ROV *VICTOR6000* on board *Atalante* will be used to investigate why the releasing procedure failed. After having finalized the work in the *Hausgarten* on 26 August, some further oceanography work could be done before returning to Longyearbyen. It will be continued during the next part of the leg.

The generally mild and calm weather was very favourable to the progress of work on deck and in the labs. Only during our way to and into the Isfjorden on 27 August, stormy weather occurred. In the night from 20 to 21 August, we crossed some open fields of drifting ice floes, with a large population of seals. This remained the only encounter with sea ice during this leg.

In the night to 27 August the scientific work during this leg ended and RV *Polarstern* returned to Longyearbyen. In the evening of 27 August 3 additional cruise participants came on board by helicopter. Parts of equipment from the deep-sea biology group were flown to Longyearbyen. In the early morning of 28 August 12 scientists disembarked. The deep-sea biology group left RV *Polarstern* to join the French research vessel *Atalante* with the remotely operating vehicle *Victor6000* on board. The chief scientists changed in Longyearbyen as well. Eberhard Fahrbach left RV *Polarstern* to return to Bremerhaven and Peter Lemke took over. This was necessary because the originally planned chief scientist Ursula Schauer had an accident and needed to be replaced at short notice.

On 28 August RV *Polarstern* steamed back to the mooring array to continue the recovery and re-deployment of the remainder of the 12 moorings. The exchange of the moorings went very well, due to calm weather and the excellent collaboration of scientists and crew. The recovery rate of instruments and data of 97 % was the highest since the beginning of the mooring array in 1997.

After finishing the mooring work, RV *Polarstern* steamed north up to 81°36'N into dense pack ice towards two geological sites to take sediment samples. The aim of this part of the cruise was to take marine sediment cores with a box corer and a gravity corer to investigate the climatic history of the Arctic Ocean. The transit was difficult since at these latitudes winter had already set in. At -9° C it was possible to observe the different stages of sea ice formation in full detail. Nevertheless, the geological work finished successfully, and RV *Polarstern* steamed south to continue the hydrographic section towards the coast of Greenland. As during the transit north a second CTD section was taken across the slope of the Yermak Plateau and the ice edge. The analysis of the water samples show that an increased *in-situ* methane production takes place at the ice edge, where the biological production is higher than in the open ocean and the ice covered areas.

This year the 79°N section could be completed as far as 17°30'W. As compared to last year, the ocean surface temperatures indicate a warming in the east and a cooling in the middle and western regions of Fram Strait, so that we encountered more sea ice on our way to Greenland than the year before. At mid-depth (50-500 m) the warming is continuing all across Fram Strait. In the middle of Fram Strait, the warming reaches depths of more than 2,000 meters.

In addition to the work mentioned above, biogeochemical and bio-optical investigations as well as counting of birds and mammals which occurred during the last leg were continued. Samples were taken to determine the distribution of plutonium isotopes which serve as well as the measured chemical parameters as tracers for pathways of water mass transport in the Arctic Ocean and the Nordic Seas. Plankton organisms were filtered out of the sea water to determine proxy data for palaeo-oceanographic investigations of the temperature distribution in past oceans.

By means of bottom samples the bio-geographic pattern of deep-sea foraminifera were studied. These will be compared to similar species in the Antarctic to look whether they are genetically identical, by studying their DNA. This research will help to understand the characteristics of biodiversity and the processes of the evolution of life.

After completion of the Fram Strait hydrographic section RV *Polarstern* steamed south-east for its last research activity on this cruise to the Håkon Mosby Mud Volcano, which is located 145 nautical miles northwest of the northern tip of Norway. Temperature and salinity profiles were measured above the volcano, and water and sediment samples were taken. A temperature lance was deployed near the centre of the mud volcano for a long-term temperature observation. It will remain in the sediment for about one year and will be recovered in the course of an expedition of the French research vessel *Pourquoi Pas?* next summer. During this period of time, the lance will record sediment temperatures in order to obtain a more profound insight into the activity of the mud volcano and the associated mud and fluid flows.

With this activity the scientific programme of the cruise leg ARK-XXI/1b was finished, and steamed to Bremerhaven and reached port at 2 am on 18 September 2005.

2. WEATHER CONDITIONS

Reinhard Strüfing, Hartmut Sonnabend
Deutscher Wetterdienst

Leaving Longyearbyen RV *Polarstern* found herself in a easterly air flow with scattered foehn clouds and good visibility provoked by a high pressure system north of Spitsbergen. This weather situation continued in Storfjord during 14 August, although, due to lower water temperatures and low clouds near the mountains fog patches occurred. At South Cape of Spitsbergen the moderate easterly wind increased to local Beaufort 6. On 15 August, still with easterly winds and scattered clouds the encounter with the cutter *Lovis* took place just west of Spitsbergen.

During the following stations in eastern parts of Fram Strait transect only minor pressure differences prevailed. With good visibility and water with a maximum of 8° C this almost ideal weather situation lasted until 21 August.

Between 23 to 25 August a low crossed Spitsbergen approaching from southwest. At its rear the north-easterly winds were enhanced to Beaufort 6 in the vicinity the north-western cape of Spitsbergen.

During 27 August when scientists and equipment had to be exchanged in Isfjorden near Longyearbyen, the frontal system of a low approaching Spitsbergen from southeast passed the area. Beneath an almost chaotic sky the easterly winds gusted up to Beaufort 10 to 11 when RV *Polarstern* passed the narrowest part of Isfjorden. On 28 the air temperature had risen to 9° C due to still prevailing foehn.

From 29 August scientific work continued in the eastern parts of Fram Strait. In moderate northerly winds caused by a wedge extending from a Greenland high and by a low over the Barents sea fog patches occurred sometimes or even light snowfall later depending on water temperatures varying between 6.5 and –0.3° C.

Between 1 and 4 September RV *Polarstern* was situated in pack ice at Yermak-Plateau. On the fringes of a polar high fog prevailed as well as sunny spells coinciding with temperatures down to -10 °C. The transfer to and from Yermak-Plateau was inhibited at times due to very thick ice floes. A general Sunday stroll on an ice floe on 3 September arranged for the collection of snow happened at -9° C.

During the meeting with Norwegian research vessel RV *Lance* in ice-free waters of Fram Strait on 6 September the weather was sunny with light and variable winds. The wedge of a Greenland high still was diverting the lows approaching from Iceland to the Barents Sea.

Even after entering the East Greenland Current with its partly very dense ice the light winds/low temperatures weather persisted. The frontal system of a polar low caused snowfall during evening of 8 September. The barbecue celebrating the end of scientific work in that area was held on the 9 at -11 °C.

During transfer to Håkon Mosby Mud Volcano near 72° N 14°E strong winds with westerly to north-westerly directions prevailed going along with waves rising up to 4 m due to a gale force low near Spitsbergen.

The weather on the voyage back to Bremerhaven was dominated by continuing northerly winds, at first northeast Beaufort 8 in northern parts of ex-Hurricane „Maria“ which turned into an extra-tropical gale force low, later with strong northerly to north-westerly winds at its rear und from 16 September onwards with a northerly winds and a mixture of sun and showers caused by a wedge of a high pressure system approaching central Europe from Ireland.

For ARK-XXI/1b the weather situation can be summarized by persistent moderate northerly winds with good visibilities and low temperatures. Statistics on wind direction, wind force and visibility are shown together with the temperature time series in figures 2.1 to 2.4.

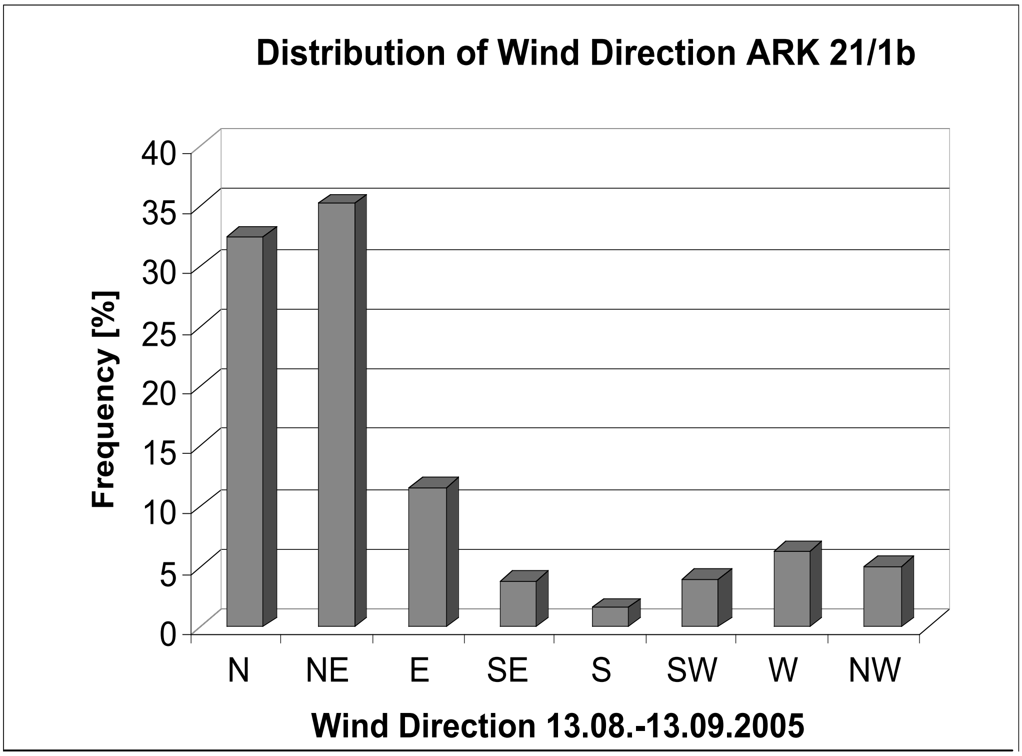

Fig.2.1: Distribution of Wind direction during ARK-XXI/1b

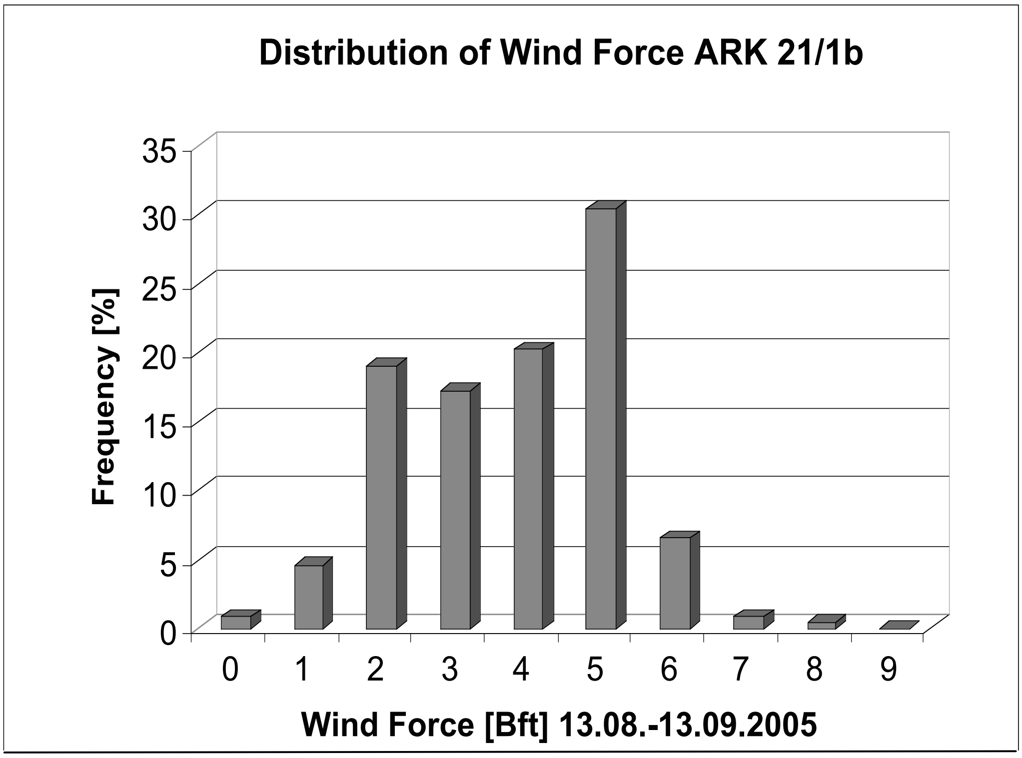

Fig. 2.2: Distribution of wind force during ARK-XXI/1b

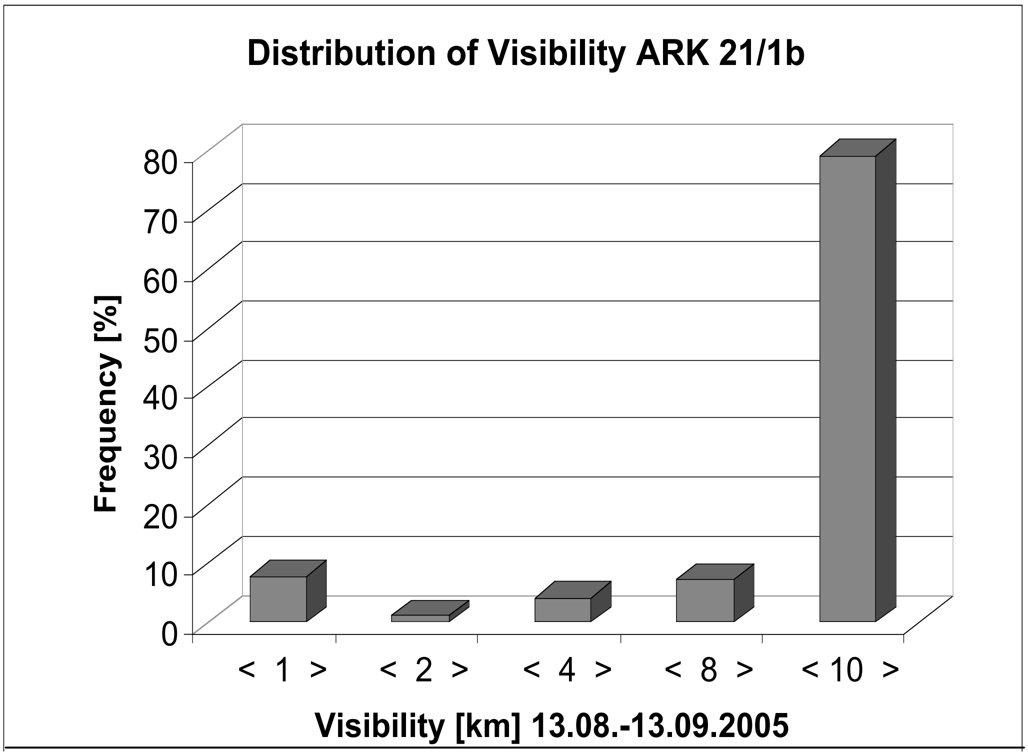

Fig. 2.3: Distribution of visibility during ARK-XXI/1b

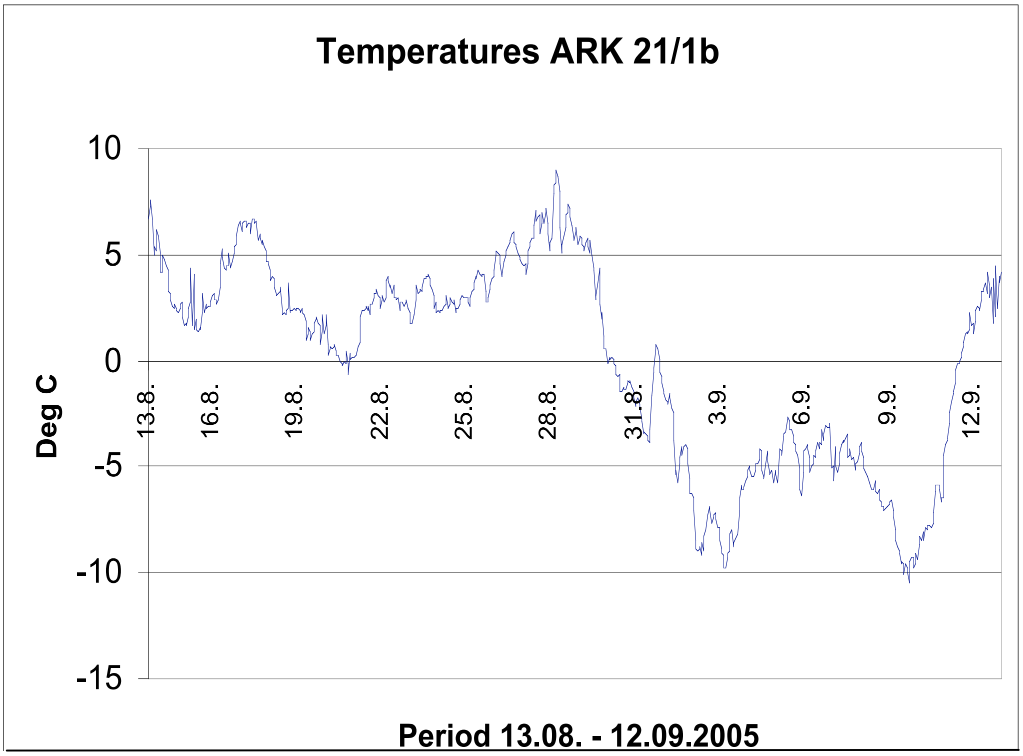

Fig. 2.4: Time series of temperature during ARK-XXI/1b

3. FLOW THROUGH FRAM STRAIT AND IN THE ENTRANCE TO THE ARCTIC OCEAN

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Objectives

Exchanges between the North Atlantic and the Arctic Ocean result in the most dramatic water mass conversions in the World Ocean: warm and saline Atlantic waters, flowing through the Nordic Seas into the Arctic Ocean, are modified by cooling, freezing and melting to become shallow fresh waters, ice and saline deep waters. The outflow from the Nordic Seas to the south provides the initial driving of the global thermohaline circulation cell. Knowledge of these fluxes and understanding of the modification processes is a major prerequisite for the quantification of the rate of overturning within the large circulation cells of the Arctic and the Atlantic Oceans, and is also a basic requirement for understanding the role of these ocean areas in climate variability on interannual to decadal time scales.

The Fram Strait represents the only deep connection between the Arctic Ocean and the Nordic Seas. Just as the freshwater transport from the Arctic Ocean is of major influence on convection in the Nordic Seas and further south, the transport of warm and saline Atlantic water affects the water mass characteristics in the Arctic Ocean which has consequences for the internal circulation and possibly influences also ice and atmosphere.

The complicated topographic structure of the Fram Strait leads to a splitting of the West Spitsbergen Current carrying Atlantic Water northward into at least three branches. One current branch follows the shelf edge and enters the Arctic Ocean north of Svalbard. This part has to cross the Yermak Plateau which poses a sill for the flow with a depth of approximately 700 m. A second branch flows northward along the north-western slope of the Yermak Plateau and the third one recirculates immediately in Fram Strait at about 79°N. Evidently, the size and strength of the different branches largely determine the input of oceanic heat to the inner Arctic Ocean. The East Greenland Current, carrying water from the Arctic Ocean southwards has a concentrated core above the continental slope.

It is our aim to measure the oceanic fluxes through Fram Strait and to determine their variability in seasonal to decadal time scales. Since 1997, year-round velocity, temperature and salinity measurements have been carried out in Fram Strait with moored instruments. Hydrographic sections exist since 1980. Through a combination of both data sets estimates of mass, heat and salt fluxes through the strait are provided. Fluxes of nutrients and tracers like the oxygen isotope ^{18}O could only be obtained occasionally. From 1997 to 2000 intensive fieldwork occurred in the framework of the European Union project VEINS (Variability of Exchanges in Northern Seas). After the end of VEINS it was maintained under national programmes. Since 2003, the work has been carried out as part of the international Programme ASOF (Arctic-Subarctic Ocean Flux Study) and is partly funded in the ASOF-N project by the European Union “Energy, Environment and Sustainable Development” Programme as Proposal No EVK2-2001-00215 (ASOF-N). The mooring line is maintained in close co-operation with the Norwegian Polar Institute and the University of Hamburg. The results of the measurements will be used in combination with regional models to investigate the nature and origin of the transport fluctuations on seasonal to decadal time scales.

Work at Sea

The oceanographic work at sea during ARK-XXI/1b included two main activities: the recovery and redeployment of the array of moorings and measurements of CTD (Conductivity, Temperature, Depth) profiles. The standard section in Fram Strait at 78°50’N, which has been occupied regularly since 1997, was measured with the high resolution coverage by 77 CTD stations, extending exceptionally far to the west up to 17°30’W. Additionally, 28 CTD stations were performed in the Storfjord area during the first part of the cruise. During activities in the area of *Hausgarten* and for the needs of the geology programme at Yermak Plateau, CTD profiles and water samples were also obtained on 28 stations.

The mooring array passes through the deep part of the Fram Strait from the eastern to the western shelf edge. In 2003 it was extended on the East Greenland shelf. RV *Polarstern* recovered 12 moorings east of 3°W, which had been deployed in autumn 2004 during ARK-XX/2 along 78°50’N (Fig. 3.1). Each subsurface mooring carried 3 to 7 instruments including rotor and acoustic current meters from Aanderaa Instruments and Falmouth Scientific Inc. (FSI), acoustic current profilers from RD Instruments, temperature and salinity probes from Sea-Bird Electronics Inc. (Sea-Bird) and two bottom pressure recorders from Sea-Bird. In parallel to the ARK-XXI/1b cruise, RV *Lance* made the attempt to recover five Norwegian moorings and two from the University of Hamburg, which are the complementary part of the Fram Strait mooring array and were deployed in 2004 between 3° and 12°30’W. During the second part of the ARK-XXI/1b cruise RV *Polarstern* also performed a thorough but unsuccessful search for the Norwegian tube mooring F19 which was located within ice covered waters, inaccessible for RV *Lance*. Most likely, the lost mooring had been taken away by one of icebergs, which were observed in a great abundance in 2005.

The mooring work was split into two parts to avoid the tight time schedule for the preparing of new deployments and to allow the exchange of the part of scientific group in Lonyearbyen. During the first part of the cruise 7 of 12 moorings were recovered and redeployed in the eastern and middle part of Fram Strait together with recovery and redeployment of two Pressure Inverted Echo Sounders (PIES). The remaining 5 western moorings and one PIES were recovered and deployed during the second part of the cruise. All work occurred under favourable weather conditions and in ice-free waters. The use of the Posidonia system for those moorings, which were equipped with Posidonia capable releases was of a great help and assured a safe recovery.

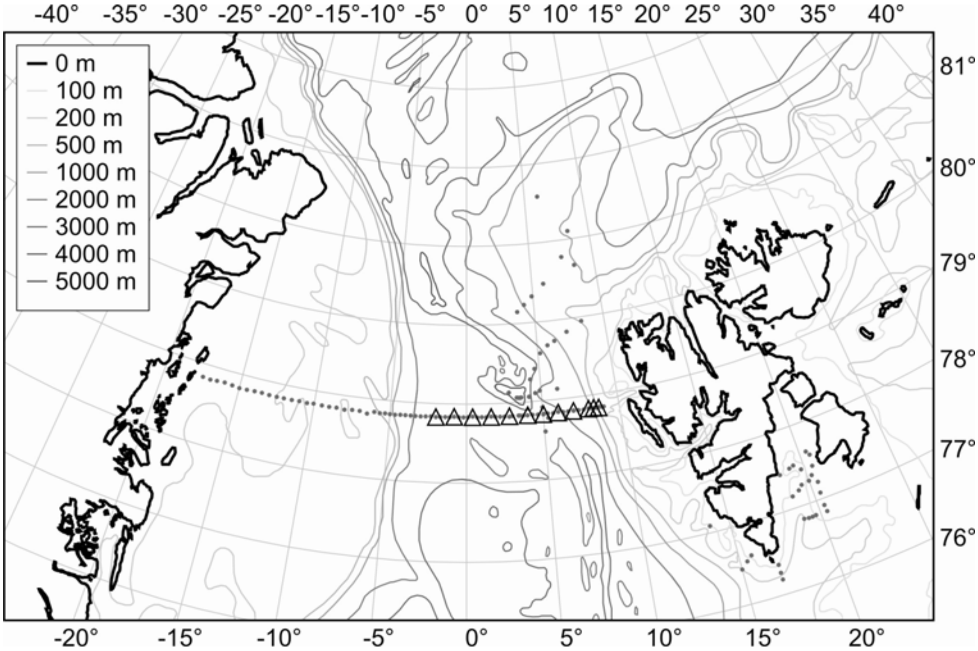


Fig. 3.1: Map with the position of moorings (triangles) and CTD stations (dots) taken during ARK-XXI/1b

The mooring recovery rate was 100 %. 78 of 80 previously deployed instruments including PIES delivered the data resulting in a 97 % rate of obtained data. One Seabird TS sensor SBE16, located at the mooring anchor was lost during recovery and another one (also SBE16 instrument) recorded no data, most likely due to the mechanical damage during deployment last year. Retrieving the data from one BB-ADCP was not possible because of the low battery status, thus the instrument will be read out after exchange of batteries at AWI. The recovered and deployed instruments and the obtained data are summarized in Tab. 3.1 and 3.2. The distribution of the instruments at the moorings is displayed in figure 3.2.

The positions of the deployed moorings were kept as closely as possible. The instrumentation agrees in general to the one of the recovered moorings (Table 3.2). Some additional instruments were added in order to obtain better vertical resolution and additional information by new sensor types. Each mooring carries 3 to 8 instruments. Five moorings are equipped with bottom pressure recorders from Sea-Bird Electronics to obtain changes of the sea level inclination indicative of barotropic velocity changes, two of them with the sea level gauges SBE26 and next three with SBE16 with the pressure sensor. Two moorings are equipped with upward looking ADCPs (Acoustic Doppler Current Profiler). During the ARK-XXI/1b deployment of moorings, all FSI current meters, which had been used in previous years and proved to be extremely unreliable were replaced by the Aanderaa acoustic current meters RCM11.

In 2004 three pressure inverted echo sounders (PIES Model 6.1E) from the University of Rhode Island were deployed at the mooring section for the second time.

By combining historical hydrography with the acoustic travel time measurements they give the opportunity to obtain time series of full water column profiles of temperature and specific volume anomaly. Therefore they can be used to estimate the baroclinic flow and the heat transport. During ARK-XXI/1b all three PIES were recovered. All instruments provided full data sets although bottom temperature records seem to be out of the correct range. During the last year's deployment all PIES were equipped with the Posidonia transponders ET861G which made recovery in 2005 much easier compared to the standard procedure. Using the Posidonia transponders allowed also obtaining the accurate positions and depths of deployed instruments. Additionally four sonobuoys were prepared for the communication with PIES from the helicopter deck if necessary, but successful recovery with Posidonia transponders eliminated such a need. Nevertheless, it is recommended for future years to be prepared using Sonobuoys as the auxiliary method to communicate with PIES in case of a Posidonia system failure. Using the PIES Acoustic Command System (ACS) in the standard mode from board of RV *Polarstern* is inefficient due to the high level of the ship noise.

The CTD measurements at the Fram Strait section occurred mostly during the nights between mooring work and consistently, were split into two periods. Therefore the sequence of stations is rather irregular. Altogether 144 CTD profiles were taken at 135 stations and water samples were collected during all casts (Fig. 3.1, Tab. 3.3). Two CTD systems from Sea-Bird Electronics Inc SBE911+ were used. Mainly SN 561 with duplicate T and C sensors (temperature sensors SBE3, SN 2678 and 2685, conductivity sensors SBE4, SN 2446 and 2618 and pressure sensor Digiquartz 410K-105 SN 75659) was in service. For the control of the temperature sensors a SBE35 RT digital reversing thermometer, SN 27 was applied. The CTD was connected to a SBE32 Carousel Water Sampler, SN 273 (24 12-liter bottles). Additionally, a Benthos Altimeter Model 2110-2 SN 189, and a Wetlabs C-Star Transmissometer SN 267 were mounted on the carousels. The SBE 43 dissolved oxygen sensor SN 880 was used. A SBE 43 uses a membrane polarographic oxygen detector in its oxygen sensor. The algorithm to compute oxygen concentration requires also measurements of temperature, salinity and pressure. When the oxygen sensor is interfaced with a Sea-Bird CTD, all of these parameters are measured by the system. The oxygen in water samples was also measured onboard with Winkler tritration for a calibration of the oxygen sensor. The continuous profiles of the chlorophyll a concentration were obtained by use of a Dr Haardt fluorometer, SN 8060. Salinity of 321 water samples was measured using the Guidline salinometer with Standard Water Batch P145 for calibration of the salinity sensor. In addition 16 water samples of 5 l were collected at 4 stations in the western part of Fram Strait for technetium measurements.

Underway measurements with a vessel-mounted narrow band 150 kHz ADCP from RD Instruments and a Sea-Bird SBE45 thermosalinograph measurements were conducted along the transect to supply temperature, salinity and current data at a much higher spatial resolution than given through the moorings. Two thermosalinographs were in use, one in 6 m depth in the bow thruster tunnel and one in 11 m depth in the keel. Both instruments are controlled by taking water samples, which are measured on board.

a)

b)

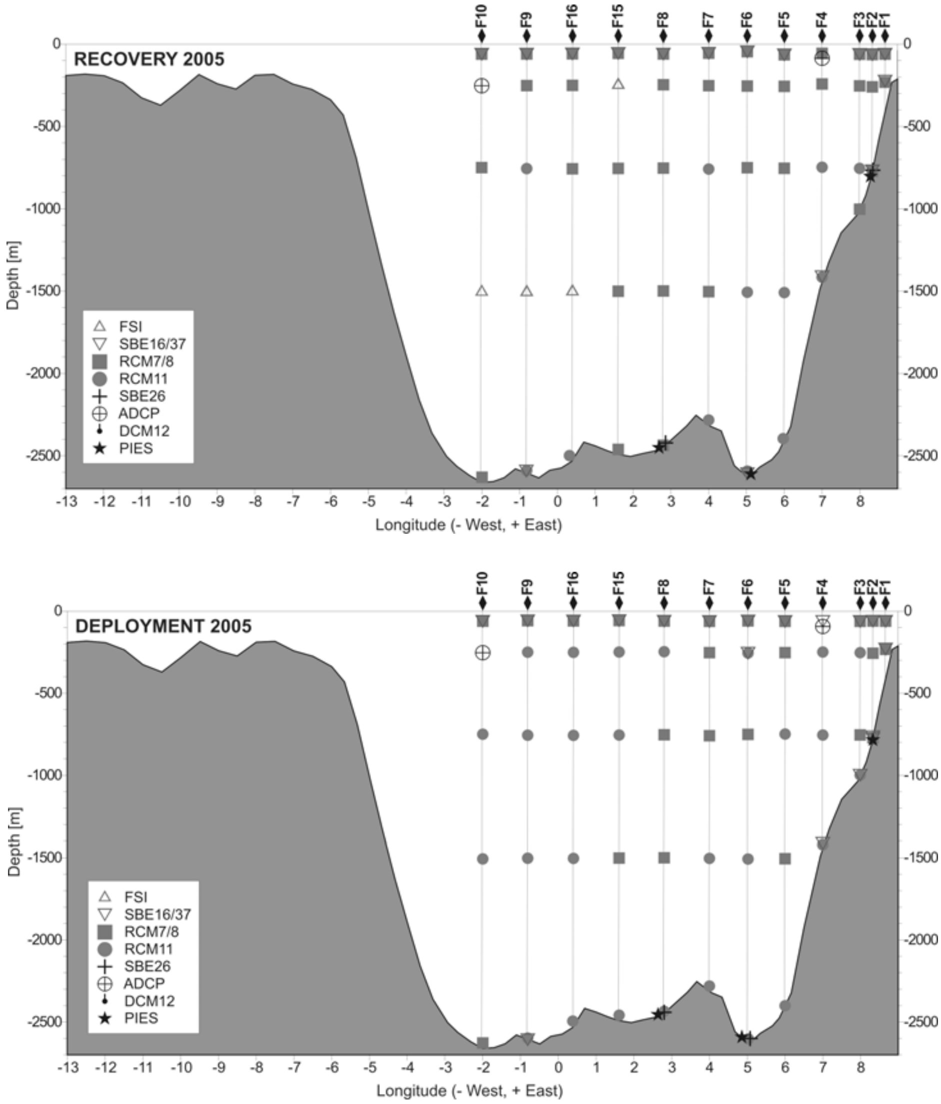


Fig. 3.2: Transect across Fram Strait with the moored instruments recovered (a) and deployed (b) during ARK-XXI/1b

Preliminary Results

The data from the moored instruments were read out from the memories but will need to be carefully processed in Bremerhaven. Therefore no results can be given here. The preliminary evaluation of the raw data is promising, especially with the extremely good data rate obtained. A very first insight into current meter time series suggests an intensification of the flow in the recirculation area and continuation of the Atlantic water layer warming, observed the year before. The analysis of the hydrographic data occurred on the basis of preliminary data available on board. The post-cruise calibration might result in minor changes.

The temperature and salinity sections across the Fram Strait are shown in figure 3.3. The main core of northward flowing warm and saline Atlantic Water is found at the eastern side of the transect in the shallow to intermediate layers. The West Spitsbergen Current is visible at the eastern slope by downward sloping isolines. The AW in the main core of the West Spitsbergen Current above the slope is slightly shallower than the year before while in the recirculation area the amount of AW is significantly greater. On average, the temperature of the AW in the main WSC core is similar to last year value, still high as compared to the long-term mean. It is the intermediate layer below the AW in the eastern part of Fram Strait where the slight cooling has occurred since last year. The outer branch of WSC is less pronounced and much shallower than in 2004 and the 2° C isotherm in the recirculation area is shifted down even deeper (down to ca. 600 m) than in the outer WSC branch. The recirculating Atlantic Water also extends significantly further to the west than in previous years and can be seen as a big pattern of warm (1 ÷ 3° C) and highly saline (34.92 ÷ 35.0) water down to 700 m, reaching the slope east of Greenland. On the western side in the shallow shelf area, the cold and low saline Polar Waters of the East Greenland Current can be seen with temperatures significantly lower than in 2004. The Polar Water above the Greenland shelf was also slightly fresher than in 2004 and amount and extent of ice was significantly higher than observed the last year.

a)

b)

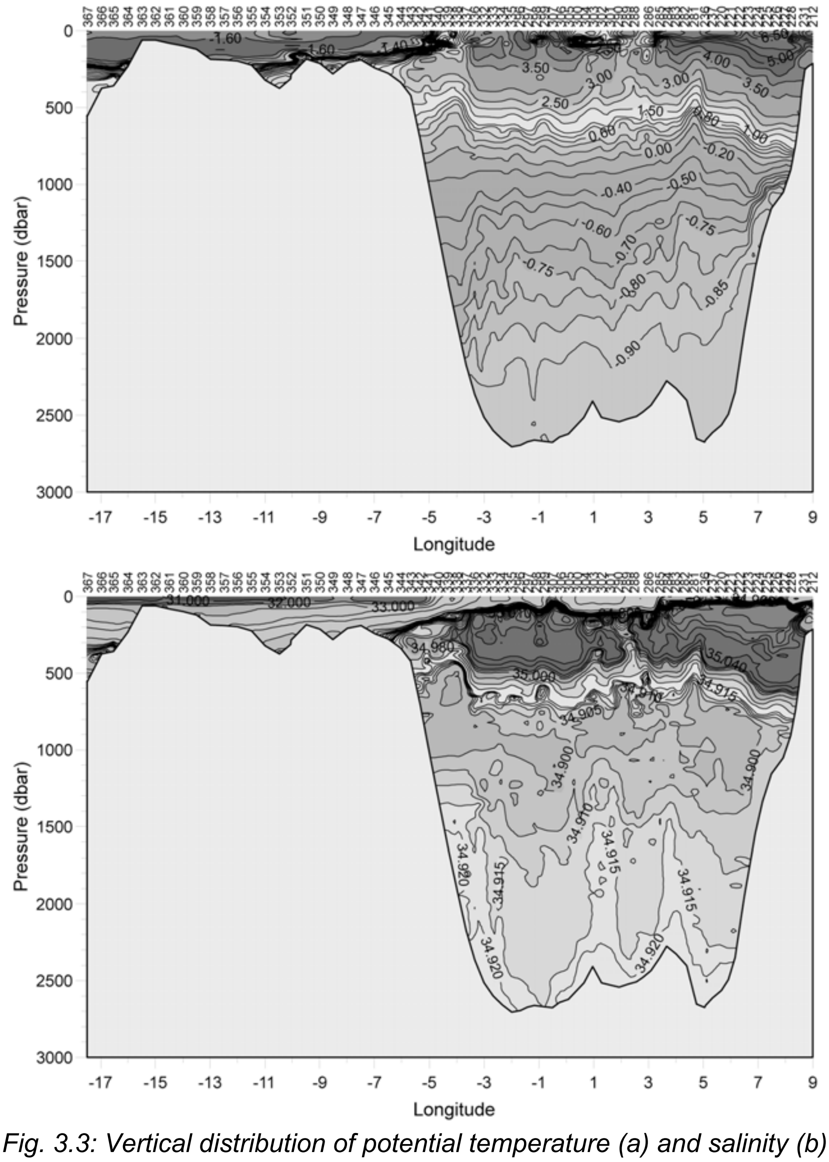
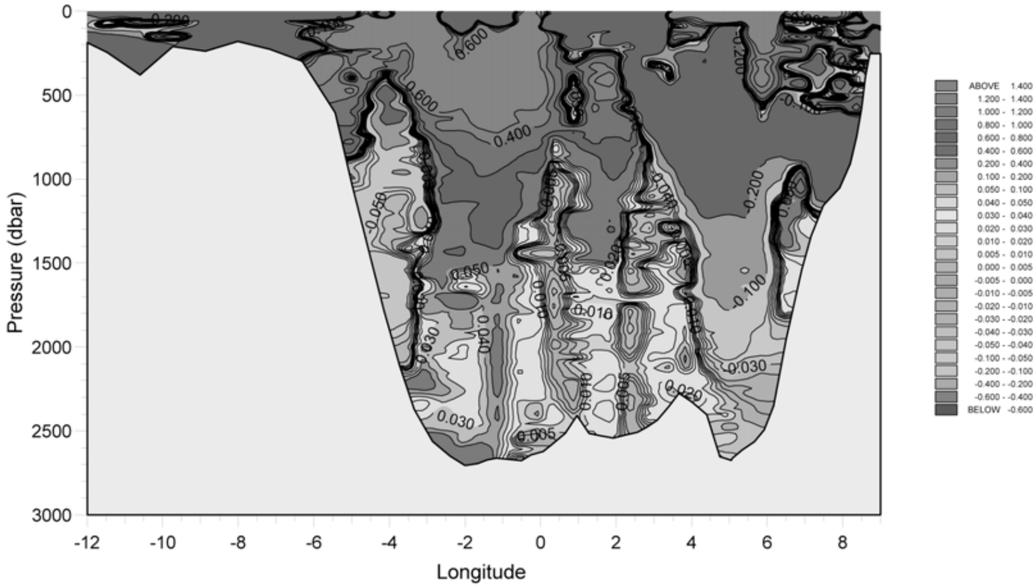


Fig. 3.3: Vertical distribution of potential temperature (a) and salinity (b) across the Fram Strait measured during ARK-XXI/1b

The differences of temperature and salinity observed in 2005 and 2004 are shown in figure 3.4. As mentioned above, the colder temperatures can be found in the western part of the East Greenland Current above the shelf and within the intermediate layer below the AW in the West Spitsbergen Current. A warming signal is present in the whole water column in the middle and western deep part of Fram Strait, being the strongest in the recirculating AW layer. A change in salinity distribution is accordant with temperature changes, however there is no significant change in the intermediate and deep layers. The most pronounced rise in salinity is observed within the Atlantic water recirculating in the western part of the strait. The observed changes can be possibly related to the shift in the location and strength of the West Spitsbergen Current branch, recirculating directly in Fram Strait.

a)



b)

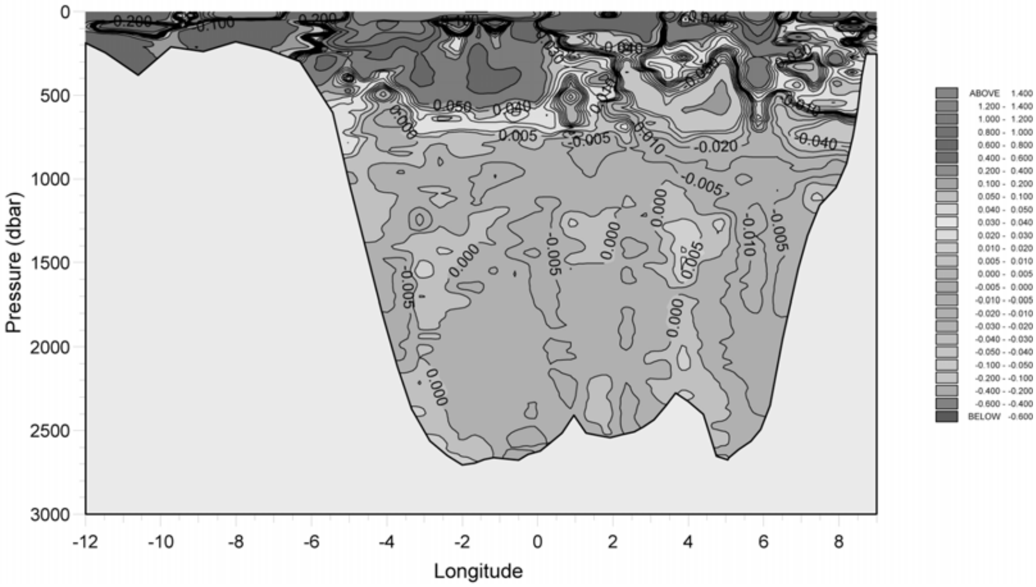


Fig. 3.4: Differences of potential temperature (a) and salinity (b) across the Fram Strait between 2005 and 2004

To identify the longer-term variability, time series of mean temperatures and salinities for typical water masses were derived for two depth intervals (5 ÷ 30 m and 50 ÷ 500 m) (Fig. 3.5). Three characteristic areas were distinguished in relation to the main flows: the West Spitsbergen Current (WSC) between the shelf edge and 5°E, the Return Atlantic Current (RAC) between 3°W and 5°E, and Polar Water in the East Greenland Current (EGC) between 3°W and the Greenland Shelf. The temperature of the near surface layer in the West Spitsbergen Current increased significantly as compared to the last year. At the same time the surface waters both in the RAW and EGC domains were colder than in 2004. The mean salinity of the surface layer increased in all three domains with the biggest rise in the western area. Since the earlier data were collected in different seasons from spring to autumn, they are affected by the annual cycle which is most pronounced in the upper layers. In the layer between 50 and 500 m both temperature and salinity are higher than the year before and this increase is observed across the whole Fram Strait. The strongest change is found in the East Greenland Current, despite the significant cooling observed in the surface and subsurface waters in the main core of the East Greenland Current. However, after the westward extension of the recirculating AW observed in 2005, the EGC domain defined as west of 3°W covers now also the modified AW in the western Fram Strait with relatively high temperature (1 ÷ 3° C) and salinity (34.92 ÷ 35.0). In the West Spitsbergen Current the increase of temperature in the AW layer is much less than between 2003 and 2004 while the mean salinity is significantly higher than the year before. Summarizing, the most pronounced warming and salinification is observed in the Return Atlantic Water in the middle and western part of the deep basin. Properties of the AW in the West Spitsbergen Current are close to the last year values while the slight cooling is found in the intermediate waters laying below.

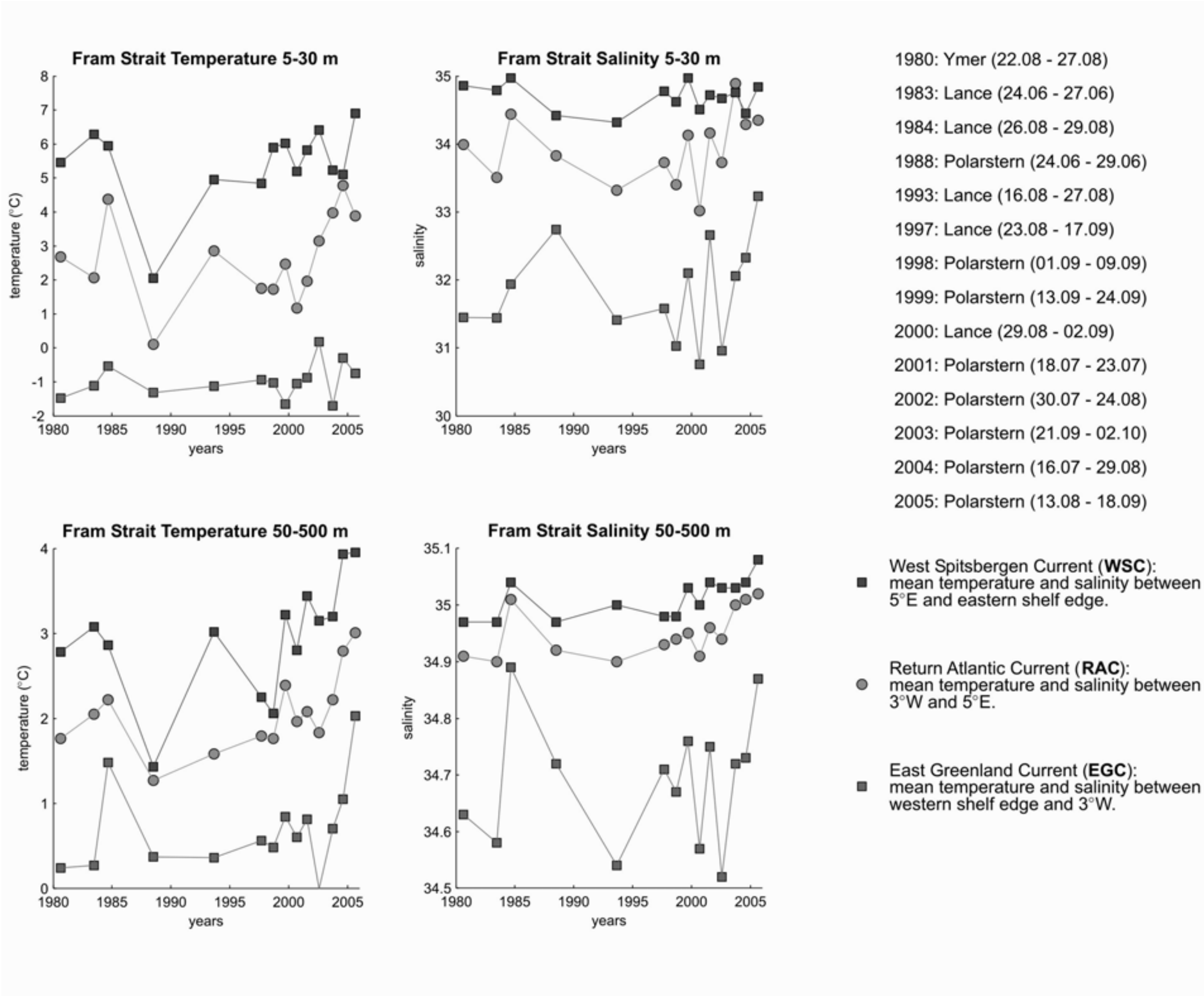


Fig. 3.5: The variations of the mean temperatures and salinities in the Fram Strait in the West Spitsbergen Current (WSC), Return Atlantic Current (RAW) and East Greenland Current (EGC)

Tab. 3.1: Moorings recovered during ARK-XXI/1b

Mooring	Latitude Longitude	Water depth (m)	Date and time of first useful record	Instrument type	Serial number	Instr. depth (m)	Time series length (days)
F1-7	78° 49.94' N 08° 39.84' E	243	20.07.04 08:00	AVTP	8048	61	392.8
			20.07.04 08:00	SBE 37	221	63	392.8
			20.07.04 08:00	SBE 37	217	226	392.8
			20.07.04 08:00	AVTP	9402	232	392.8
F2-8	78° 50.14' N 08° 19.64' E	780	20.07.04 10:00	AVTP	8050	59	392.8
			20.07.04 10:00	SBE 37	212	61	392.8
			20.07.04 10:00	AVT	3517	255	392.8
			20.07.04 10:00	SBE 16	2419	771	392.8
			20.07.04 10:00	AVT	9403	773	392.8
			20.07.04 10:00	SBE 26	258	778	392.8
PIES_E	78°50.14'N 08°19.72'E	785	03.09.04 03:00	PIES	062	784	348.3

Mooring	Latitude Longitude	Water depth (m)	Date and time of first useful record	Instrument type	Serial number	Instr. depth (m)	Time series length (days)
F3-7	78° 50.30' N 07° 59.55' E	1016	20.07.04 12:00	AVTP	8403	60	392.8
			20.07.04 12:00	SBE 37P	1228	62	392.8
			20.07.04 12:00	AVTP	9786	252	392.8
			20.07.04 12:00	RCM 11	294	753	384.4
			20.07.04 12:00	RCM 11	295	999	392.8
			20.07.04 12:00	SBE 16/Trans	2421/446	1001	392.8
F4-7	78° 50.17' N 07° 00.01' E	1427	18.07.04 10:00	SBE 37 CTD	1229	63	394.9
			18.07.04 10:00	ADCP	1368	93	394.9
			18.07.04 10:00	AVTPC	9213	249	394.9
			18.07.04 10:00	RCM 11	296	755	394.9
			18.07.04 10:00	SBE 16/Trans	2418/435	1419	394.9
			18.07.04 10:00	RCM 11	297	1421	394.9
F5-7	78° 49.93' N 06° 00.10' E	2418	19.07.04 10:00	AVT	6856	61	395.2
			19.07.04 10:00	SBE 16	2414	63	395.2
			19.07.04 10:00	AVTP	8417	253	395.2
			19.07.04 10:00	AVTP	9212	749	395.2
			19.07.04 10:00	RCM 11	298	1505	395.2
			19.07.04 10:00	RCM 11	311	2401	395.2
F6-8	78° 49.80' N 05° 01.33' E	2645	19.07.04 14:00	AVT	9179	59	400.0
			19.07.04 14:00	SBE 16	1253	61	400.0
			19.07.04 14:00	AVTP	9192	255	400.0
			19.07.04 14:00	AVTP	9997	751	400.0
			19.07.04 14:00	RCM 11	312	1507	400.0
			19.07.04 14:00	RCM 11	313	2638	400.0
			19.07.04 14:00	SBE 16	1978	2644	1)
PIES_C	78°49.72'N 05°01.17'E	2685	03.09.04 00 :00	PIES	141	2684	349.8
F7-6	78° 49.99' N 04° 00.03' E	2294	22.07.04 08:00	AVT	9184	61	397.3
			22.07.04 08:00	SBE 16	2413	63	397.3
			22.07.04 08:00	AVTP	9194	253	397.3
			22.07.04 08:00	RCM 11	314	759	397.3
			22.07.04 08:00	AVTP	12332	1503	397.3
			22.07.04 08:00	RCM11	315	2281	397.3
F8-7	78° 50.05' N 02° 48.09' E	2443	22.07.04 12:00	AVT	9185	60	402.7
			22.07.04 12:00	SBE 16	2415	62	402.7
			22.07.04 12:00	AVTP	9195	247	402.7
			22.07.04 12:00	AVTP	9219	753	402.7
			22.07.04 12:00	AVTP	12328	1499	402.7
			22.07.04 12:00	AVT	10530	2435	402.7
			22.07.04 12:00	SBE 26	259	2441	402.7
PIES_W	78°50.32'E 02°47.74'E	2480	02.09.04 22 :00	PIES	071	2479	360.4
F15-3	78° 50.00' N 01° 36.59' E	2497	23.08.04 20:00	AVT	9187	57	370.6
			23.08.04 20:00	SBE 16	2416	59	370.6
			23.08.04 20:00	ACM	1391	248	370.6
			23.08.04 20:00	ACM	1389	249	370.6
			23.08.04 20:00	AVTP	10492	755	370.6
			23.08.04 20:00	AVT	10531	1501	370.6
			23.08.04 20:00	AVT	9206	2487	370.6
F16-3	78° 50.05' N 00° 23.81' E	2532	22.08.04 12:00	AVTP	9207	59	372.0
			22.08.04 12:00	SBE 16	1976	61	372.0
			22.08.04 12:00	AVTP	10872	251	372.0

Mooring	Latitude Longitude	Water depth (m)	Date and time of first useful record	Instrument type	Serial number	Instr. depth (m)	Time series length (days)
			22.08.04 12:00	AVT	9782	757	372.0
			22.08.04 12:00	ACM	1442	1502	372.0
			22.08.04 12:00	ACM	1443	1503	372.0
			22.08.04 12:00	RCM 11	20	2519	372.0
F9-6	78° 50.33' N 00° 48.74' W	2610	21.08.04 18:00	AVTP	10002	58	372.8
			21.08.04 18:00	SBE 16	1977	60	372.8
			21.08.04 18:00	AVTP	11889	250	372.8
			21.08.04 18:00	RCM 11	217	756	372.8
			21.08.04 18:00	ACM	1447	1506	372.8
			21.08.04 18:00	ACM	1449	1507	372.8
			21.08.04 18:00	RCM 11	212	2603	372.8
			21.08.04 18:00	SBE 16	1979	2609	[2)]
F10-7	78° 49.88' N 02° 00.06' W	2666	24.08.04 08:00	AVTP	11888	61	370.3
			24.08.04 08:00	SBE 16	2422	63	370.3
			24.08.04 08:00	ADCP-UP	1561	253	370.3
			24.08.04 08:00	AVTP	11613	750	370.3
			24.08.04 08:00	ACM	1450	1505	370.3
			24.08.04 08:00	AVTP	12333	2652	370.3

Abbreviations:

ADCP	RDI Inc. Self-Contained Acoustic Doppler Current Profiler
ACM	Falmouth Scientific Inc. 3-dimensional acoustic current meter
AVTCP	Aanderaa current meter with temperature, conductivity and pressure sensor
AVTP	Aanderaa current meter with temperature and pressure sensor
AVT	Aanderaa current meter with temperature sensor
RCM 11	Aanderaa Doppler current meter with temperature sensor
SBE 16	Seabird Electronics SBE16 recording temperature, conductivity, and pressure
SBE 26	Seabird Electronics SBE26 bottom pressure recorder
SBE 37	Seabird Electronics SBE37 recording temperature and conductivity (optionally pressure SBE 37 P)
PIES	Pressure Inverted Echo Sounder (optionally with current meter C-PIES)

Remarks:

[1)] Instrument lost.
[2)] Instrument failure, no data.
[3)] Rotor lost during recovery.

Tab. 3.2: Moorings deployed during ARK-XXI/1b

Mooring	Latitude Longitude	Water depth DWS (m)	Date and time of first useful record	Instrument type	Serial number	Instr. depth (m)
F1-8	78°49.95'N	251	17.08.05 08:00	RCM7 VTP1000,tlow	8367	61
	08°39.85'E			SBE 37 CTP	2610	63
				SBE 37 CT	2086	232
				RCM8 VTP1000,tlow	10004	233
F2-9	78°50.14'N	798	18.08.05 10:00	RCM7 VTP1000,tlow	8400	60
	08°19.64'E			SBE 37 CTP	250	62
				RCM11VTP3500m,tlow	455	256
				SBE 37 CT	2088	766
				RCM8 VT	10498	772
				SBE 16	630	798
PIES_E	78°50.36'N	785	18.08.05 11:00	PIES	067	784
	08°19.63'E					
F3-8	78°50.32'N	1037	18.08.05 14:00	RCM7 VTP1000,tlow	8401	62
	07°59.52'E			SBE 37 CTP	2236	64
				RCM11VTP3500m,tlow	457	253
				RCM8 VT	10499	754
				RCM11 VTP3500m	458	999
				SBE 16	1167	1001
F4-8	78°50.18'N	1452	18.08.05 16:00	SBE 37 CTP	2237	64
	07°00.14'E			ADCP	951	93
				RCM11VTP3500m,tlow	461	249
				RCM11 VTP3500m	462	755
				SBE 37	2090	1415
				RCM11 VT	145	1421
F5-8	78°49.97'N	2465	23.08.05 14:00	RCM7 VTP1000,tlow	8402	62
	06°00.21'E			SBE 16 P1000	1975	64
				RCM8 VT,tlow	9768	253
				RCM11 VTP3500m	501	749
				RCM8 VTP3000	9783	1505
				RCM11 VT	486	2401
F6-9	78°49.82'N	2690	26.08.05 16:00	RCM7 VTP1000,tlow	8405	59
	05°01.34'E			SBE 16 P1000	1973	61
				RCM11VTCP3500m,tlow	452	255
				SBE37	2089	257
				RCM8 VTP3000	9215	751
				RCM11 VTP3500m	513	1507
				RCM11 VT	102	2633
PIES_C	78°49.97'N	2598	26.08.05 16:00	PIES	062	2597
	04°54.60'E					
F7-7	78°50.00'N	2342	26.08.05 12:00	RCM8 VTP1000,tlow	9201	62
	04°00.00'E			SBE 16 P3000	2420	64
				RCM8 VT,tlow	10503	253
				RCM7 VTP20MPa	8395	759
				RCM11 VTP3500m	469	1503
				RCM11 VT	127	2281
F8-8	78°50.05'N	2491	31.08.05 16:00	RCM8 VT,tlow	9390	60
	02°48.10'E			SBE 37P	2392	62
				RCM11 VTP3500,tlow	472	247
				RCM7 VTP20MPa,	10925	753
				RCM8 VTP20MPa	9995	1499
				RCM11 VT	134	2435
				SBE26	276	2491

Mooring	Latitude Longitude	Water depth DWS (m)	Date and time of first useful record	Instrument type	Serial number	Instr. depth (m)
PIES_W	78°49.88'N 02°50.63'E	2488	31.08.05 17:00	PIES	141	2487
F15-4	78°49.98'N 01°36.60'E	2547	30.08.05 20:00	RCM8 VTP1000,tlow	11887	57
				SBE 37P	2393	59
				RCM11VTP3500m,tlow	474	249
				RCM11 VTP3500m	504	755
				RCM8 VTP(blind)	10005	1501
				RCM11 VT	133	2487
				RCM8 VTP1000,tlow	11887	57
F16-4	78°50.10'N 00°24.07'E	2582	30.08.05 14:00	RCM8 VTP1000,tlow	11892	59
				SBE 37P	2395	61
				RCM11VTP3500m,tlow	475	251
				RCM11 VTP3500m	506	757
				RCM11 VTP3500m	500	1503
				RCM11 VT	135	2519
				RCM8 VTP1000,tlow	11892	59
F9-7	78°50.30'N 00°48.66'W	2662	30.08.05 10:00	RCM7 VTP2000,tlow	10491	58
				SBE 37P	2396	60
				RCM11VTP3500m,tlow	491	250
				RCM11 VTP3500m	512	756
				RCM11 VTP3500m	509	1502
				RCM11 VT	144	2598
				SBE 16 P10000	631	2662
F10-8	78°49.90'N 01°59.99'W	2715	06.09.05 10:00	RCM8 VTP1000,tlow	8396	61
				SBE 37P	2609	63
				ADCP	1563	253
				RCM11 VTP3500m	489	750
				RCM11 VTP3500m	465	1506
				RCM8 VT	9389	2652

Abbreviations:

ADCP	RDI Inc. Self-Contained Acoustic Doppler Current Profiler
ACM	Falmouth Scientific Inc. 3-dimensional acoustic current meter
AVTCP	Aanderaa current meter with temperature, conductivity and pressure sensor
AVTP	Aanderaa current meter with temperature and pressure sensor
AVT	Aanderaa current meter with temperature sensor
RCM7	Aanderaa current meter type RCM7
RCM8	Aanderaa current meter type RCM8
RCM 11	Aanderaa Doppler current meter with temperature sensor
SBE 16	Seabird Electronics SBE16 recording temperature, conductivity, and pressure
SBE 26	Seabird Electronics SBE26 bottom pressure recorder
SBE 37	Seabird Electronics SBE37 recording temperature and conductivity (optionally pressure SBE 37 P)
PIES	Pressure Inverted Echo Sounder

Tab. 3.3: CTD stations carried out during ARK-XXI/1b

Station	Cast	Latitude	Longitude	Day	Month	Year	Hour	Minute	Water Depth	Max. Pressure
185	1	77.086	13.866	14	8	2005	2	31	116	113
186	1	76.596	15.679	14	8	2005	6	34	38	38
187	1	76.536	15.38	14	8	2005	7	33	123	122
188	1	76.454	15.001	14	8	2005	8	44	224	222
189	1	76.192	16.932	14	8	2005	12	17	281	280
190	1	76.28	16.928	14	8	2005	13	37	201	199
191	1	76.383	16.944	14	8	2005	14	52	59	56
192	1	76.836	19.042	14	8	2005	19	43	115	111
193	1	76.826	19.296	14	8	2005	20	37	138	135
194	1	76.826	19.508	14	8	2005	21	29	156	153
195	1	76.832	19.72	14	8	2005	22	13	156	153
196	1	76.832	20.377	14	8	2005	23	26	124	121
197	1	76.914	20.349	15	8	2005	0	16	123	120
198	1	77.079	20.375	15	8	2005	1	30	89	85
199	1	77.219	20.459	15	8	2005	3	42	85	81
200	1	77.326	20.253	15	8	2005	4	57	97	93
201	1	77.432	20.476	15	8	2005	6	5	69	65
202	1	77.576	20.555	15	8	2005	7	56	68	64
203	1	77.629	20.412	15	8	2005	9	12	89	85
204	1	77.518	19.438	15	8	2005	10	58	148	145
205	1	77.497	19.159	15	8	2005	11	50	181	178
206	1	77.457	18.533	15	8	2005	13	12	102	98
207	1	77.437	19.788	15	8	2005	15	30	133	128
208	1	77.269	20	15	8	2005	17	2	130	126
209	1	77.252	19.535	15	8	2005	18	11	170	166
210	1	77.199	19.279	15	8	2005	19	14	166	163
211	1	77.15	18.827	15	8	2005	20	22	120	117
212	1	78.835	8.999	16	8	2005	22	22	216	214
212	2	78.832	9.012	16	8	2005	23	24	113	124
213	1	78.834	8.84	17	8	2005	0	16	240	238
215	1	78.833	8.5	17	8	2005	2	25	22	32
219	1	78.835	7.008	17	8	2005	14	18	1417	1432
220	1	78.833	5.667	17	8	2005	16	54	2524	2561
221	1	78.842	6.001	17	8	2005	19	12	2424	2461
222	1	78.834	6.332	17	8	2005	21	10	2142	2171
223	1	78.834	6.658	17	8	2005	22	59	1752	1773
224	1	78.837	7.005	18	8	2005	0	38	1420	1435
225	1	78.834	7.332	18	8	2005	2	7	1207	1219
226	1	78.833	7.667	18	8	2005	3	27	1082	1091
227	1	78.839	7.995	18	8	2005	4	47	1012	1020
228	1	78.833	8.206	18	8	2005	5	53	893	899
229	1	78.836	8.328	18	8	2005	7	0	784	788
230	1	78.832	8.495	18	8	2005	8	51	588	589
231	1	78.84	8.666	18	8	2005	9	40	232	230
236	2	78.836	5.054	18	8	2005	20	43	2647	2691
237	1	78.835	5.319	18	8	2005	23	4	2581	2623
238	1	79.065	4.176	19	8	2005	2	43	2421	2456
242	1	79.132	2.842	19	8	2005	14	35	5547	5676
244	1	79.063	3.354	19	8	2005	23	58	5128	5237
245	1	79.064	4.182	20	8	2005	7	44	1103	1016
249	1	79.411	4.683	20	8	2005	23	59	2509	2549
250	1	79.604	5.173	21	8	2005	4	57	2738	2783

Station	Cast	Latitude	Longitude	Day	Month	Year	Hour	Minute	Water Depth	Max. Pressure
250	4	79.597	5.142	21	8	2005	9	56	1106	1019
251	1	79.283	4.341	21	8	2005	14	49	2351	2387
252	1	79.059	3.572	21	8	2005	21	27	3530	3594
253	1	78.834	3.498	22	8	2005	3	27	2296	2328
254	1	79.063	3.653	22	8	2005	6	30	3093	3144
267	1	79.06	3.469	23	8	2005	20	38	3988	4064
271	1	79.107	4.608	24	8	2005	11	9	1907	1931
273	1	78.919	4.993	24	8	2005	18	56	2582	2621
274	1	78.78	5.325	24	8	2005	23	44	2426	2461
275	1	78.61	5.069	25	8	2005	3	59	2289	2322
275	5	78.599	5.081	25	8	2005	10	58	1101	1014
276	2	79.132	4.922	25	8	2005	21	23	1497	1513
277	1	79.133	6.091	26	8	2005	1	27	1249	1261
280	1	78.829	5.024	26	8	2005	12	4	2642	2683
281	1	78.832	4.662	26	8	2005	16	54	2506	2541
282	1	78.833	4.321	26	8	2005	19	0	2352	2385
283	1	78.832	3.98	26	8	2005	20	55	2277	2311
284	1	78.831	3.692	26	8	2005	22	39	2240	2273
285	1	78.835	3.406	27	8	2005	0	27	2319	2354
286	1	78.834	2.999	28	8	2005	18	57	2407	2442
287	1	78.826	2.799	28	8	2005	20	54	2450	2487
288	1	78.831	2.487	28	8	2005	22	55	2472	2510
289	1	78.833	2.195	29	8	2005	0	44	2493	2530
290	1	78.834	1.892	29	8	2005	2	53	2506	2543
296	1	78.833	-1.707	29	8	2005	21	40	2657	2698
297	1	78.833	-1.398	29	8	2005	23	46	2629	2671
298	1	78.833	-1.103	30	8	2005	1	42	2516	2557
298	2	78.834	-1.097	30	8	2005	3	40	1112	1025
299	1	78.838	-0.814	30	8	2005	4	58	2609	2649
300	2	78.841	0.4	30	8	2005	13	45	2527	2565
301	2	78.837	1.61	30	8	2005	18	46	2495	2532
302	1	78.832	1.294	30	8	2005	20	49	2476	2514
303	1	78.833	0.991	30	8	2005	22	37	2435	2471
304	1	78.832	0.705	31	8	2005	0	28	2418	2454
305	1	78.834	0.093	31	8	2005	2	52	2576	2615
306	1	78.833	-0.202	31	8	2005	4	57	2591	2630
307	1	78.834	-0.497	31	8	2005	7	4	2635	2676
309	1	79.693	5.733	31	8	2005	23	35	1555	1573
310	1	79.742	6.263	1	9	2005	1	22	1079	1090
311	1	79.837	7.205	1	9	2005	3	25	783	788
312	1	79.949	8.352	1	9	2005	5	30	490	491
313	1	80.664	8.431	1	9	2005	10	19	836	842
318	3	81.104	8.307	2	9	2005	7	35	1127	1137
318	4	81.094	8.274	2	9	2005	9	10	1059	1071
321	1	81.584	6.125	3	9	2005	8	3	798	803
327	1	80.787	7.535	4	9	2005	23	39	132	32
327	2	80.793	7.539	5	9	2005	0	10	967	976
328	1	80.477	5.882	5	9	2005	3	33	592	594
329	1	80.33	4.922	5	9	2005	6	3	783	788
330	1	80.231	4.287	5	9	2005	7	58	1083	1093
331	1	80.147	3.76	5	9	2005	9	34	1576	1594
332	1	78.831	-3.001	5	9	2005	23	31	2478	2514
333	1	78.834	-2.668	6	9	2005	1	42	2559	2600
334	1	78.835	-2.333	6	9	2005	3	57	2618	2659
335	1	78.831	-2.008	6	9	2005	6	18	2662	2705

Station	Cast	Latitude	Longitude	Day	Month	Year	Hour	Minute	Water Depth	Max. Pressure
336	1	78.832	-3.346	6	9	2005	11	28	2331	2364
337	1	78.834	-3.656	6	9	2005	13	34	2140	2172
338	1	78.833	-3.998	6	9	2005	15	33	1881	1905
338	2	78.832	-3.991	6	9	2005	17	15	1891	1829
339	1	78.833	-4.334	6	9	2005	19	45	1606	1625
339	2	78.829	-4.314	6	9	2005	21	22	1101	1014
340	1	78.828	-4.668	6	9	2005	22	44	1309	1323
341	1	78.831	-5.003	7	9	2005	0	45	1005	1014
342	1	78.835	-5.33	7	9	2005	3	37	703	706
343	1	78.831	-5.68	7	9	2005	5	45	421	422
344	1	78.839	-6.044	7	9	2005	7	57	338	337
345	1	78.81	-6.506	7	9	2005	9	54	279	277
346	1	78.831	-6.997	7	9	2005	11	55	245	243
347	1	78.833	-7.494	7	9	2005	14	18	190	191
348	1	78.823	-7.988	7	9	2005	16	53	211	209
349	1	78.833	-8.519	7	9	2005	20	36	283	281
350	1	78.828	-8.997	7	9	2005	22	6	214	212
351	1	78.832	-9.491	7	9	2005	23	31	188	185
352	1	78.837	-10.041	8	9	2005	2	1	286	284
352	3	78.833	-10.061	8	9	2005	2	58	319	312
353	1	78.83	-10.476	8	9	2005	4	33	375	374
354	1	78.834	-10.986	8	9	2005	6	29	324	323
355	1	78.832	-11.488	8	9	2005	8	17	226	224
356	1	78.83	-12.014	8	9	2005	10	7	199	197
357	1	78.83	-12.492	8	9	2005	12	6	193	190
358	1	78.832	-12.995	8	9	2005	16	6	190	187
359	1	78.838	-13.496	8	9	2005	18	13	124	120
360	1	78.835	-13.977	8	9	2005	20	3	103	99
361	1	78.829	-14.497	8	9	2005	22	20	84	81
362	1	78.825	-14.996	9	9	2005	0	2	66	61
363	1	78.834	-15.491	9	9	2005	2	13	65	61
364	1	78.843	-16.011	9	9	2005	5	4	234	232
365	1	78.837	-16.526	9	9	2005	6	48	358	358
366	1	78.828	-16.97	9	9	2005	8	20	375	375
367	1	78.833	-17.48	9	9	2005	10	7	550	552
369	1	72.005	14.722	12	9	2005	13	8	1257	1269
371	1	71.959	14.663	12	9	2005	17	51	1319	1333

4. BIOGEOCHEMISTRY

4.1 In-situ production of methane on polar shelves and in the marginal ice zone

Ellen Damm, Ellen Lichte, Ingrid Voege
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Objectives

Recent changes in the Arctic may have profound effect on natural biogeochemical cycles in seawater. Especial feedback effects to pathways of climatically relevant biogases like methane will loom large in the equation of change. The present marine methane cycle is influenced mainly by atmospheric methane transported by downward diffusion and convective ventilation into the deeper ocean, by fossil methane released from gas venting sites at the sea floor, microbial *in-situ* methane production in the upper ocean and microbial oxidation in the whole water column. With this expedition we expect to expand the knowledge about the methane *in-situ* production in the upper water column. The aim of our investigations is to estimate the balance between the pathways and the resultant isotopic fractionation processes. The methane budget in the Storfjorden and in the upper water column along the Fram Strait transect will be estimated related to background concentrations and super-saturations. A further goal is to calculate sink and source capacities of these areas due to estimate its contribution to the atmospheric methane budget at the high northern latitudes.

Work at sea

Methane concentrations were measured at 69 stations in Storfjorden, along the Fram Strait transect and along two transects at the western slope of the Yermack Plateau. Water samples were collected in Niskin bottles mounted on a rosette sampler from bottom water depths up to the surface (0.5 m). The dissolved gases were immediately extracted from the water and were analysed for methane by gas chromatograph equipped with a flame ionization detector (FID) on board ship. Gas samples were stored for investigations of the $\delta^{13}C_{CH4}$values in the home laboratory. Furthermore at each station samples for the analyses of DMSP (p), DMSP (d), $\delta^{13}C_{DIC}$ and $\delta^{18}O_{H2O}$ were taken, which will be analyzed in the home lab.

Preliminary results

During the winter expedition in Storfjorden in 2003 an extended methane anomaly was detected by methane concentrations exceeding the normal background values of < 5nM. The clearly increasing concentrations from the sea surface to the bottom points to a release of submarine methane during resuspension events of sediments, while the methane is originated by recent bacterial activities. The presence of the methane anomaly in the whole semi-enclosed Storfjorden is confirmed now also during the summer. However, in contrast to the wintertime the methane maxima are located in the upper water column supporting the assumption of a bacterial *in-situ* originated methane. Water stratification and freshwater inflow determines the pathways of methane in the water column and creates a regionally different sea-air flux of methane.

Methane *in-situ* production on a lower concentration level than in Storfjorden was found also on the Greenland shelf and along the marginal ice zone.

4.2 Structure and function of microbial communities in the Storfjorden and Fram Strait

Elisabeth Helmke
Alfred-Wegener-Institut

Objectives
Investigations on structure and function of bacterial communities were conducted to broaden our understanding on formation and fate of methane in the Storfjorden as well as the upper water column of the Fram Strait. Furthermore the bacterial communities in the Fram Strait were screened for the occurrence of specific bacteria that may be indicative for the different water bodies and may be helpful for analysing changes in the Arctic Ocean.

Work at sea
At 6 different stations in the Storfjorden greater amounts of water (up to 20 litre) were taken with the rosette sampler from at least three different water depths. Moreover surface sediment and sediment-overlaying water was sampled with the multicorer at four of these stations.

At 10 stations along the 78°50'N Fram Strait transect water was taken from different water bodies. Additionally sediment and overlaying water was sampled at four of these stations in the eastern part of the Fram Strait.

To characterize the structure of benthic communities surface sediment was frozen immediately after sampling. Since bacterial concentrations in the water column are clearly less than in the surface sediments 10 up to 20 litres of water were filtered to get sufficient bacterial DNA. The filters were frozen and will be used for DNA-extraction in the home laboratory. Sufficient DNA is a prerequisite to analyse the taxonomical community structure by means of Denaturing Gradient Gel Electrophoresis (DGGE). A quantitative community structure analysis will be conducted by means of Fluorescence *in-situ* Hybridisation (FISH). The main steps of this - in principal microscopic - method have also to be carried out in the home laboratory. On board the cells of the different water and sediment samples were fixed, washed, mounted on filters in appropriate dilutions, and frozen.

To differentiate between functional and inactive members of the bacterial communities different incubation experiments under varying temperature-, pressure-, and substrate- conditions were performed with selected water and sediment samples. The approaches were terminated on board and will be processed further in the home laboratory.

Expected results

To work up the different samples it will take about one year. We expect that the activity data in connection with the community structure and methane concentration will provide new insights into methane cycling in the higher northern latitudes. Furthermore we will learn if specific bacterial groups are useful in characterising and differentiating water bodies in the Fram Strait.

4.3 Nutrients, oxygen, and dissolved organic matter

Kai-Uwe Ludwichowski[1)], Ines Vogel[1)], Marthi Wolff[1)], Eva Falck[2)]

[1)]Alfred-Wegener-Institut
[2)]University of Bergen

Objectives

The distributions of nutrients and oxygen are closely related to the physical and biological processes that take place in the ocean. These parameters are therefore well suited as tracers for the identification of water masses and assessment of biological activity. As for the first leg, one major objective for the second part was to trace water masses of Pacific origin. Pacific waters are known to exit the Arctic Ocean through the Canadian Archipelago and the Fram Strait. Since the nitrate to phosphate ratio is different for waters of Pacific and Atlantic origin, this can be used to determine the presence of Pacific water. In 2004 no Pacific waters were found above the East Greenland Shelf, in contrast to earlier cruises from the 1980s and 1990s when unmodified Pacific Water was present above shelf. One interesting question is therefore how long it will take before the Pacific water returns to the Fram Strait and the Greenland Sea. The nutrients and oxygen measurements taken during the entire cruise will also be compared with historical data to determine seasonal and interannual variability and to see whether there are further modifications of the water masses exiting or entering the Arctic Ocean.

Dissolved organic matter (DOM), extracted from seawater, will be taken for chemical characterisation and determination of sources and modifications. DOM in the oceans contains about the same amount of carbon as the global biomass or atmospheric CO_2 and exhibits an average age of several thousand years. Source, diagenesis, and preservation mechanisms of DOM remain elemental questions in contemporary marine sciences and represent a missing link in models of global elemental cycles. High amounts of terrestrial organic matter are discharged by the huge Russian Rivers into the Arctic Ocean and are partially transported via the Transpolar Drift towards the Fram Strait and further south along the Greenland shelf.

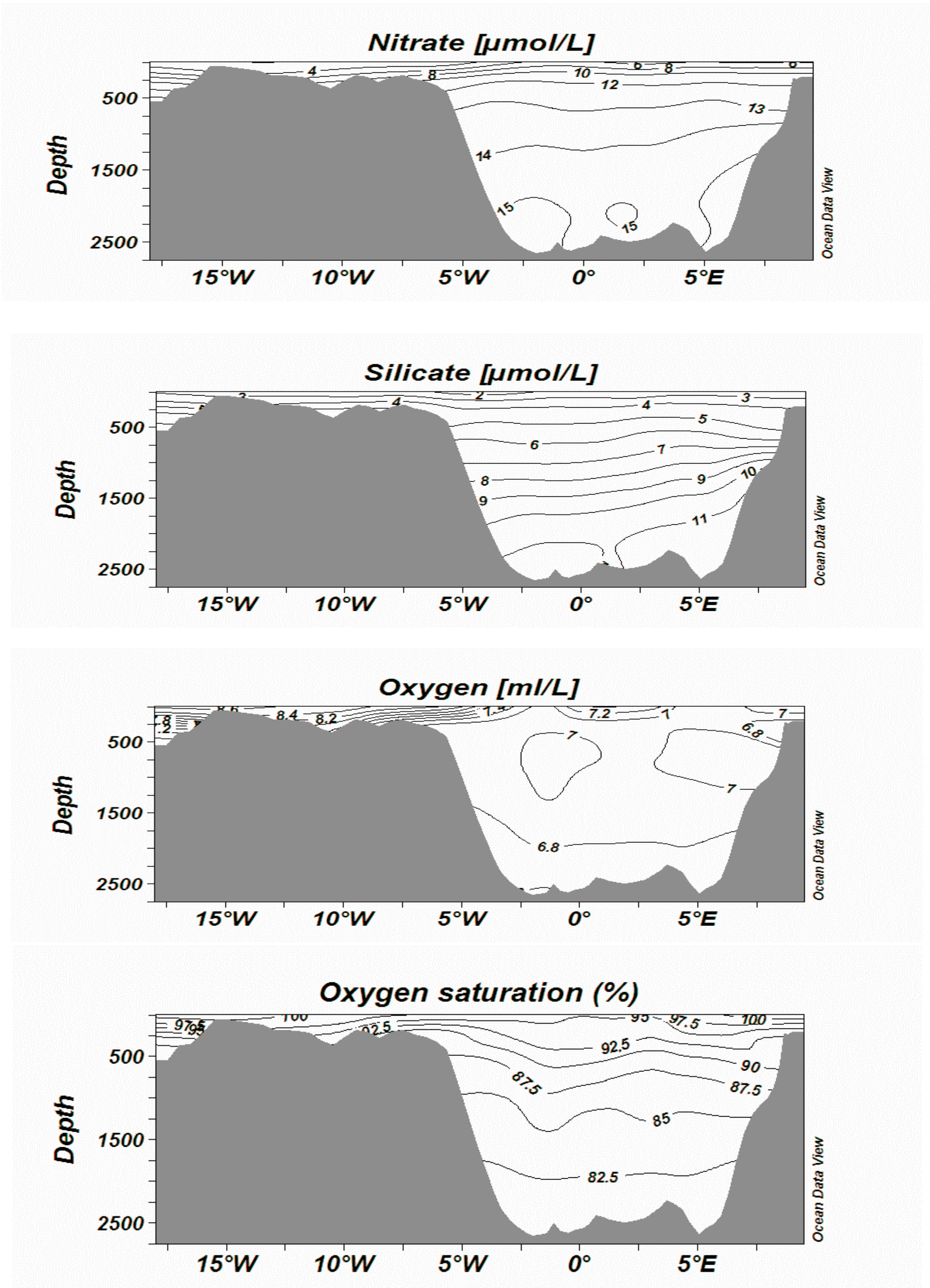

Fig. 4.1: Distribution of nutrients and oxygen along the transect (78.8°N) in the Fram Strait (preliminary data)

Work at sea

Nutrients were sampled at 127 stations and oxygen at 66 stations during the second leg. From all water samples taken with the rosette sampler at different depths, the nutrients - nitrate, nitrite, phosphate and silicate - were determined immediately on board with an Autoanalyser-system (Alliance, France) according to standard seawater methods. Oxygen was measured by the Winkler method. DOM measurements were performed at two stations, one on the Svalbard side and one on the Greenland side of the Fram Strait, where 100 to 120 l of seawater from two different depths were particle-free filtered and extracted with a PPL adsorber (polystyrene cross-linked with divinylbenzene) and eluted with methanol. The chemical characterisation of DOM will be performed at the home labs in Bremerhaven.

Preliminary results

The nutrient and oxygen profiles from the Storfjorden area show the presence of different water masses. For instance, in the deeper parts of Storfjorden, north of the sill, remnants of the bottom water produced during winter were found, with a strong increase in nutrients and a respective decrease in oxygen. In the Molloy Deep, the different parameters showed a complete homogenous water column from about 2,000 m down to the bottom. During the transect across the Fram Strait nutrient and oxygen measurements (Fig. 4.1) were taken at close intervals which gives a good special resolution. The preliminary results show that unmodified Pacific Water had not returned to the East Greenland shelf, only very diluted remnants of this water mass could still be seen circulating around the Belgica Bank.

5. BIO-OPTICS

Jill Schwarz, Pablo Corella, Alex Nauels
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Objectives

The variability in optically active parameters (OAPs) is being investigated with the aim of improving algorithms for retrieval of parameters such as concentrations of chlorophyll-a, particulate and dissolved organic carbon and inorganic sediment in polar waters. Given a good knowledge of this variability for different seasons and different biogeochemical provinces, forward bio-optical models can be adapted to the region, and model inversion applied to interpret satellite data.

Work at sea

During this cruise leg, sampling continued as described for leg 1a. Bio-optics samples were taken from most CTDs in Storfjorden, the west coast of Svalbard, Yermak Plateau and the 78°50'N transect. Sampling depths were restricted to 10 m and the depth of the chlorophyll maximum.

Samples were also taken for the measurement suite: Excitation-Emission fluorometry, DOC and absorption by coloured, dissolved organic matter, at stations 2° longitude apart along the 78°50' transect, occasionally in waters around Svalbard and at the Håkon Mosby Mud Volcano. The aim in this case was to seek Ex-Em fluorescences signatures characteristic of the major deeper water masses, which could be used to monitor non-terrigenous DOC concentrations and thus complement the existing gelbstoff fluorometer deployed during leg 1a. Samples were taken at higher depth resolution close to the sea bed at the Håkon Mosby Mud Volcano in order that the Ex-Em fluorescence signal could be compared with chemical analyses of the water carried out by Ellen Damm. At each of these sampling stations, samples were also collected for genetic analysis of bacteria populations, on behalf of Markus Moeseneder, U. Vienna. The sampling protocal for bacteria collection is documented here in detail:

Samples for analysis of bacteria population

Water samples were collected from the CTD in PVC canisters, after rinsing the canister with sample water at least twice. Facilities for sterilisation or more thorough cleaning of the canisters were not available. Glass filtration stands were rinsed thoroughly with milli-Q water, and a fresh, 0.2 mm membrane filter placed on the stand using forceps cleaned with alcohol. 500 ml plastic beakers were rinsed with milli-Q water and then with seawater sample before filtering 500 ml aliquots of sample. The total volume sampled varied from one to four litres, depending on water availability, time constraint and the quantity of suspended material in the sample (filter clogging). The filter was then removed using forceps cleaned in alcohol, folded, placed in a sterile cryovial and stored in liquid nitrogen.

Samples collected for analysis in the home laboratory

- Phytoplankton pigments (HPLC: high performance liquid chromatography)
- Absorption by pigments/non-pigmented particles (Aphy: spectrophotometry)
- Particulate organic carbon (POC)
- Dissolved organic carbon (DOC)
- Absorption by dissolved substances (Acdom: spectrophotometry)
- Excitation-Emission Matrices for dissolved substances (EEM: spectrofluorometry)
- Total organic/inorganic suspended particulates (SPM: weight)
- Particle size distribution (PSD: Coulter counter)
- Phytoplankton taxonomy (TAX: light/electron microscope)

6. THE AWI *HAUSGARTEN*: LONG-TERM RESEARCH AND IN-SITU EXPERIMENTATION AT AN ARCTIC DEEP-SEA STATION

Ingo Schewe, Eduard Bauerfeind, Melanie Bergmann, Jennifer Dannheim, Corinna Kanzog, Ingrid Kolar, Mirko Maganini, Burkhard Sablotny, Mareike Volkenand, Jan Wegner
Alfred-Wegener-Institut

Introduction and objectives

The AWI *Hausgarten* observatory consists out of 15 permanent benthic sampling sites along a depth transect from Vestnesa Ridge to the Molloy Deep (1,000-5,500 m) and along a latitudinal transect following the 2,500 m isobath crossing the central *Hausgarten* station (Fig. 6.1), which serves as an experimental area for long-term experiments at the deep seafloor. Repeated benthic sampling and the deployment of moorings and different bottom lander systems has taken place since the beginning of the station in summer 1999.

Water column studies at *Hausgarten* comprise the assessment of physico-chemical parameters as well as flux measurements of particulate organic matter to the deep seafloor. Whereas currentmeters in long-term moorings and free-falling devices provide information on current speeds and directions at various heights above the seafloor, repeated CTD casts at the permanent stations allow the identification of temporal variations in water temperatures and salinities. Transmissiometers and oxygen sensors attached to the CTD provide additional information on suspended matter and remineralization processes in the water column.

Benthic investigations at *Hausgarten* comprise biochemical analyses to estimate the input of organic matter from phytodetritus sedimentation and analyses of activity and biomass of the small sediment-inhabiting biota as well as assessments of distribution patterns of benthic organisms (covering all size classes from bacteria to megafauna) and their temporal development.

Demersal fish constitute an important fraction of the benthic megafauna present at *Hausgarten*. Despite their abundance little is known about their biology and functional ecological role. Stomach contents analysis and tissue samples taken for radio stable isotope analysis will not only allow us to determine the fishes' feeding behaviour and trophic level but also their functional ecological role. Such analyses ultimately enable us to assess the predation pressure exerted on other benthic biota and to determine how fish structure the benthic assemblages present. Together with stable isotope analyses of tissue samples from megafaunal organisms this may also allow us to re-construct benthic food webs at *Hausgarten*.

Work at sea

In-situ-experiments performed at the deep-sea floor allow some kind of calibration and a better classification of the parameters measured within the *Hausgarten* long-term-studies. In this connection, lander systems act as perfect experimental platforms to position experiments at selected positions of the deep-sea floor. During this expedition, we deployed two of these lander systems on the seafloor at 2,500 m and 5,500 m water-depth. Both were equipped with various types of potential food for deep-sea animals (phytodetritus, chitin, large carcasses) which are deployed straight on the seafloor. The observations by time-lapse camera-systems, mounted on the landers, will give information about the speed of food consumption and about the scavenging animals itself. After almost three weeks of deployment, the remotely operated vehicle *Victor6000* will inspect these experiments. But, these actions including targeted sediment sampling on and around the experiments will be part of a subsequent expedition with the French research vessel *L'Atalante*.

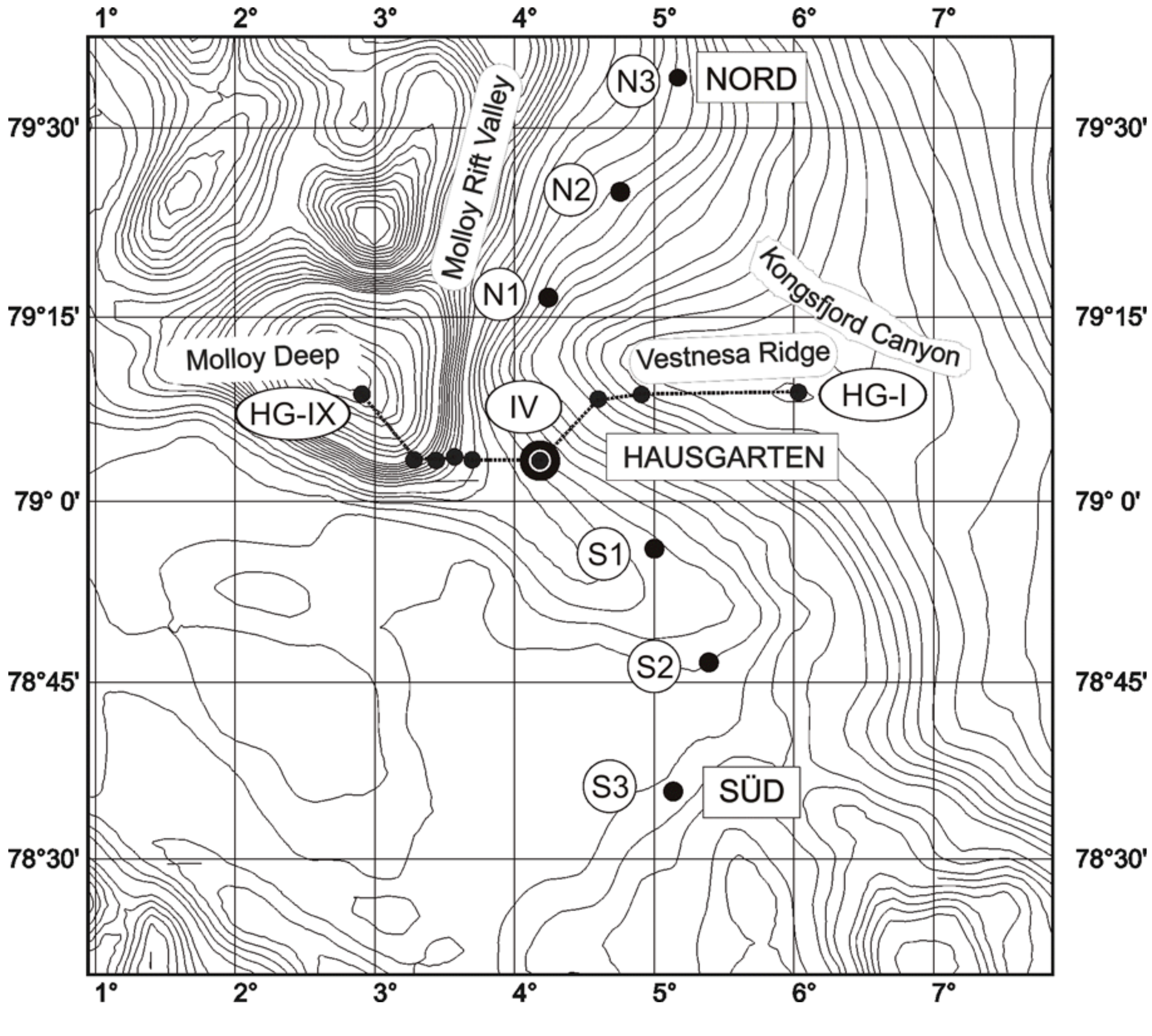

Fig. 6.1: Deep-sea long-term station AWI Hausgarten

6.1 Biological oceanography and sedimentation

Eduard Bauerfeind, Burkhard Sablotny, Jan Wegner
Alfred-Wegener-Institut

Objectives

The transfer of organic material produced in upper water column to the deep waters and finally the sediments of the deep sea is an important process, as this organic matter is the major food source for deep sea organisms and thus determines to a high degree the amount of benthic fauna thriving at and within the sediments of the sea.

Work at sea and preliminary results

To get insights into the amount and composition of the sedimenting material moorings containing sediment traps were deployed in the area of AWI *Hausgarten* during RV *Polarstern* cruise ARK-XX in 2004 at stations HGIV, N3 and S3. These traps were successfully recovered and redeployed. Samples could be obtained from 3 sediment traps at position HG IV and N3, and from the benthic lander which was also equipped with a sediment trap. At position S3 and from the trap close to the seafloor at HGIV no samples were obtained due to malfunction of the electronic control unit of the sediment traps. First macroscopic inspections of the samples showed a seasonal signal with highest fluxes occurring in August /September and another period with elevated flux in Mai/June. From this visual inspection of the sampling jars only a rough impression can be obtained, more detailed information will be obtained after detailed chemical, biochemical and microscopic analysis of the samples later on.

At the position of the moorings a CTD profile from the surface to the seafloor was carried out. Water samples were taken at several depths from the surface to the bottom of the sea. This water was filtered for the analysis of Chl a, seston, particulate organic carbon and nitrogen particulate $\delta^{15}N$ and the determination of biogenic particulate Si as well analysis of inorganic dissolved nutrients and species composition of the phytoplankton. All this analysis will be carried out after the return to the land-based laboratory.

6.2 Effect of organic enrichments on hydrolytic potentials and growth of bacterial deep-sea communities

Corinna Kanzog
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Objectives

Since it is produced by many marine organisms, including zooplankton and several phytoplankton species, chitin is a common biopolymer in nature and possibly the most common one to occur in marine environments (Gooday, 1990). It is the aim to assess the effect of different chitin concentrations on the composition of sediment-inhabiting bacterial communities.

Work at sea

During the cruise RV *Polarstern* ARK-XX/1 (2004) Colonization Tray with different concentrations of chitin and different types of artificial sediments was deployed for one year at the central *Hausgarten* station (HG IV, 2500 m). Chitinase activity was examined by using the fluorogenic substrate Methylumbelliferone-β-N-Acetyl-glucosamine. Bacterial cell counts and biomass was determined from 1 ml sediment samples diluted with 9 ml of a sterile filtered 4 % formaldehyde-seawater solution and stored refrigerated. Subsamples for molecular biological techniques (fluorescent *in-situ* hybridization, FISH) were prepared according to the method of Amann et al. (1997).

To investigate turn-over rates and the composition of bacterial communities we also sampled deep-sea sediments with a multi-corer (Table 6.1). At the laboratory, these sediments will be used for long-term incubation experiments to investigate the impact of organic enrichments on the hydrolytic potentials and growth of benthic bacterial communities in the Arctic Ocean.

Tab. 6.1: Samples for long-term incubation experiments.

Station number	**Water depth (m)**	**Number of samples**
PS 68 / 251-3	2400	2 x 600 ml Sediment (0-3 cm)
PS 68 / 262-1	2500	2 x 600 ml Sediment (0-3 cm)
PS 68 / 275-8	2300	2 x 600 ml Sediment (0-3 cm)

In addition, we sampled each long-term station of the AWI *Hausgarten* (Table 6.2) to determine bacterial numbers and biomasses, and to identify bacterial communities with molecular methods.

Tab. 6.2: Samples for bacterial numbers and biomasses.

Station number	**Water depth (m)**
PS 68 / 238-3	2500
PS 68 / 242-2	5500
PS 68 / 248-1	2500
PS 68 / 49-2	2500
PS 68 / 251-2	2400
PS 68 / 252-2	3300
PS 68 / 261-1	3200
PS 68 / 267-2	4000

PS 68 / 268-1	5000
PS 68 / 271-2	1800
PS 68 / 273-2	2600
PS 68 / 274-2	2500
PS 68 / 275-3	2300
PS 68 / 276-3	1500
PS 68 / 277-2	1300

6.3 Smallest benthic animals at the HAUSGARTEN long-term stations

Ingo Schewe, Ingrid Kolar, Mirko Maganini, Mareike Volkenand
Alfred-Wegener-Institut

Objectives
The standard long-term investigations in the AWI *Hausgarten* area are dedicated to large-scale ecological investigations on the benthic community. The stations for these investigations are spread over a wide range in water depth and in latitudinal space (Fig. 6.1), so they cover a wide variety of different habitats. Sampling of virtually undisturbed sediments was done with a multiple corer.

Work at sea and preliminary results
During ARK-XXI/1b, we were able to absolve the full programme of 20 multicorer-operations in total. With the sampled sediments, we will be able to cover the full set of aspired biochemical analyses and investigations on the benthic organisms itself (see introduction). Immediately on board we measured the concentrations of sediment bound plant pigments as well as the potential activity of sediment inhabiting bacteria. As an outcome of these investigations, the preliminary results show pigment concentrations and benthic activities, which are in a comparable range as the ones measured in 2004. Future analyses in Bremerhaven of the sampled sediments will show how far these results continue the looming trend of a decreasing organic matter input with a coupled decreasing amount of total microbial biomass (Fig. 6.2; Soltwedel et al. 2005).

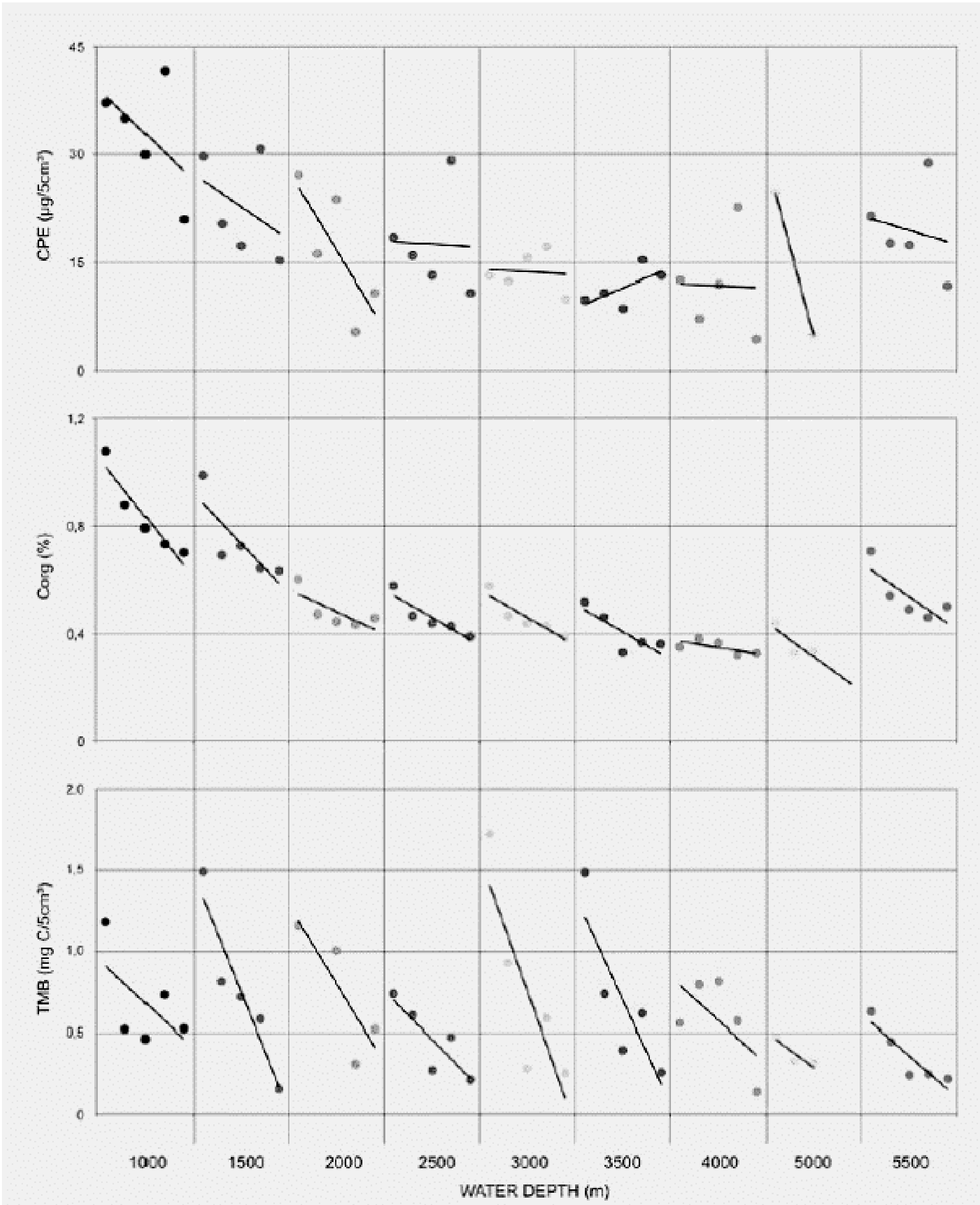

Fig. 6.2: The temporal development of concentrations in chloroplastic pigment equivalents, (CPE), organic carbon (Corg), and total microbial biomass (TMB) in sediments along the Hausgarten depth transect between 2000 and 2004

6.4 Ecology of eelpout from the AWI *Hausgarten* and the Håkon Mosby Mud Volcano

Melanie Bergmann, Jennifer Dannheim
Alfred-Wegener-Institut

Objectives

Despite their abundance, little is known about the ecology and habitat preferences of demersal deep-sea fishes, especially of those from polar regions. Footage from an Ocean Floor Observation System (OFOS) showed that fish such as zoarcid eelpout constitute an important fraction of the megafauna present at the *Hausgarten*. Being top predators they may play important role in such ecosystems.

Work at sea

Following previous results, we sampled the demersal fish fauna at *Hausgarten* to study their ecology and for ground-truthing of the OFOS footage. Both, an Agassiz trawl (Fig. 6.3) and and fish traps (Fig. 6.4) were used to sample the fish fauna. Five trawls were carried out in total at stations of different depths and baited fish traps attached to a benthic lander (Fig. 6.5) were deployed four times on the seabed at HG IV, V and VI (Table 6.3b). In addition to fish, the traps also caught high numbers of scavenging amphipods (*Eurythenes gryllus*) that were preserved (Fig. 6.6). All fish were measured, weighed and preserved and will be subject to stomach contents analysis. The data will be compared with previously collected data on megafaunal abundance to estimate prey selectivity. Furthermore, the gonads and livers will be analysed and the otoliths read to age the fish and to determine growth and production. Muscle tissue samples were taken for stable isotope ($\delta^{15}N$, $\delta^{13}C$) analysis to assess the fishes' longer-term trophic level. Megafaunal samples were also taken at each trawl station for ground-truthing of the OFOS footage and tissue samples were taken for stable isotope analysis. Filtrates from water samples of the sea floor and sea surface taken by CTD rosette will be used to determine the lowest trophic level of the food web.

Tab. 6.3: Summary of sampling effort

a) Agassiz trawl

	Hausgarten II	Hausgarten III	Hausgarten V	Hausgarten VI*	Hausgarten VII
Depth (m)	1500	1900	3000	3500	3900
No. of fish	8	7	5	1	0
Species caught	*Lycodes squamiventer* (4) *Lycodes frigidus* (1) *Lycodonus flagellicauda* (3)	*Lycodes frigidus* (6) Sandeel? (1)	*Lycodes frigidus* (4) *Rhodichthys regina* (1)	*Lycodes frigidus* (1)	0
Mega-faunal subsample	x	x	x	x	x

b) baited fish traps attached to a benthic lander

	Hausgarten IV	Hausgarten IV	Hausgarten V	Hausgarten VI
Depth (m)	2435	2309	3059	3370
Deployment time	24h	40h 4min	31h 6min	40h 5min
No. of fish	2	3	3	1
Species caught	*Lycodes frigidus* (2)	*Lycodes frigidus* (2) *Paraliparis bathybius* (1)	*Lycodes frigidus* (3)	*Lycodes frigidus* (1)
Eurythenes gryllus	x	x	x	x

All fish were measured, weighed and preserved and will be subject to stomach contents analysis. The data will be compared with previously collected data on megafaunal abundance to estimate prey selectivity. Furthermore, the gonads and livers will be analysed and the otoliths read to age the fish and to determine growth and production. Muscle tissue samples were also taken for radio stable ($\delta^{15}N$, $\delta^{13}C$) isotope analysis to assess the fishes' longer-term trophic level. Megafaunal samples were also taken at each trawl station for ground-truthing of the OFOS footage and tissue samples were taken for stable isotope analysis. Filtrates from water samples of the sea floor and sea surface taken by CTD rosette will be used to determine the lowest trophic level of the food web.

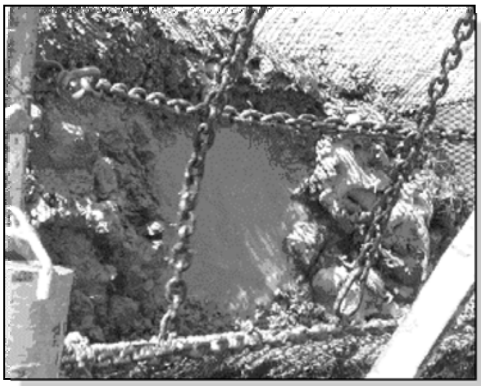

Fig. 6.3: Catch of an Agassiz trawl

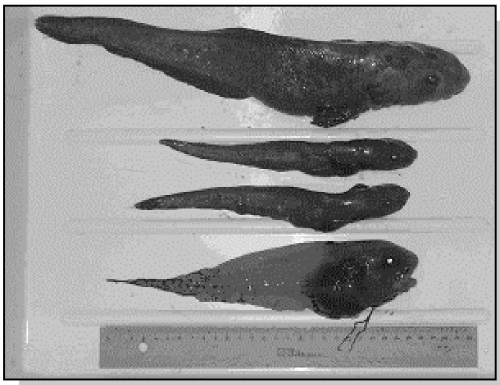

Fig. 6.4: Lycodes frigidus and Rhodichthys regina caught by traps

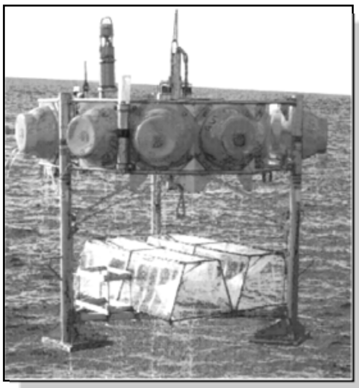

Figure 6.5: Recovery of fish traps attached to a benthic lander

Figure 6.6: Amphipods caught by fish traps

Preliminary results

Six species of fish were caught in total (Table 6.3). The number of fish caught by traps was lower compared with catches from ARK XX/1a. Results from stable isotope analysis indicated that eelpout occupy an intermediate trophic level ($\delta^{15}N$ of 13-14 ‰) whereas starfish (*Poraniomorpha tumida*) occupied the highest trophic level ($\delta^{15}N$ = 21 ‰) which may reflect their scavenging life style.

Acknowledgements

I would like to thank Boris Klein (AWI) for providing the fish traps and bait. I am also indebted to Daniel Müller, Alexander Nauels and Nikolas Krauß for their assistance in sorting the trawl catches and for the filtration of water samples.

References

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6.5 Long-term temperature observation at Håkon Mosby Mud Volcano

Tomas Feseker[1)], Michael Schlüter [1)], Jean-Paul Foucher[2)] (not on board)

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[2)]IFREMER, Paris

Objectives

Warm fluids escaping at seeps create heat flow anomalies which in turn, when detected and quantified, provide information on the nature and strength of fluid venting at those seeps. Measurements of temperature at several depths below the seafloor allow the determination of temperature gradients. Heat flow is defined as the simple product of the vertical temperature gradient and sediment thermal conductivity measured either *in-situ* or on recovered core samples. A main goal is to use heat flow anomalies to constrain models of heat and fluid flow at of Håkon Mosby Mud Volcano. Sediment temperature measurements recorded over longer period of time will help to identify the key processes of heat transfer and provide new insights into the temporal variations in the activity of this mud volcano.

Work at sea

A temperature lance was deployed close to the apparent center of activity of the mud volcano. The temperature lance is a modified 11.5 m long gravity corer, which is equipped with two different kinds of temperature logging systems. Eight MICREL temperature loggers mounted on outriggers were programmed to perform and record a temperature measurement every 60 minutes. In addition, two independent RBR thermistor chains were attached to the barrels of the corer. Each of these thermistor strings consists of 8 temperature sensors that are controlled by a central data logger.

Every 30 minutes, a temperature measurement is recorded from each sensor. The data loggers at the top end of the thermistor strings are attached to a chain, which is held up above the weight of the corer by two benthos buoys. Tear-off connectors between the sensor strings and the data loggers will allow the recovery of the data loggers with the help of an ROV. In order to facilitate the re-location of the lance at the sea floor during assessment and recovery, a sonar reflector was attached to one of the benthos buoys.

According to the Posidonia system of the acoustic releaser that was used for the deployment, the position of the temperature lance is estimated to be 72° 0.297'N 14° 43.677'E. However, this position still has to be confirmed during an ROV dive to the lance in the course of an expedition of the RV *L'Atalante* in September 2005. Both the data loggers and the temperature lance will be recovered during the HERMES/VICKING expedition of the RV *Pourqouis Pas?* in summer of 2006.

Figure 6.7: Deployment of the temperature lance on 12/09/2005

7. BIOGEOGRAPHY OF DEEP-SEA FORAMINIFERA

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Objectives

Foraminifera and the closely related large testate (shell-bearing) gromiids, are a significant and often visually conspicuous component of the deep-sea and high-latitude benthic fauna. In addition to the geologically important and well-known calcareous foraminifera, deep-sea and high-latitude assemblages include substantial numbers of soft-shelled, mostly single-chambered species, most of which are undescribed. These organisms include the organic-walled allogromiids, finely agglutinated saccamminids and the large, delicately agglutinated komokiaceans.

Literature records, combined with our own studies on Antarctic faunas, suggest that many foraminiferal morphospecies have wide geographical ranges in the deep sea. However, it is not certain whether all of these morphospecies constitute single taxonomic entities at the molecular level over their entire geographical ranges. Living benthic foraminiferans were collected from Storfjord, the Fram Strait, Yermak Plateau, the eastern continental shelf (200 - 600 m) of Greenland and the area surrounding as well as the Håkon Mosby Mud Volcano itself, in order to test the general hypothesis that deep-sea foraminiferan species do indeed have cosmopolitan distributions. This will be achieved by comparing species collected during this expedition with similar morphospecies collected from Antarctica during previous sampling campaigns (Weddell Sea and McMurdo Sound). The comparison will combine molecular analyses of ribosomal RNA gene sequences with conventional morphology-based species descriptions to determine whether or not genetic divergence has occurred between widely separated populations of the same morphospecies. The description of some of the many new species collected during this expedition is also an important objective which will improve our knowledge of benthic foraminiferal and gromiid biodiversity.

Work at sea

Methods

The foraminifera were isolated from surface sediment samples (0 - 2 cm) collected by multicorer, with additional sporadic boxcorer or Agassiz trawl samples. At each site, between 1 and 5 cores were examined and a subsample of 5 ml of surface sediment was collected and immediately deep frozen in the liquid nitrogen. These samples will be used for total DNA extraction and the study of microbial eukaryote diversity. The remaining sediment was sieved on 1 mm, 0.5 mm, 0.125 mm and 0.063 mm meshes in a cold container at 4° C and stored at 2° C. Specimens of living foraminifera were then isolated under a dissecting microscopes. The isolated foraminifera were identified, photographed with a digital camera and either immediately processed for

DNA extraction, frozen in liquid nitrogen or fixed in 4 % buffered formaldehyde (formalin). The fixed material will form the basis of the morphological part of our study.

Additionally, ecological data will be added by a smaller number of quantitative surface (0 - 2 cm) samples (formalin) collected at some stations.

Preliminary Results

During the course of the expedition a total of 38 stations were sampled, yielding 346 DNA extracts, 83 frozen specimen samples, 22 samples of frozen sediment for total environmental DNA analysis and 1174 preserved specimens in formalin (Table 7.1).

A total of 93 morphospecies were identified, in addition to a large number of unidentified, mostly single-chambered (monothalamous) species (Table 7.2). Several of these undescribed monothalamous species have been selected for future description, based on their morphological characters and subject to molecular data.

The number of specimens sampled, isolated, extracted and fixed has far exceeded initial expectations of this sampling campaign and will enable a successful comparison of this material with previously sampled Antarctic specimens, as well as advancing our knowledge of monothalamous foraminifera through new species descriptions.

Acknowledgements

The authors would like to thank the cruise leaders Eberhard Fahrbach and Peter Lemke for the excellent organisation of the cruise, Ingo Schewe and Norbert Lensch for their help in operating the multicorer and the loan of equipment, and the captain Stefan Schwarze and his crew for the optimal working conditions they provided at sea.

Tab. 7.1: Summary of work carried out during ARK-XXI/1b (n/a = data unavailable at the time of writing)

	Storefjord (Svalbard)	AWI *Hausgarten*	Yermak Plateau	Fram Strait (79° Transect)	Håkon-Mosby Mud Volcano
Stations	**4**	**15**	**9**	**8**	**2**
Species	**36**	**58**	**63**	**71**	**n/a**
DNA Extracts	**106**	**125**	**80**	**35**	**n/a**
Frozen Specimen	**2**	**43**	**20**	**18**	**n/a**
Preserved Specimens	**361**	**>432**	**108**	**273**	**n/a**
Frozen Sediment	**4**	**12**	**4**	**0**	**2**

Tab. 7.2: Species (presence/absence) sampled during ARK-XXI/1b for both molecular and morphological investigation. Species identifications were performed on board with a low-power dissecting microscope and may therefore be subject to minor changes after examination with more powerful microscopes in the home laboratory.

	Storfjorden				AWI *Hausgarten*																		Yermak Plateau									Fram Strait				Greenland				HM	
	199	202	206	211	238	242	248	250	251	252	256	260	261	267	268	271	272	273	274	275	276	277	314	317	318	320	321	322	323	325	326	328	331	338	341	343	352	357	367	370	371
Species																																									
Adercotryma glomerata																																						x	x		
Ammodiscus sp.													x								x						x											x			
Ammomarginulina ensis																		x																							
Ammotium sp.	x	x																																							
Aschemonella-like sp.					x	X											x				x																				
Astrorhiza arenaria																																x				x		x			
Astrorhiza crassatina																																x	x	x							x
Bathyallogromia sp.			x	x	x	X	x		x				x	x	x	x		x		x	x		x	x	x	x		x	x	x		x	x	x		x	x	x			
Bathysiphon argenteus		x	x	x	x		x	x						x		x	x				x	x	x	x	x	x		x	x									x	x		x
Bathysiphon spp.						X								x		x		x			x	x	x					x				x	x					x			
Bolivina sp.	x																																								
Cassidulina spp.																												x									x	x	x		
Chitinosiphon sp.					x		x								x								x	x		x		x													
Cibicides sp.	x																																				x		x		
Cibicides wuellerstorfii					x			x	x	x		x							x		x			x	x	x					x		x								
Conqueria-like					x		x	x							x			x				x						x													
Cornuspira sp.				x									x						x				x	x	x				x		x										
Cribrostomoides subglob.					x			x										x	x		x		x	x	x	x	x				x	x	x	x					x		x
Crithionina hispida								x	x			x	x					x	x	x	x		x	x	x		x	x	x					x							
Crithionina-like sp.				x			x																		x	x															
Cylindrogullmia	x	x	x	x																												x						x			

	Storfjorden				AWI *Hausgarten*																		Yermak Plateau									Fram Strait				Greenland				HM	
	199	**202**	**206**	**211**	**238**	**242**	**248**	**250**	**251**	**252**	**256**	**260**	**261**	**267**	**268**	**271**	**272**	**273**	**274**	**275**	**276**	**277**	**314**	**317**	**318**	**320**	**321**	**322**	**323**	**325**	**326**	**328**	**331**	**338**	**341**	**343**	**352**	**357**	**367**	**370**	**371**
alba																																									
Elphidium spp.	x																															x						x	x	x	
Epistominella arctica							x	x						x				x				x	x					x	x			x	x				x				
Epistominella exigua					x		x	x	x				x	x		x		x	x	x	x	x	x	x				x					x				x	x			x
Eponides tumidulus					x		x	x	x				x					x		x		x	x																		
Fissurina spp.													x									x	x		x	x	x	x	x		x							x			
Globipelorhiza? sp.														x			x	x																							
Gloiogullmia-like	x																			x													x								
Gromia (opaque)																								x	x							x			x		x		x		
Gromia (elongate)	x	x						x									x			x	x					x						x			x	x					
Gromia spp.	x	x			x	X	x		x				x		x	x			x	x	x		x	x	x		x	x	x			x	x				x				
Hippocrepina crassa	x			x											x																										
Hippocrepina indivisa	x		x	x																																					
Hippocrepina sp.			x																																						
Hippocrepinella hirudinea																x	x				x	x	x	x	x							x				x		x			
Hormosina monile							x	x					x							x		x	x	x									x								
Hyperammina friabilis					x																											x									
Hyperammina sp.				x			x											x														x					x	x			
Islandiella norcrossi				x																	x			x	x		x		x			x				x	x	x	x	x	
Lagena gracillima																												x				x						x			
Lagenammina difflugiformis																								x								x						x			
Lagenammina sp.	x		x		x				x												x		x																x		
Lenticulina sp.																																					x				
Leptohalysis sp.		x	x																																						
Melonis sp.																																x					x				
Micrometula sp.		x																x				x	x								x		x								
Miliammina sp.	x			x																																		x			

	Storfjorden				AWI *Hausgarten*																		Yermak Plateau									Fram Strait				Greenland				HM	
	199	**202**	**206**	**211**	**238**	**242**	**248**	**250**	**251**	**252**	**256**	**260**	**261**	**267**	**268**	**271**	**272**	**273**	**274**	**275**	**276**	**277**	**314**	**317**	**318**	**320**	**321**	**322**	**323**	**325**	**326**	**328**	**331**	**338**	**341**	**343**	**352**	**357**	**367**	**370**	**371**
Miliolinella subrotunda																					x	x	x	x			x	x				x	x								
Nemogullmia-like sp.			x																				x																		
Nodellum membranaceum							x							x									x					x													
Nodellum sp.					x			x													x	x						x					x					x			
Nonionella labradorica	x			x																												x									
Normanina-like sp.							x																																		
Nummoloculina irregularis																										x	x	x	x		x				x	x			x		
Oridorsalis umbonatus					x		x	x	x				x						x	x	x		x		x														x		
Parafissurina groenlandica																x								x		x	x														
Parafissurina sp.					x		x	x										x		x		x																			
Pelosina-like						X																	x		x			x						x			x	x			x
Placopsilinella sp.					x																																				
Psammophaga sp.	x	x																																							
Psammosphaera (white)																									x		x	x													
Psammosphaera spp.													x							x	x			x									x	x		x	x	x	x		
Pullena bulloides																					x		x	x		x						x									
Pyrgo depressa					x		x	x	x																									x							x
Pyrgo elongata																																				x	x				
Pyrgo murrhyna					x		x	x	x																																
Pyrgo spp.	x			x			x						x			x		x	x	x				x	x	x	x				x					x					
Pyrgoella sphaera																													x		x							x	x		x
Quinqueloculina sp.														x																			x								
Radicula (?) sp.						X	x	x																																	
Reophax guttifer					x			x	x												x		x				x		x							x			x		
Reophax nodulosus	x																																								

	Storfjorden				AWI *Hausgarten*																		Yermak Plateau									Fram Strait				Greenland				HM	
	199	**202**	**206**	**211**	**238**	**242**	**248**	**250**	**251**	**252**	**256**	**260**	**261**	**267**	**268**	**271**	**272**	**273**	**274**	**275**	**276**	**277**	**314**	**317**	**318**	**320**	**321**	**322**	**323**	**325**	**326**	**328**	**331**	**338**	**341**	**343**	**352**	**357**	**367**	**370**	**371**
Reophax spp.	x	x	x				x		x							x		x		x			x	x			x		x				x			x		x		x	
Reophax subfusiformis		x		x												x			x		x		x		x	x	x	x	x		x		x			x	x		x		
Rhabdammina abyssorum																																x				x			x		
Rhizammina sp.														x									x		x	x	x	x			x										
Robertina arctica																							x				x											x	x		
Rupertia stabilis																														x	x										
Saccammina sp.	x																																								
Saccammina sphaerica																																			x	x					
Saccorhiza ramosa																							x	x	x		x	x	x									x	x		
Spirillina arctica																																						x			
Spiroplectammina sp.																																						x			
Stainforthia fusiformis	x		x		x		x	x											x		x	x	x										x					x			
Staphylion-like sp.																							x																		
Thurammina albicans																							x	x														x			
Tinogullmia sp.																													x								x	x	x		
Triloculina spp.		x																		x		x	x				x		x		x				x			x			
Uvigerina sp.																																x									
Vaginulopsis sp.																									x		x	x													
Vanhoeffenella sp.					x																x	x	x					x						x			x	x			
Vellaria-like sp.	x																																								
Virgulina sp.																x						x				x															
Unidentified:																																									
Arborescent foram																																x									
Black allogromiid sp.							x						x					x	x			x						x	x					x							
Flask-shaped white saccamminid 1																					x	x	x									x	x								

	Storfjorden				AWI *Hausgarten*																		Yermak Plateau									Fram Strait				Greenland				HM	
	199	**202**	**206**	**211**	**238**	**242**	**248**	**250**	**251**	**252**	**256**	**260**	**261**	**267**	**268**	**271**	**272**	**273**	**274**	**275**	**276**	**277**	**314**	**317**	**318**	**320**	**321**	**322**	**323**	**325**	**326**	**328**	**331**	**338**	**341**	**343**	**352**	**357**	**367**	**370**	**371**
Flask-shaped white saccamminid 2	x				x		x									x		x	x		x	x	x	x	x	x	x	x	x			x	x				x	x			
Fusiform allogromiid																																						x	x		
Komokiacean spp.											x			x									x									x									
Mudballs						X	x					x	x			x				x	x	x	x	x	x	x	x	x	x				x					x			
Unidentified allogromiids	x	x	x	x			x		x					x	x						x	x	x	x	x			x	x		x		x			x		x			
Unidentified golden saccamminids							x	x	x				x					x		x	x							x													
Unidentified silver saccamminids	x	x	x	x			x		x					x		x		x		x	x	x	x	x	x		x	x	x				x		x		x	x	x		
White Bathyallogromia																												x										x			
White allogromiid inside H. crassatina tubes																																	x								
White spherical saccam	x	x		x																																					

8. PALEOCEANOGRAPHY AND SEDIMENTARY PROCESSES OF DRIFT DEPOSITS IN THE FRAM STRAIT/YERMAK PLATEAU AREA

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Objectives

Studies of sediment drift deposits may give important information about changes in paleoclimate and paleoceanographic circulation patterns through time. During ARK-XX/2 (2004) major sediment drifts were documented in Parasound and multichannel seismic profiles from the Fram Strait/Yermak Plateau area (Stein, 2005). Unfortunately, no sediment cores could be obtained during this expedition. During ARK-XXI/1b, we had planned to revisit two of the sediment drift locations (Fig. 8.1, 8.2) to take long sediment cores and near-surface sediments. The exact location of these cores was known (see below). Thus, no additional time for a site survey was needed.

- Study of the history and formation processes of sediment drifts on the Yermak Plateau.
- Establishing of a stratigraphic framework including sediment cores, acoustic profiles and well-constrained chronology (e.g., AMS^{14}C and stable isotopes).
- High resolution reconstruction of the paleoclimatic and paleoceanographic circulation patterns in the Arctic gateway area, using sedimentological and geochemical methods.
- Study of past (bottom) water mass exchange between the Arctic and North Atlantic oceans.

Work at sea

In the two areas (Fig. 8.1, 8.2), a total of 13 geological stations were carried out (two gravity cores and one GKG per station). The water depths were between 820 and 1,200 m. Within the two working areas, the distance between the geological stations was between about 0.3 and 3 km.

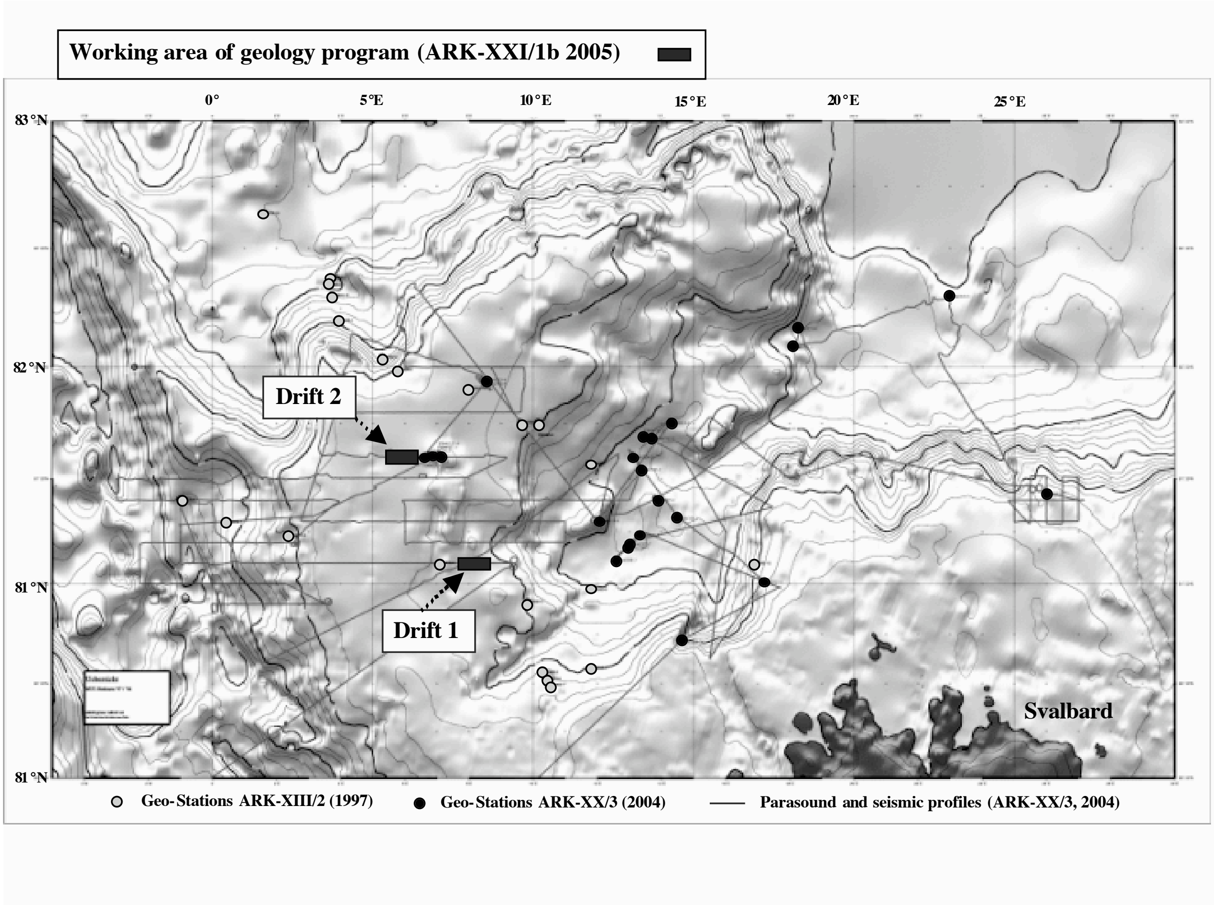

Fig. 8.1: Working area of ARK-XXI/1b geology programme. Geological stations (ARK-XIII/2 and ARK-XX/3) and Parasound/seismic profiles (ARK-XX/3) of previous RV *Polarstern expeditions are also shown (Stein and Fahl, 1997; Stein, 2005).*

Location of geological stations:

Latitude (N)	Longitude (E)	Station
81,100070	8,596360	drift-1-1
81,100290	8,511000	drift-1-2
81,100400	8,427480	drift-1-3
81,100430	8,364200	drift-1-4
81,100140	8,323590	drift-1-5
81,100220	8,303090	drift-1-6
81,100200	8,156590	drift-1-7

81,600180	6,167800	drift-2-1
81,600330	6,285490	drift-2-2
81,600380	6,390790	drift-2-3
81,600320	6,422080	drift-2-4
81,600240	6,464080	drift-2-5
81,600200	6,496150	drift-2-6

Geological Sampling, Description, and Methods Applied

Surface and near-surface sediment sampling

Surface and near-surface sediment sampling was carried out by using a giant box corer (GKG). The GKG (weight of ca. 900 kg; volume of sample 50*50*60 cm) was successfully used 12 times at 12 stations. From the box corer surface sediments and three sediment cores (diameter 12 cm) for (1) sedimentological, mineralogical, and geochemical studies, and (2) archiving were taken.

The following samples were obtained from the surface sediments:

10x10 cm^2	(100cc)	Coarse fraction/Isotopes
10x10 cm^2	(100cc)	Org. Geochemistry (to be deep-frozen onboard)
03x03 cm^2	(ca. 10 cc)	TOC
10x10 cm^2	(100cc)	Sedimentology
10x10 cm^2	(100cc)	Archive

Sampling of long sediment cores

Long sediment cores were taken by a gravity corer. The gravity corer (GC or "Schwerelot", SL) has a penetration weight of 1.5 t. It was successfully used in variable barrel lengths of 5, 8, 10 or 13 m at 13 stations (14 cores). The recovery of the gravity corer varied between 3.84 and 6.18 m, the penetration between 3.50 and 10.50 m.

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Stein, R. and Fahl, K. (Eds.), 1997. Scientific Cruise Report of the Arctic Expedition ARK-XIII/2 of RV *Polarstern* in 1997. Reps. Pol. Res 255, 235 pp.

9. CHARACTERIZATION OF THE MAIN WATER MASSES AND SEA ICE IN FRAM STRAIT WITH RESPECT TO PLUTONIUM ISOTOPES

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Introduction

Man-made radionuclides can be found all over the Nordic Seas and the Arctic Ocean (Pfirman et al. 1995, Cooper et al. 2000, Masqué et al. 2003). They mainly stem from three sources: global fallout from nuclear weapons testing which peaked at the beginning of the 1960s, the Chernobyl accident in 1986 and the continuing waterborne discharges from the large nuclear reprocessing plants in Sellafield (UK) and Cap de la Hague (France). For the Arctic proper, nearby fallout from the Novaya Zemlya test-site is of additional importance. Minor contamination comes from river runoff (e.g. Ob, Yenisei - all draining nuclear facilities further upstream), nuclear accidents at sea and the dumping of both solid low-level waste and complete nuclear reactors (Sholkovitz, 1983).

These radioactive releases into European coastal waters can be used as transient tracers for long-distance transport paths. One of the man-made elements that have found their way into the Nordic Seas and the marine Arctic is plutonium.

Plutonium is of particle-reactive behaviour and adsorbs easily onto particle surfaces like e.g. clay minerals. Still, a significant fraction of its activity released into the oceans has escaped the direct scavenging[1] into the marine sediments close to the discharge points and remains present in sea water in the dissolved phase.

Tab. 9.1: Isotopes of plutonium of interest in environmental samples.

Isotope	Half-life
^{238}Pu	87.7 years
^{239}Pu	24100 years
^{240}Pu	6560 years
^{241}Pu	14.4 years

[1] The combined process of adsorptive uptake by particles and subsequent transport into the sediment is often referred to as "scavenging".

Plutonium has a variety of isotopes that are of interest for environmental studies (Table 9.1). Their atomic ratios yield information on different sources and input terms, of which $^{240}Pu/^{239}Pu$ is the one determined most commonly. The half-lives of ^{239}Pu and ^{240}Pu are long enough to trace transport processes over several decades without loss attributed to radioactive decay. Dahlgaard (1995) gives average transit times of 3, 5, and up to 10 years for the North Sea, the Barents Sea and the East Greenland Current, respectively, calculated for Sellafield as the input source. The isotopic composition of plutonium, expressed as $^{240}Pu/^{239}Pu$ atomic ratios, is characteristic of its source regions.

Objectives

The primary goals of the sampling programme can be summarized as follows:

(a) Establish an input/output budget for plutonium in the Arctic Ocean. Plutonium from global fallout and the European reprocessing plants enters through Fram Strait and Barents Sea with more activity being added from sources in the Siberian Arctic. At the same time, scavenging processes alter the water signature.

(b) Identify the source regions of pollutants in Arctic sea ice, as revealed by atomic ratios of Pu, notably $^{240}Pu/^{239}Pu$.

(c) Investigate the role of sea ice sediments in "cleaning" the water column by enhancing the scavenging effect. It is likely that they have an important impact on the geochemistry of particle-reactive elements in the water column and their budgets in the underlying sediments.

These data will represent the first comprehensive compilation on Pu concentrations and their associated atomic ratios available for the waters leaving and entering Fram Strait.

The study will be accompanied by the analysis of two additional tracers for complementing information: ^{137}Cs and $^{210}Po/^{210}Pb$. ^{137}Cs is of anthropogenic origin and, in contrast to plutonium, yields a rather conservative behaviour as it is distributed by ocean currents. Analysis of ^{137}Cs can be performed on the same samples as those taken for plutonium, their separation being carried out by a series of precipitations.

$^{210}Po/^{210}Pb$ is a naturally occurring tracer pair often used to study particle dynamics in the water column. It provides information on scavenging processes taking place on the time scale of weeks to months and will help in the interpretation of the plutonium data.

Work at sea

In total, 49 samples of about 100 l each were taken during both legs, comprising 20 surface water samples, 18 intermediate and deep water samples taken from the CTD and 11 sea ice samples (Fig. 9.1). Samples will be further processed in the home laboratory by ion column chemistry and prepared for isotope and activity determinations. The isotopic composition of Pu will be determined by ICP-MS at the University of Frankfurt/M., Germany, and ^{137}Cs activities will be analyzed via gamma-counting at AWI or UAB.

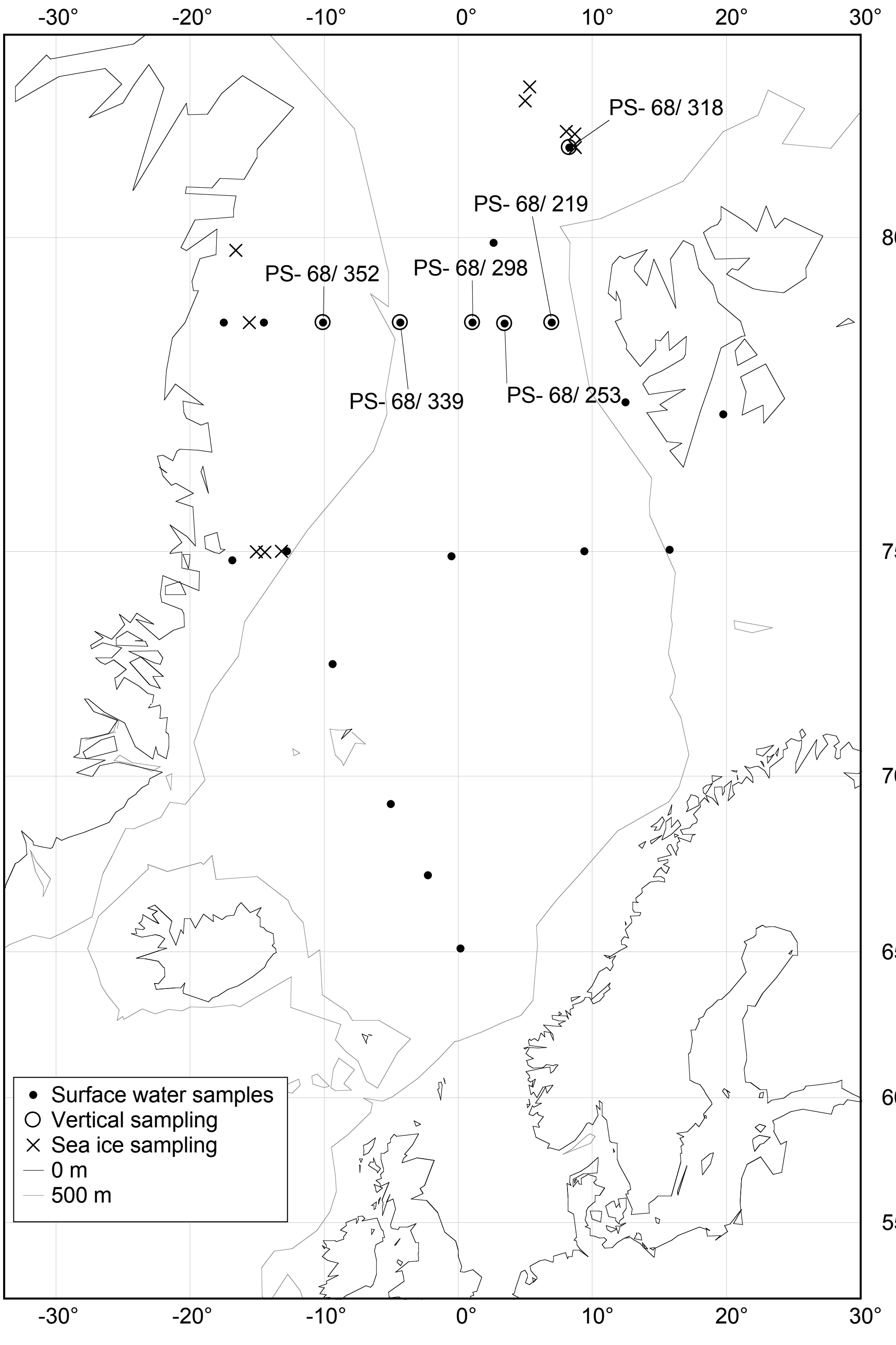
In addition, sediment cores were taken at selected sites for the analysis of the distribution of man-made radionuclides in the sediment (Fig. 9.2).

Sea water samples
About 100 l of unfiltered water were transferred into a plastic barrel and acidified with 32 % HCl. ^{242}Pu and ^{209}Po spikes as chemical yield tracers, an iron carrier solution ($FeCl_3$) and $PbCl_2$ were added under constant stirring. The pH was then raised to 9 with NaOH in order to precipitate the iron as $Fe(OH)_3$. This scavenges the plutonium and polonium onto the precipitate while cesium stays in solution.

The supernatant was then transferred into a second barrel while the precipitate was stored in plastic bottles for further processing at home. By addition of 65 % HNO_3, the pH was lowered again. A pre-weighed sample of ammonium molybdophosphate was then added while stirring thoroughly. This produced a yellow precipitate containing all the ^{137}Cs. The precipitate was left to settle and then transferred into smaller bottles.

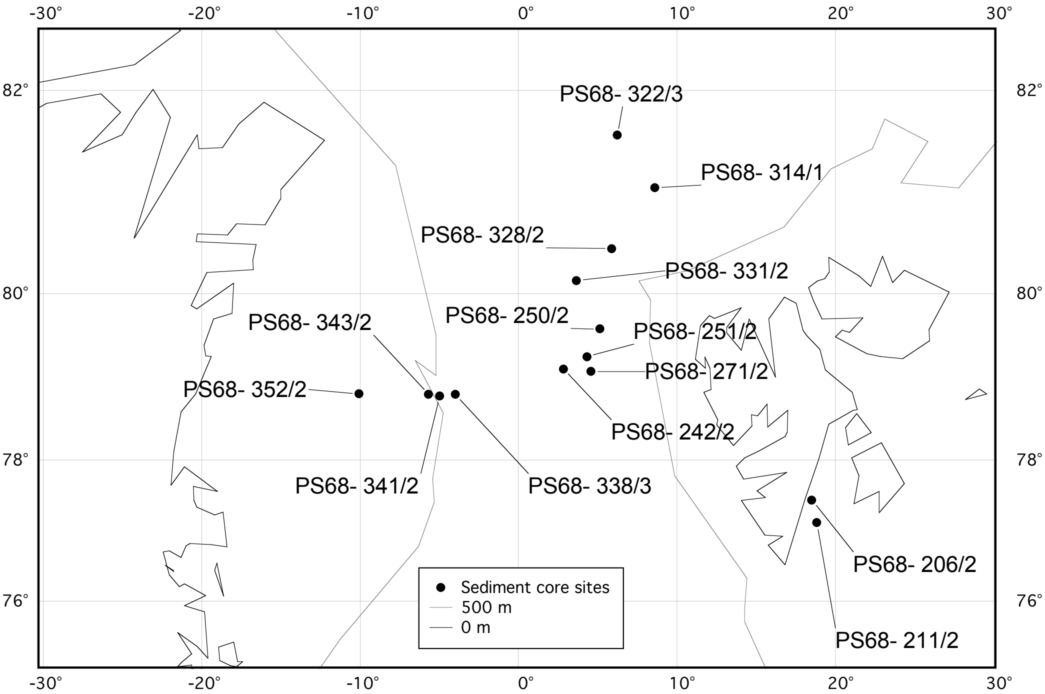
Sea ice samples
Sea ice samples were left in a barrel to melt completely. Further processing was identical to the procedure described for water samples.

Sediment cores
In total, 17 sediment cores were taken with the multicorer. The top first 5 cm were cut in slices every 0.5 cm and stored in the freezer at -30ºC.



Source: GEBCO.

Fig. 9.1:Sampling chart for the determination of Plutonium isotopes and ^{137}Cs in the Nordic Seas during expeditions ARK-XXI/1a+b



Source: GEBCO.

Fig. 9.2: Sampling chart for sediment cores

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10. CALIBRATION OF ALKENONES AND FORAMINIFERAL MG/CA PALEOTEMPERATURE PROXIES IN HIGH LATITUDES

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Introduction

Marine heat transport processes are paramount in Earth's climate as they distribute energy around the globe. Sea surface temperatures (SST) fluctuations are thus critical to understand how heat is distributed, and their reconstruction in marine paleoclimatology is the key to assessing the variability of heat transport processes through time. Consequently, validation and calibration of inorganic and organic geochemical "proxy" approaches with modern observations and environmental data is a very high priority.

As the upper 3 m of the ocean contain as much heat as the entire atmosphere, the temperature of the upper ocean is probably the most important variable in the earth's climate system. It regulates ocean-atmosphere heat exchange, formation of pressure gradients and wind fields, as well as formation and circulation of water masses that comprise the oceanic thermohaline circulation (THC). Consequently, this important property is involved in both surface and deep oceanic circulation, as well as heat transport around the globe, and therefore the state of global climate as a whole. In the modern environment, it can basically be argued that upper ocean temperature modulates global weather. In the science of paleoceanography, SST reconstruction is therefore of paramount importance, especially in the context of the role of the surface ocean in past climate change, and particularly at rapid timescales approaching those of human generations. Precision in past SST reconstruction is also vital to improving the accuracy of numerical simulations of past climate through general circulation models (GCMs), which represent the best opportunity to address the extent and impact of anthropogenically forced climate change, but also require stringent testing by close comparison to quantitative SST reconstruction via proxy data. SST of past oceans is also linked to productivity and organic carbon burial, mostly through the process of upwelling where cold and nutrient-rich waters from intermediate depths advect upward into the photic zone of the surface ocean.

Past SST reconstruction requires the use of "proxy systems" to accurately decode the climate system in quantitative ways. Our scientific understanding of climate evolution thus critically depends on the accuracy and reliability of such proxies to capably record and preserve the changing climate variables. Given that our field of science places so much emphasis on past ocean/climate parameter reconstruction, we stand to benefit from using modern environments more as a means to "validate" our methods, especially since we have the luxury of instruments and direct observations of *in-situ* parameters only for this timeframe.

State of the art

Trace elements in planktonic foraminiferal shells

The paleoceanographic community is currently focusing on the trace element composition (primarily Mg/Ca) of planktonic foraminifera as a proxy of upper water column temperature. Exponential relationships of foraminiferal Mg/Ca to calcification temperature (derived from $\delta^{18}O$) in both core-top sediments and sediment trap samples, as well as measured temperature in culture studies, have demonstrated potential promise for this geochemical "paleothermometer". The problem is that none of these approaches actually calibrates this system in the environment in which planktonic foraminifera live and calcify their shells, the upper several hundred meters of the ocean water column. Sediment traps are generally moored well below the base of the production depths, and core-top sediments are generally 1000's of meters below the surface. With each of these approaches, calcification temperature must be estimated with $\delta^{18}O$ and assumptions of isotopic equilibrium, which have been questionable for some time and references therein. Culture studies certainly circumvent many of these problems, but they are performed in artificial environments.

Alkenones

Over the last decade, the alkenone unsaturation index U^K_{37}' has been widely adopted by palaeoceanographers as a proxy to estimate past SSTs. This index measures the relative abundance of the di- and tri-unsaturated C_{37} alkenones ($C_{37:2}$, $C_{37:3}$).

$$U^{K}_{37'} = \frac{C_{37:2}}{C_{37:2} + C_{37:3}}.$$

Since it was first demonstrated that alkenone abundance ratios in sediments changed in a systematic way with inferred temperature, a great deal of research has been conducted with the aim of confirming and calibrating this relationship, expressed as the U^K_{37}. The general temperature dependent nature of the relative abundance of the $C_{37:2}$ and $C_{37:3}$ alkenones has been confirmed by culture, surficial sediment and water column particulate organic matter (POM) studies.

The initial U^K_{37}' - SST calibration derived from a culture of *E. huxleyi* (N.E. Pacific strain) by Prahl and Wakeham shows a clear linear relationship between U^K_{37}' and temperature in the range of 8 – 25º C. Interestingly, this linear regression equation is statistically the same as a regression between U^K_{37}' measured in global (60º N – 60º S) sediment core-tops and ocean-atlas mean annual SSTs.

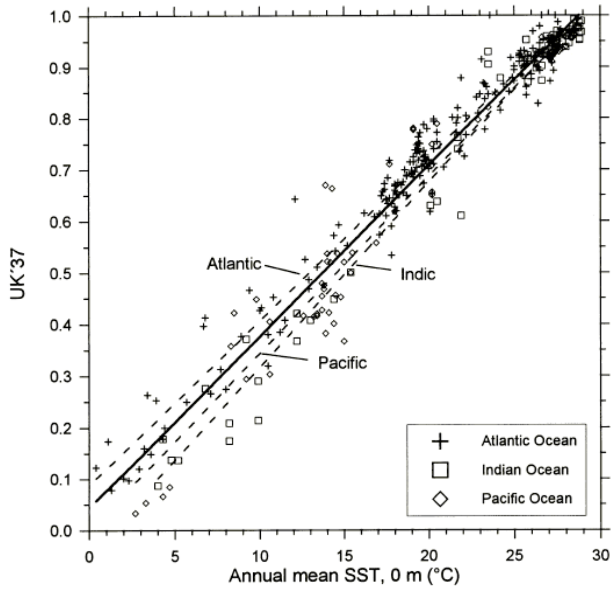


Fig. 10.1: Global core top calibration of U^K_{37}' index measured in surface sediment to mean annual SST

Moreover, it appears that values of U^K_{37}' – once set biogeochemically by the algae – are not significantly altered by degradation in sedimentary processes. Therefore, U^K_{37}' when measured in most modern sediments throughout the world ocean can be converted into realistic, seemingly reliable estimates of mean annual temperature at the sea surface (SST). However, despite such positive results, the application of alkenone indices are not devoid of uncertainties. A number of recent studies highlight a degree of nonlinearity in the relationship of alkenones to SST at high (> 25º C) and low (<8º C) temperature extremes. Therefore it is apparent that in certain contexts or regions absolute temperatures derived from the "recommended" Prahl & Wakeham or Muller et al. equations are unrealistic. In the Nordic Seas SST Index are subject to increasing error when the present SST falls below 6º C.

This is frustrating for palaeoceanographic investigations, as the cold water regions of the Nordic Seas play a key role in the production of deep water masses, and in the wider global meridional overturning circulation (MOC). Therefore, further investigation of alkenone distributions in the Nordic seas surface waters is necessary, as previous North Atlantic water column studies have reported no or very few results from the Arctic and Polar water masses.

Objectives

The primary goals of the sampling programme can be summarized as follows:

- To study the spatial variability of the concentration and distribution of algal lipids, namely alkenones, and coccolithophores across the main water domains in the Nordic Seas, and paying special attention to the transitions across the Arctic and Polar fronts.

- To refine planktonic foraminiferal-based geochemical proxies (Mg/Ca and Sr/Ca ratios) against temperature and potentially other variables (especially nutrient availability).

- To improve and validate the calibration of these proxy systems to reconstruct SST in high latitude oceanic settings.

Work at sea

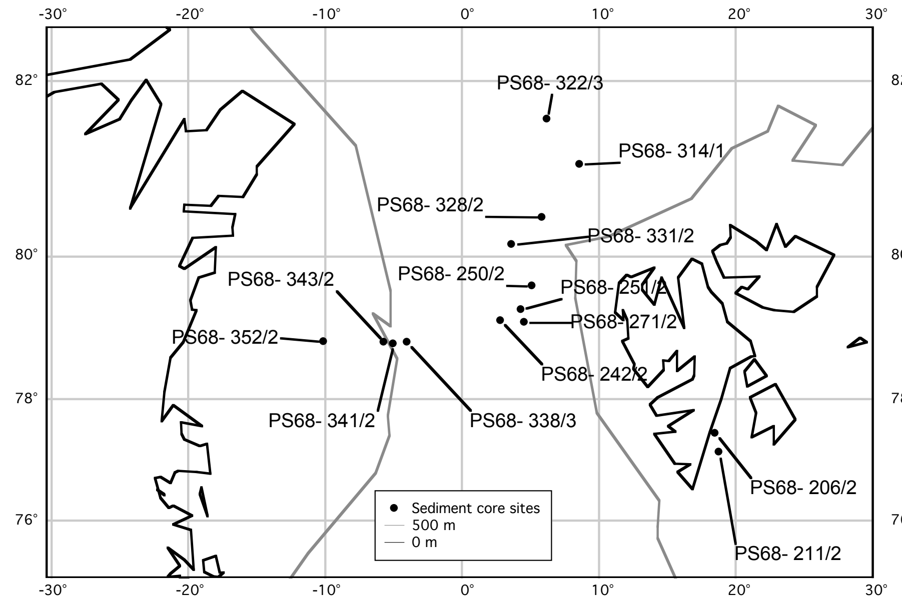
During ARK-XXI/ 1 a+b, a set of samples of planktonic foraminifera and coccolitophores were successfully taken from the ship's sea water supply, covering a big range of sea water conditions (temperature, salinity, nutrients) (Fig. 10.3). The method used has enabled to sample large volumes of water along different water masses in the Nordic Seas, paying special attention to the transition across the Arctic and Polar Fronts.

In total, 150 plankton samples were filtered:

- 50 samples of phytoplankton for alkenones and coccolithofores identification and alkenones analysis.
- 100 samples of zooplankton for trace elements analysis.

Samples will be further processed in the home laboratory by GCMS (Gas Cromatography Mass Spectrometer) and ICP-MS (Inductively Coupled Plasma Mass Spectometry).

In addition, 17 sediment cores were taken at selected sites for the analysis of the alkenones and planktonic shells in the core-tops in order to improve the reliability of the calibration by comparison with water column data.



Source: GEBCO.

Fig. 10.2: Sampling chart for sediment cores

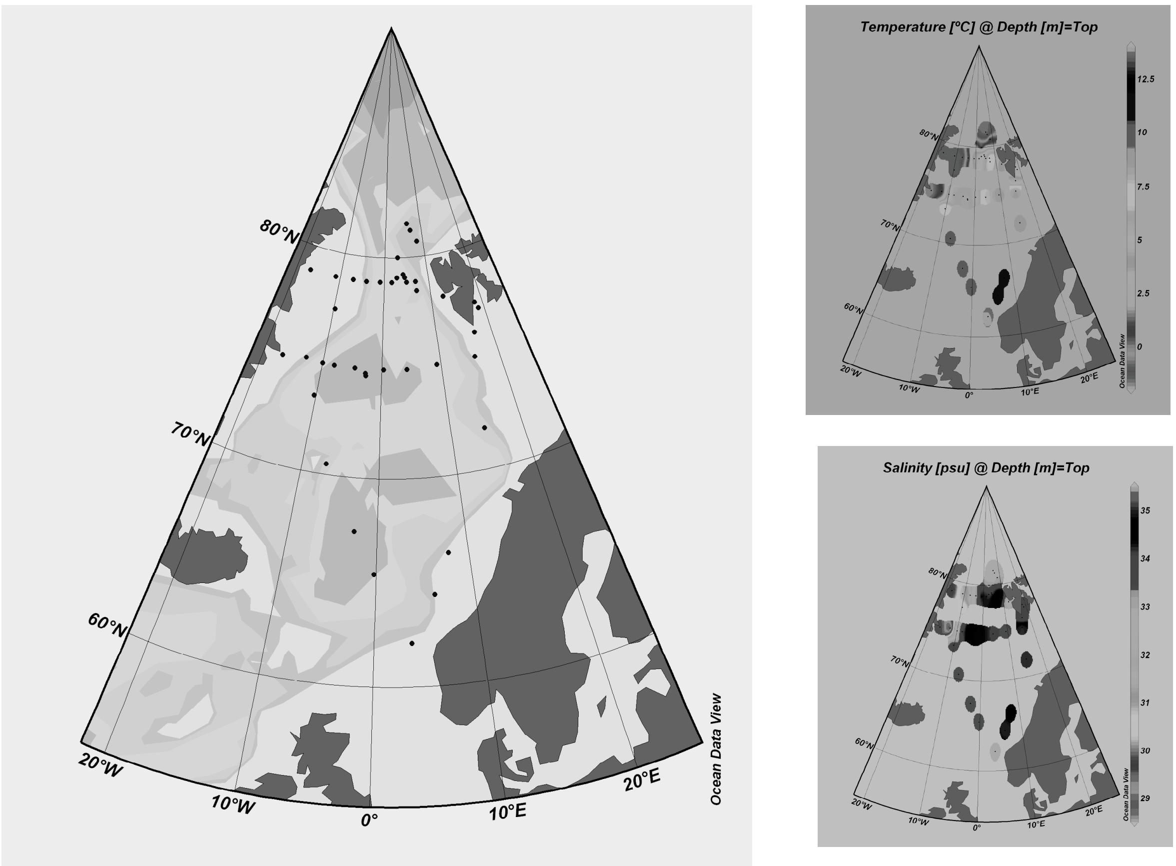


Fig. 10.3: Sampling points for alkenones and coccolitophores, and its respective salinity and temperature data

11. QUANTIFICATION OF HIGHER TROPHIC LEVELS

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Objectives

This work's objective was to quantify the at-sea distribution of seabirds and marine mammals in the Greenland Sea, as a function of the main water masses (Atlantic water, polar water, pack ice), identified on the base of hydrological parameters (water temperature, salinity), and of front structures between water masses and the ice edge.

Work at sea

During the ARK-XXI/1b cruise leg, transect counts of seabirds and marine mammals were realized from the bridge of the RV *Polarstern* while the ship was steaming. (Counting while the ship is moving minimizes the interactions between the ship and the birds; at stations, the ship can attract seabirds from an unknown range.) A total of 605 half-hour counts were realized. Two counts by helicopter were also realized near the ice edge, on 4 and 10 September 2005; these two counts concerned mainly mammals.

Preliminary Results

The most numerous encountered seabirds were Fulmar, Kittiwake, Little Auk, Ivory Gull and Brünnich's Guillemot (the latter was however absent from the ice edge west of the Fram Strait, although this might have been due to the rather late date at which we visited this area). Other seabirds present in significant numbers included Ross's Gull, Glaucous Gull, Arctic Tern, Black Guillemot, Puffin, and Arctic, Pomarine, Long-tailed and Great Skua. Two Gyrfalcons (of the Greenland white morph) were also observed in the pack ice, one on the Yermak Plateau, and the other near Greenland.

Clear structures in the distribution of birds and seals appeared along the 78°50'N transect, along the way to and from the Yermak Plateau, and along the way from Greenland to the Håkon Mosby Mud Volcano (i.e., each time we crossed the ice edge). The distributions of selected species along the 78°50'N transect are presented as graphs at the end of this report. In the pack ice itself, the most numerous species was Ivory Gull; this species disappeared away from the ice (see Fig. 11.1). Concentrations of seals (mainly Harp and Hooded) occurred in the outer marginal ice zone (OMIZ), where polar bears were also encountered (see Fig. 11.2). Ross's Gulls occurred near the ice edge and (in small numbers), in the pack ice itself (see Fig. 11.3). Large numbers of feeding Little Auks were present in the OMIZ on the way from Greenland to the Håkon Mosby Mud Volcano, but were not detected near the other ice edges that we crossed (along the 78°50'N transect, they occurred mainly in the central part of Farm Strait – see Fig.11.4). Fulmars and Kittiwakes occurred mainly in open waters, though a few were also present in the pack ice (see Fig. 11.5 and 11.6).

Small groups of dolphins, both white-beaked and white-sided, were seen around Svalbard, and another group of 3 white-sided was observed off the Norwegian coast, while steaming back to Germany. Pods of Minke and Fin Whales were seen on several occasions, principally around Svalbard, along the eastern portion of the 78°50'N transect and further north, near the Yermak Plateau. Along the transect, eight baleen whales were also seen at a longitude more or less comparable to that where a huge feeding ground had been observed further south, during the first leg of the cruise, but no very large concentrations could be detected. A sperm whale could be observed while we were leaving Svalbard for the second part of the cruise leg. Lastly, a pod of 7 Northern Bottlenose Whales was seen at 75°31'N at 1°38'W, south-west of the Greenland pack ice. In the same general area, a very probable Blue Whale was also observed.

The number of animals obtained during these counts (raw data) will be converted into densities by using conversion factors depending on the conspicuousness of each species, and by taking into account the distance covered by the ship during each count. The density data will then be expressed as daily food intake and placed into an ecological perspective, taking into account the hydrological parameters that were recorded during the counts. They will also be compared to other similar counts that have already been performed in the Arctic, since 1973, as part of a long-term study concerning Polar regions.

Unexpected observations: at least two Sooty Shearwater, a southern hemisphere breeding species that winters in the northern oceans, and that usually does not occur north of Iceland, were observed near Svalbard (this species had also been detected on two occasions during the first cruise leg).

On two occasions, more southern land birds (a Lesser Whitethroat and a Turtle Dove) were found on the ship. Both birds were juveniles; they were probably reverse migrants (birds migrating in a direction opposite to their normal migration path).

Distribution of selected species along the 78°50'N transect (number of individuals observed per half-hour count as a function of longitude) are displayed in figures 11.1 to 11.6.

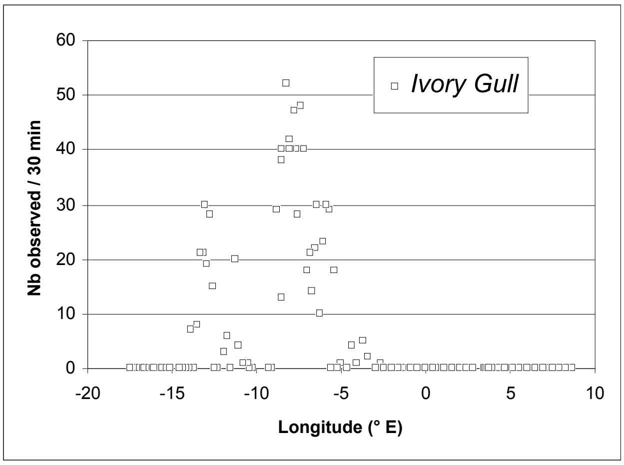

Fig. 11.1: Ivory Gull

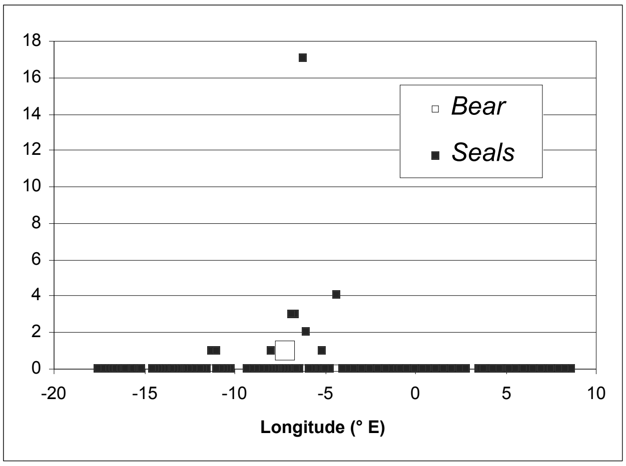

Fig. 11.2: Seals (Harp and Hooded), and Polar Bear

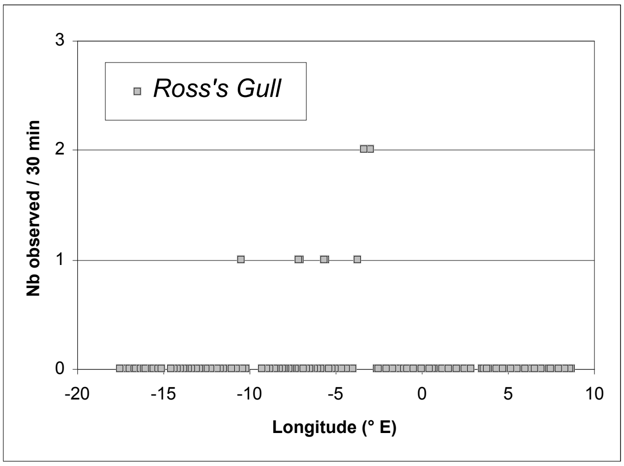

Fig. 11.3: Ross's Gull

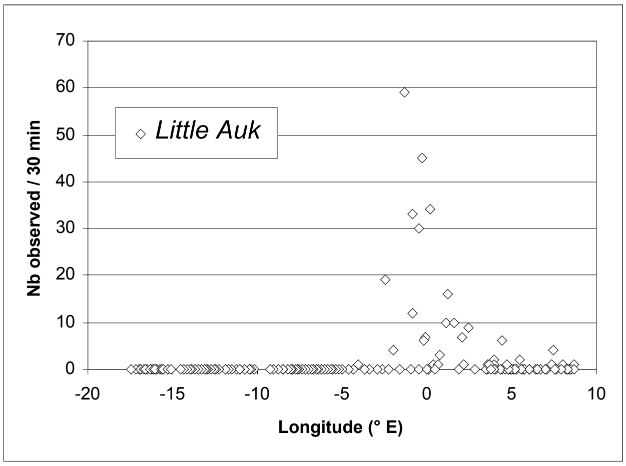

Fig. 11.4: Little Auk

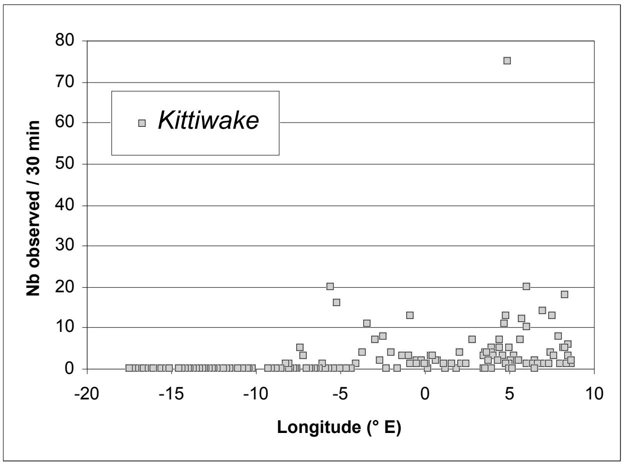

Fig. 11.5: Kittiwake

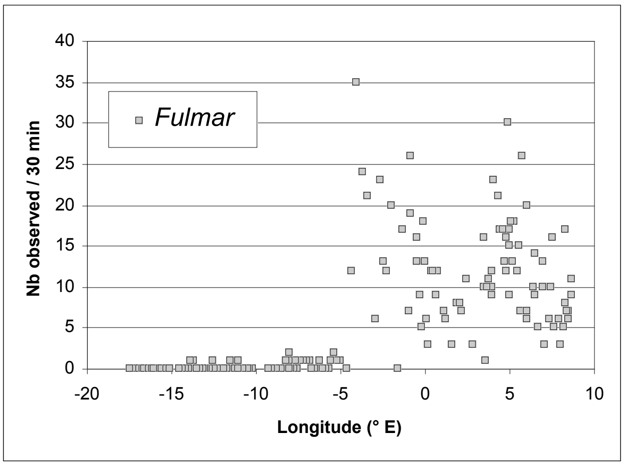

Fig .11.6: Fulmar

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Schütt	Ekkehard	AWI	Technician
Schwarz	Jill	AWI	Scientist
Sonnabend	Hartmut	DWD	Technician
Stimac	Mihael	HeliTransair	Inspector
Strüfing	Reinhard	DWD	Meteorologist
Vöge	Ingrid	AWI	CTA
Vogel	Ines	AWI	Technician
Volkenandt	Mareike	AWI	Student
Wegner	Jan	AWI	Meteorologist
Wisotzki	Andreas	AWI	Oceanographer
Wolff	Marthi	AWI	Technician

14. SCHIFFSBESATZUNG / SHIP'S CREW

No.	Name	Rank
1.	Schwarze, Stefan	Master
2.	Grundmann, Uwe	1.Offc.
3.	Farysch, Bernd	Ch.Eng.
4.	Fallei, Holger	2. Offc.
5.	Peine, Lutz G.	2.Offc.
6.	Wunderlich, Thomas	3.Offc.
7.	Uhlig, Heinz-Jürgen	Doctor
8.	Hecht, Andreas	R.Offc.
9.	Erreth, Monostori G.	1.Eng.
10.	Minzlaff, Hans-Ulrich	3.Eng.
11.	Sümnicht, Stefan	3.Eng.
12.	Scholz, Manfred	ElecEng.
13.	Fröb, Martin	ELO
14.	Muhle, Helmut	ELO
	Nasis, Ilias	ELO
15.	Schulz, Harry	ELO
16.	Loidl, Reiner	Boatsw.
17.	Reise, Lutz	Carpenter
18.	Bäcker, Andreas.	A.B.
19.	Guse, Hartmut	A.B.
20.	Hagemann, Manfred	A.B.
21.	Hartwig-Lab., Andreas	A.B.
22.	Lamm, Gerd	A.B.
23.	Schmidt, Uwe.	A.B.
24.	Vehlow, Ringo	A.B.
25.	Winkler, Michael	A.B.
26.	Preußner, Jörg	Storek.
27.	Elsner, Klaus	Mot-man
28.	Grafe, Jens	Mot-man
29.	Hartmann, Ernst-Uwe	Mot-man
30.	Ipsen, Michael	Mot-man
31.	Vov. Bernd	MotMan
32.	Müller-Homburg, R.-D.	Cook
33.	Silinski, Frank	Cooksmate
34.	Völske, Thomas	Cooksmate
35.	Jürgens, Monika	1.Stwdess
36.	Wöckener, Martina	Stwdss/Kr
37.	Czyborra, Bärbel	2.Stwdess
38.	Gaude, Hans-Jürgen	2.Steward
39.	Huang, Wu-Mei	2.Steward
40.	Möller, Wolfgang	2.Stwdess
41.	Silinski, Carmen	2.Steward
42.	Yu, Chung Leung	Laundrym.
43.	Miller, Christina	Trainee.

A.1 STATION LIST

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/185-1	14.08.05	02:37	77° 5,19' N	13° 52,04' E	113,2	CTD/RO
PS68/186-1	14.08.05	06:38	76° 35,77' N	15° 40,62' E	33,6	CTD/RO
PS68/187-1	14.08.05	07:36	76° 32,17' N	15° 22,75' E	126,4	CTD/RO
PS68/188-1	14.08.05	08:49	76° 27,20' N	15° 0,03' E	227,6	CTD/RO
PS68/189-1	14.08.05	12:26	76° 11,52' N	16° 55,92' E	290,0	CTD/RO
PS68/190-1	14.08.05	13:45	76° 16,80' N	16° 55,78' E	207,2	CTD/RO
PS68/191-1	14.08.05	14:55	76° 22,94' N	16° 56,38' E	61,2	CTD/RO
PS68/192-1	14.08.05	19:45	76° 50,17' N	19° 2,44' E	119,2	CTD/RO
PS68/193-1	14.08.05	20:40	76° 49,56' N	19° 17,79' E	142,8	CTD/RO
PS68/194-1	14.08.05	21:32	76° 49,55' N	19° 30,23' E	162,0	CTD/RO
PS68/195-1	14.08.05	22:16	76° 49,95' N	19° 43,19' E	160,8	CTD/RO
PS68/196-1	14.08.05	23:32	76° 49,99' N	20° 22,59' E	129,2	CTD/RO
PS68/197-1	15.08.05	00:21	76° 54,86' N	20° 20,97' E	127,6	CTD/RO
PS68/198-1	15.08.05	01:36	77° 4,81' N	20° 22,52' E	92,8	CTD/RO
PS68/199-1	15.08.05	03:47	77° 13,16' N	20° 27,42' E	87,6	CTD/RO
PS68/199-2	15.08.05	04:05	77° 13,18' N	20° 27,35' E	86,8	MUC
PS68/200-1	15.08.05	05:02	77° 19,60' N	20° 15,14' E	98,8	CTD/RO
PS68/201-1	15.08.05	06:08	77° 25,93' N	20° 28,57' E	72,4	CTD/RO
PS68/202-1	15.08.05	07:58	77° 34,59' N	20° 33,35' E	71,6	CTD/RO
PS68/202-2	15.08.05	08:19	77° 34,61' N	20° 33,82' E	69,2	MUC
PS68/203-1	15.08.05	09:14	77° 37,75' N	20° 24,72' E	93,6	CTD/RO
PS68/204-1	15.08.05	11:07	77° 31,09' N	19° 26,09' E	154,8	CTD/RO
PS68/205-1	15.08.05	11:58	77° 29,89' N	19° 9,50' E	186,4	CTD/RO
PS68/206-1	15.08.05	13:17	77° 27,43' N	18° 32,01' E	105,6	CTD/RO
PS68/206-2	15.08.05	13:40	77° 27,52' N	18° 32,03' E	104,8	MUC
PS68/207-1	15.08.05	15:39	77° 26,19' N	19° 47,26' E	137,2	CTD/RO
PS68/208-1	15.08.05	17:07	77° 16,15' N	19° 59,93' E	133,2	CTD/RO
PS68/209-1	15.08.05	18:19	77° 15,12' N	19° 32,02' E	176,0	CTD/RO
PS68/210-1	15.08.05	19:18	77° 11,95' N	19° 16,80' E	172,0	CTD/RO
PS68/211-1	15.08.05	20:24	77° 8,99' N	18° 49,62' E	124,8	CTD/RO
PS68/211-2	15.08.05	20:46	77° 8,94' N	18° 50,28' E	124,4	MUC
PS68/212-2	16.08.05	22:22	78° 50,11' N	8° 59,91' E	218,7	SD
PS68/212-1	16.08.05	22:26	78° 50,09' N	9° 0,04' E	220,8	CTD/RO
PS68/212-3	16.08.05	23:26	78° 49,92' N	9° 0,73' E	219,8	CTD/RO
PS68/213-2	17.08.05	00:09	78° 50,02' N	8° 50,47' E	242,6	SD
PS68/213-1	17.08.05	00:17	78° 50,03' N	8° 50,63' E	245,7	CTD/RO
PS68/214-2	17.08.05	01:04	78° 50,57' N	8° 39,76' E	233,1	SD
PS68/214-1	17.08.05	01:12	78° 50,63' N	8° 39,68' E	235,2	CTD/RO
PS68/215-1	17.08.05	02:39	78° 50,00' N	8° 29,99' E	583,6	CTD/RO
PS68/215-1	17.08.05	05:25	78° 50,04' N	8° 39,76' E	249,2	CTD/RO

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/216-1	17.08.05	05:54	78° 50,06' N	8° 39,76' E	249,2	MOR
PS68/216-1	17.08.05	06:21	78° 49,93' N	8° 39,85' E	250,5	MOR
PS68/216-2	17.08.05	06:34	78° 49,95' N	8° 39,92' E	249,6	CTD/RO
PS68/216-2	17.08.05	06:37	78° 49,95' N	8° 39,86' E	249,4	CTD/RO
PS68/216-3	17.08.05	06:56	78° 49,93' N	8° 39,80' E	250,7	MOR
PS68/216-3	17.08.05	07:25	78° 49,95' N	8° 39,85' E	250,0	MOR
PS68/217-1	17.08.05	08:05	78° 50,25' N	8° 20,12' E	786,4	MOR
PS68/217-1	17.08.05	08:11	78° 50,24' N	8° 20,18' E	786,0	MOR
PS68/217-1	17.08.05	08:12	78° 50,24' N	8° 20,19' E	785,6	MOR
PS68/217-2	17.08.05	08:17	78° 50,24' N	8° 20,22' E	785,2	CTD/RO
PS68/217-2	17.08.05	08:22	78° 50,29' N	8° 20,25' E	783,2	CTD/RO
PS68/217-1	17.08.05	08:38	78° 50,14' N	8° 19,80' E	795,6	MOR
PS68/217-1	17.08.05	08:59	78° 50,16' N	8° 19,94' E	792,4	MOR
PS68/217-3	17.08.05	09:04	78° 50,16' N	8° 19,96' E	792,4	CTD/RO
PS68/217-3	17.08.05	09:12	78° 50,11' N	8° 20,17' E	789,2	CTD/RO
PS68/217-4	17.08.05	09:27	78° 50,28' N	8° 19,90' E	0,0	PIES
PS68/217-4	17.08.05	09:57	78° 50,31' N	8° 20,10' E	0,0	PIES
PS68/217-4	17.08.05	10:12	78° 50,18' N	8° 19,82' E	794,0	PIES
PS68/218-1	17.08.05	10:45	78° 50,40' N	8° 0,35' E	1030,8	MOR
PS68/218-1	17.08.05	10:49	78° 50,40' N	8° 0,43' E	0,0	MOR
PS68/218-1	17.08.05	10:50	78° 50,40' N	8° 0,45' E	0,0	MOR
PS68/218-2	17.08.05	10:58	78° 50,44' N	8° 0,75' E	1028,0	CTD/RO
PS68/218-1	17.08.05	11:17	78° 50,36' N	8° 0,34' E	1030,8	MOR
PS68/218-1	17.08.05	11:43	78° 50,39' N	8° 1,22' E	1024,0	MOR
PS68/219-1	17.08.05	13:06	78° 50,36' N	7° 0,70' E	1447,6	MOR
PS68/219-1	17.08.05	14:05	78° 50,36' N	7° 2,13' E	1432,4	MOR
PS68/219-2	17.08.05	14:50	78° 50,10' N	7° 0,44' E	1451,2	CTD/RO
PS68/220-2	17.08.05	17:31	78° 49,98' N	5° 39,89' E	2575,6	SD
PS68/220-1	17.08.05	17:45	78° 49,98' N	5° 39,81' E	2576,0	CTD/RO
PS68/221-1	17.08.05	19:52	78° 50,52' N	6° 0,08' E	2473,2	CTD/RO
PS68/221-2	17.08.05	20:08	78° 50,57' N	6° 0,09' E	2473,6	SD
PS68/222-1	17.08.05	21:44	78° 50,07' N	6° 20,35' E	2180,0	CTD/RO
PS68/223-1	17.08.05	23:26	78° 50,12' N	6° 39,27' E	1790,0	CTD/RO
PS68/224-1	18.08.05	01:07	78° 50,22' N	7° 0,00' E	1453,6	CTD/RO
PS68/225-1	18.08.05	02:32	78° 50,06' N	7° 20,15' E	1233,6	CTD/RO
PS68/226-1	18.08.05	03:50	78° 49,98' N	7° 40,14' E	1105,6	CTD/RO
PS68/227-1	18.08.05	05:09	78° 50,27' N	8° 0,06' E	1032,8	CTD/RO
PS68/228-1	18.08.05	06:16	78° 49,93' N	8° 11,97' E	914,0	CTD/RO
PS68/229-1	18.08.05	07:18	78° 50,13' N	8° 19,56' E	800,0	CTD/RO
PS68/229-2	18.08.05	07:49	78° 50,14' N	8° 19,64' E	798,4	MOR
PS68/229-2	18.08.05	08:26	78° 50,14' N	8° 19,64' E	798,8	MOR
PS68/230-1	18.08.05	09:02	78° 49,86' N	8° 29,44' E	598,4	CTD/RO
PS68/231-1	18.08.05	09:45	78° 50,38' N	8° 39,86' E	237,6	CTD/RO

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/232-1	18.08.05	10:36	78° 50,41' N	8° 19,66' E	790,0	PIES
PS68/232-1	18.08.05	10:41	78° 50,39' N	8° 19,40' E	794,4	PIES
PS68/232-1	18.08.05	10:46	78° 50,37' N	8° 19,49' E	794,0	PIES
PS68/232-1	18.08.05	10:50	78° 50,37' N	8° 19,52' E	792,8	PIES
PS68/232-1	18.08.05	11:01	78° 50,21' N	8° 19,86' E	792,4	PIES
PS68/233-1	18.08.05	12:11	78° 50,32' N	7° 59,58' E	1037,6	MOR
PS68/233-1	18.08.05	12:54	78° 50,32' N	7° 59,52' E	1038,0	MOR
PS68/234-1	18.08.05	14:10	78° 50,16' N	7° 0,08' E	1454,0	MOR
PS68/234-1	18.08.05	15:06	78° 50,18' N	7° 0,14' E	1453,2	MOR
PS68/235-1	18.08.05	16:28	78° 49,82' N	6° 0,35' E	2465,6	MOR
PS68/235-1	18.08.05	17:39	78° 50,14' N	6° 0,55' E	2465,6	MOR
PS68/236-1	18.08.05	19:14	78° 49,58' N	5° 0,87' E	0,0	PIES
PS68/236-1	18.08.05	20:07	78° 49,51' N	5° 0,87' E	2689,2	PIES
PS68/236-1	18.08.05	20:21	78° 49,64' N	5° 1,11' E	2688,8	PIES
PS68/236-2	18.08.05	21:29	78° 50,39' N	5° 2,62' E	2696,4	CTD/RO
PS68/236-3	18.08.05	22:00	78° 50,40' N	5° 2,16' E	2700,8	SD
PS68/237-1	18.08.05	23:45	78° 50,22' N	5° 18,02' E	2635,6	CTD/RO
PS68/237-2	19.08.05	00:01	78° 50,29' N	5° 18,21' E	2636,4	SD
PS68/238-2	19.08.05	02:59	79° 3,92' N	4° 10,27' E	2468,8	SD
PS68/238-1	19.08.05	03:30	79° 3,91' N	4° 10,29' E	2468,8	CTD/RO
PS68/238-3	19.08.05	05:08	79° 3,91' N	4° 10,81' E	2462,4	MUC
PS68/238-5	19.08.05	06:45	79° 4,68' N	4° 6,78' E	2494,8	LANDER
PS68/238-5	19.08.05	07:25	79° 4,59' N	4° 6,12' E	2504,0	LANDER
PS68/238-5	19.08.05	08:03	79° 4,82' N	4° 4,92' E	2511,2	LANDER
PS68/238-4	19.08.05	08:16	79° 4,55' N	4° 6,52' E	2504,4	LANDER
PS68/239-1	19.08.05	08:45	79° 3,32' N	4° 18,78' E	2434,8	LANDER
PS68/240-1	19.08.05	09:19	79° 0,81' N	4° 20,51' E	2590,8	MOR
PS68/240-1	19.08.05	09:20	0° 0,00' N	0° 0,00' E	0,0	MOR
PS68/240-1	19.08.05	09:44	79° 0,96' N	4° 20,56' E	2584,8	MOR
PS68/240-1	19.08.05	10:52	79° 0,82' N	4° 19,03' E	2596,8	MOR
PS68/241-1	19.08.05	11:34	79° 4,72' N	4° 5,33' E	2512,0	LANDER
PS68/241-1	19.08.05	12:17	79° 4,68' N	4° 4,67' E	2520,0	LANDER
PS68/241-1	19.08.05	12:58	79° 4,99' N	4° 5,62' E	2497,6	LANDER
PS68/242-1	19.08.05	15:59	79° 7,97' N	2° 50,61' E	5570,0	CTD/RO
PS68/242-2	19.08.05	19:49	79° 8,01' N	2° 50,54' E	5570,8	MUC
PS68/243-1	19.08.05	23:22	79° 5,61' N	3° 7,86' E	5404,8	LANDER
PS68/244-1	20.08.05	01:24	79° 3,91' N	3° 20,58' E	5062,4	CTD/RO
PS68/244-2	20.08.05	04:33	79° 3,93' N	3° 20,81' E	5200,4	MUC
PS68/245-1	20.08.05	08:05	79° 3,79' N	4° 10,63' E	2471,6	CTD/RO
PS68/246-1	20.08.05	08:21	79° 3,75' N	4° 10,82' E	2472,8	LANDER
PS68/239-1	20.08.05	08:45	79° 3,54' N	4° 17,42' E	2433,2	LANDER
PS68/239-1	20.08.05	09:33	79° 3,10' N	4° 19,64' E	2447,6	LANDER
PS68/239-1	20.08.05	09:45	79° 3,16' N	4° 18,90' E	2448,0	LANDER

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/247-1	20.08.05	10:43	79° 2,63' N	3° 40,87' E	2935,6	AGT
PS68/247-1	20.08.05	11:59	79° 5,46' N	3° 38,91' E	3036,4	AGT
PS68/247-1	20.08.05	12:05	79° 5,67' N	3° 38,68' E	3072,4	AGT
PS68/247-1	20.08.05	12:35	79° 6,32' N	3° 38,78' E	3101,6	AGT
PS68/247-1	20.08.05	13:26	79° 6,58' N	3° 39,39' E	3046,8	AGT
PS68/247-1	20.08.05	14:45	79° 7,02' N	3° 39,39' E	2932,4	AGT
PS68/247-2	20.08.05	15:06	79° 6,00' N	3° 40,30' E	3059,2	LANDER
PS68/248-1	20.08.05	16:46	79° 4,01' N	4° 10,22' E	2465,6	MUC
PS68/249-1	21.08.05	00:46	79° 24,85' N	4° 42,27' E	2557,6	CTD/RO
PS68/249-2	21.08.05	02:36	79° 24,59' N	4° 41,76' E	2545,6	MUC
PS68/250-1	21.08.05	05:47	79° 36,35' N	5° 10,00' E	2784,8	CTD/RO
PS68/250-2	21.08.05	07:34	79° 36,23' N	5° 10,32' E	2784,4	MUC
PS68/250-3	21.08.05	08:25	79° 36,09' N	5° 10,85' E	2782,4	MOR
PS68/250-3	21.08.05	08:29	79° 36,10' N	5° 10,63' E	2783,6	MOR
PS68/250-3	21.08.05	08:54	79° 35,93' N	5° 9,52' E	2793,2	MOR
PS68/250-3	21.08.05	09:48	79° 35,82' N	5° 8,62' E	2804,8	MOR
PS68/250-4	21.08.05	10:17	79° 35,87' N	5° 8,69' E	2804,4	CTD/RO
PS68/250-5	21.08.05	10:49	79° 36,03' N	5° 9,84' E	2792,0	MOR
PS68/250-5	21.08.05	12:30	79° 36,00' N	5° 9,92' E	2791,2	MOR
PS68/251-1	21.08.05	15:35	79° 17,01' N	4° 20,06' E	2400,0	CTD/RO
PS68/251-2	21.08.05	17:04	79° 16,98' N	4° 19,65' E	2400,8	MUC
PS68/251-3	21.08.05	18:55	79° 16,97' N	4° 20,06' E	2396,8	MUC
PS68/252-1	21.08.05	22:22	79° 3,53' N	3° 34,46' E	3557,2	CTD/RO
PS68/252-2	22.08.05	00:36	79° 3,60' N	3° 34,89' E	3485,2	MUC
PS68/253-1	22.08.05	04:15	78° 50,05' N	3° 29,04' E	2346,0	CTD/RO
PS68/254-1	22.08.05	07:32	79° 3,80' N	3° 39,69' E	3113,6	CTD/RO
PS68/255-1	22.08.05	08:30	79° 5,84' N	3° 40,24' E	3018,4	LANDER
PS68/255-1	22.08.05	09:12	79° 5,80' N	3° 39,85' E	2992,8	LANDER
PS68/255-1	22.08.05	09:26	79° 6,25' N	3° 40,27' E	3022,0	LANDER
PS68/256-1	22.08.05	10:23	79° 0,79' N	3° 15,23' E	3604,0	AGT
PS68/256-1	22.08.05	12:11	79° 4,10' N	3° 29,41' E	3870,0	AGT
PS68/256-1	22.08.05	12:41	79° 4,64' N	3° 30,62' E	3654,0	AGT
PS68/256-1	22.08.05	15:42	79° 5,50' N	3° 29,42' E	3972,4	AGT
PS68/257-1	22.08.05	16:24	79° 5,42' N	3° 35,90' E	0,0	LANDER
PS68/258-1	22.08.05	18:16	78° 56,34' N	3° 36,99' E	2438,4	LANDER
PS68/259-1	22.08.05	19:17	79° 4,14' N	4° 4,43' E	2555,6	CTR
PS68/259-1	22.08.05	20:00	79° 4,67' N	4° 5,09' E	2514,8	CTR
PS68/259-1	22.08.05	20:10	79° 4,76' N	4° 5,95' E	2502,0	CTR
PS68/259-1	22.08.05	20:11	79° 4,76' N	4° 5,96' E	2501,6	CTR
PS68/259-1	22.08.05	20:19	79° 4,71' N	4° 5,42' E	2509,6	CTR
PS68/260-1	22.08.05	21:07	79° 2,33' N	3° 33,97' E	3558,8	AGT
PS68/260-1	22.08.05	22:32	79° 5,52' N	3° 33,19' E	3514,8	AGT
PS68/260-1	22.08.05	22:41	79° 5,81' N	3° 33,27' E	3576,4	AGT

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/260-1	22.08.05	23:12	79° 6,47' N	3° 32,79' E	3588,0	AGT
PS68/260-1	23.08.05	01:39	79° 6,86' N	3° 31,25' E	4029,2	AGT
PS68/261-1	23.08.05	03:33	79° 3,80' N	3° 39,48' E	3127,2	MUC
PS68/262-1	23.08.05	06:15	79° 3,90' N	4° 10,78' E	2464,4	MUC
PS68/263-1	23.08.05	08:04	79° 0,98' N	4° 20,64' E	2582,8	MOR
PS68/263-1	23.08.05	10:08	79° 1,00' N	4° 20,62' E	2582,0	MOR
PS68/264-1	23.08.05	12:34	78° 49,98' N	6° 0,16' E	2466,0	MOR
PS68/264-1	23.08.05	13:47	78° 49,97' N	6° 0,21' E	2465,6	MOR
PS68/265-1	23.08.05	15:19	78° 49,71' N	5° 1,04' E	2689,6	MOR
PS68/265-1	23.08.05	16:26	78° 50,27' N	4° 58,76' E	2712,4	MOR
PS68/266-1	23.08.05	17:35	78° 49,79' N	3° 59,36' E	2333,6	MOR
PS68/266-1	23.08.05	18:40	78° 49,79' N	3° 57,03' E	2324,8	MOR
PS68/267-1	23.08.05	21:42	79° 3,49' N	3° 28,85' E	3992,8	CTD/RO
PS68/267-2	24.08.05	00:24	79° 3,61' N	3° 28,55' E	4008,0	MUC
PS68/268-1	24.08.05	03:48	79° 3,86' N	3° 20,16' E	5108,0	MUC
PS68/269-1	24.08.05	06:25	79° 4,53' N	4° 8,91' E	2472,4	LANDER
PS68/269-1	24.08.05	07:40	79° 4,45' N	4° 9,20' E	2467,6	LANDER
PS68/270-1	24.08.05	08:40	79° 5,19' N	3° 34,82' E	3430,8	LANDER
PS68/270-1	24.08.05	09:36	79° 5,37' N	3° 33,88' E	3539,6	LANDER
PS68/270-1	24.08.05	09:52	79° 5,73' N	3° 35,69' E	3316,8	LANDER
PS68/271-1	24.08.05	11:40	79° 6,41' N	4° 36,05' E	1930,8	CTD/RO
PS68/271-2	24.08.05	13:03	79° 6,48' N	4° 36,02' E	1914,4	MUC
PS68/272-1	24.08.05	14:07	79° 4,95' N	4° 25,83' E	2309,2	LANDER
PS68/272-2	24.08.05	14:23	79° 3,82' N	4° 30,90' E	2302,4	AGT
PS68/272-2	24.08.05	15:27	79° 5,53' N	4° 43,78' E	1898,8	AGT
PS68/272-2	24.08.05	15:42	79° 5,31' N	4° 46,36' E	1913,6	AGT
PS68/272-2	24.08.05	16:12	79° 4,97' N	4° 48,97' E	1929,2	AGT
PS68/272-2	24.08.05	16:13	79° 4,96' N	4° 49,02' E	1928,8	AGT
PS68/272-2	24.08.05	16:50	79° 4,87' N	4° 49,30' E	1927,6	AGT
PS68/272-2	24.08.05	17:45	79° 4,44' N	4° 49,33' E	1968,4	AGT
PS68/273-1	24.08.05	19:48	78° 55,14' N	4° 59,36' E	2634,4	CTD/RO
PS68/273-2	24.08.05	21:45	78° 55,05' N	5° 0,13' E	2633,6	MUC
PS68/274-1	25.08.05	00:31	78° 46,87' N	5° 19,93' E	2468,8	CTD/RO
PS68/274-2	25.08.05	02:00	78° 46,83' N	5° 19,95' E	2467,6	MUC
PS68/275-1	25.08.05	04:50	78° 36,47' N	5° 3,84' E	2340,8	CTD/RO
PS68/275-2	25.08.05	05:58	78° 34,86' N	5° 5,00' E	2333,6	MOR
PS68/275-2	25.08.05	07:08	78° 35,29' N	5° 4,59' E	2340,4	MOR
PS68/275-3	25.08.05	08:14	78° 36,59' N	5° 4,20' E	2338,8	MUC
PS68/275-4	25.08.05	09:24	78° 34,88' N	5° 5,71' E	2334,0	MOR
PS68/275-4	25.08.05	10:38	78° 35,06' N	5° 5,63' E	2336,1	MOR
PS68/275-5	25.08.05	11:15	78° 35,99' N	5° 5,00' E	2338,2	CTD/RO
PS68/275-6	25.08.05	12:03	78° 36,20' N	5° 4,36' E	2338,7	MOR
PS68/275-6	25.08.05	12:31	78° 36,30' N	5° 4,77' E	2339,4	MOR

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/275-6	25.08.05	12:38	78° 36,24' N	5° 4,35' E	2339,6	MOR
PS68/275-7	25.08.05	13:02	78° 36,33' N	5° 4,12' E	2339,6	MOR
PS68/275-7	25.08.05	13:05	78° 36,34' N	5° 4,12' E	2339,7	MOR
PS68/275-7	25.08.05	13:08	78° 36,35' N	5° 4,11' E	2339,7	MOR
PS68/275-8	25.08.05	14:06	78° 36,51' N	5° 4,02' E	2339,6	MUC
PS68/276-1	25.08.05	18:34	79° 8,14' N	4° 51,04' E	1562,8	AGT
PS68/276-1	25.08.05	19:11	79° 7,39' N	4° 57,54' E	1542,0	AGT
PS68/276-1	25.08.05	19:17	79° 7,24' N	4° 58,30' E	1546,4	AGT
PS68/276-1	25.08.05	19:47	79° 6,77' N	4° 59,39' E	1574,8	AGT
PS68/276-1	25.08.05	20:12	79° 6,52' N	4° 58,55' E	1594,0	AGT
PS68/276-1	25.08.05	21:00	79° 6,45' N	4° 59,25' E	1591,2	AGT
PS68/276-2	25.08.05	21:51	79° 7,90' N	4° 54,72' E	1531,6	CTD/RO
PS68/276-3	25.08.05	23:09	79° 7,81' N	4° 54,13' E	1548,8	MUC
PS68/277-1	26.08.05	01:54	79° 8,07' N	6° 5,72' E	1280,8	CTD/RO
PS68/277-2	26.08.05	03:00	79° 8,00' N	6° 5,57' E	1279,2	MUC
PS68/278-1	26.08.05	06:03	79° 4,84' N	4° 25,05' E	2293,2	LANDER
PS68/278-1	26.08.05	06:45	79° 4,97' N	4° 24,05' E	2301,2	LANDER
PS68/278-1	26.08.05	07:02	79° 4,97' N	4° 24,54' E	2306,8	LANDER
PS68/279-1	26.08.05	09:09	78° 49,92' N	4° 0,45' E	2342,8	MOR
PS68/279-1	26.08.05	10:35	78° 50,01' N	4° 0,10' E	2341,8	MOR
PS68/280-1	26.08.05	12:53	78° 49,80' N	5° 1,50' E	2697,6	CTD/RO
PS68/280-2	26.08.05	13:46	78° 49,81' N	5° 1,30' E	2696,9	MOR
PS68/280-2	26.08.05	15:16	78° 49,82' N	5° 1,34' E	4155,0	MOR
PS68/280-3	26.08.05	15:52	78° 50,03' N	4° 54,80' E	2585,8	MOR
PS68/280-3	26.08.05	15:53	78° 50,04' N	4° 54,70' E	2587,1	MOR
PS68/281-1	26.08.05	17:43	78° 49,97' N	4° 39,92' E	2573,1	CTD/RO
PS68/282-1	26.08.05	19:45	78° 50,00' N	4° 19,98' E	2398,8	CTD/RO
PS68/283-1	26.08.05	21:33	78° 50,06' N	3° 58,62' E	2327,2	CTD/RO
PS68/284-1	26.08.05	23:15	78° 49,97' N	3° 40,99' E	2287,6	CTD/RO
PS68/285-2	27.08.05	00:54	78° 50,03' N	3° 23,93' E	2369,6	SD
PS68/285-1	27.08.05	01:14	78° 50,06' N	3° 24,12' E	2370,4	CTD/RO
PS68/286-1	28.08.05	19:40	78° 50,00' N	3° 0,69' E	2458,0	CTD/RO
PS68/287-2	28.08.05	21:19	78° 49,42' N	2° 48,09' E	2501,6	SD
PS68/287-1	28.08.05	21:33	78° 49,38' N	2° 47,88' E	2502,0	CTD/RO
PS68/288-2	28.08.05	23:13	78° 50,01' N	2° 28,93' E	2524,4	SD
PS68/288-1	28.08.05	23:35	78° 50,10' N	2° 28,24' E	2523,6	CTD/RO
PS68/289-2	29.08.05	01:28	78° 50,11' N	2° 10,83' E	2546,0	SD
PS68/289-1	29.08.05	01:36	78° 50,10' N	2° 11,25' E	2545,2	CTD/RO
PS68/290-1	29.08.05	03:41	78° 50,02' N	1° 53,91' E	2558,0	CTD/RO
PS68/291-1	29.08.05	06:05	78° 50,07' N	2° 47,60' E	2495,2	MOR
PS68/291-1	29.08.05	07:15	78° 50,18' N	2° 47,40' E	2495,2	MOR
PS68/291-2	29.08.05	07:37	78° 50,36' N	2° 46,99' E	0,0	PIES
PS68/291-2	29.08.05	08:49	78° 50,18' N	2° 47,17' E	2496,0	PIES

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/292-1	29.08.05	10:32	78° 50,00' N	1° 35,97' E	2547,2	MOR
PS68/292-1	29.08.05	11:39	78° 50,30' N	1° 32,44' E	2544,0	MOR
PS68/293-1	29.08.05	13:31	78° 50,14' N	0° 23,14' E	2584,0	MOR
PS68/293-1	29.08.05	15:10	78° 50,64' N	0° 16,54' E	2598,8	MOR
PS68/294-1	29.08.05	16:42	78° 50,43' N	0° 50,03' W	2664,8	MOR
PS68/294-1	29.08.05	16:46	78° 50,49' N	0° 50,17' W	2665,6	MOR
PS68/294-1	29.08.05	16:50	78° 50,53' N	0° 50,07' W	2666,4	MOR
PS68/294-1	29.08.05	16:52	78° 50,48' N	0° 49,85' W	2666,0	MOR
PS68/294-1	29.08.05	17:51	78° 50,66' N	0° 51,20' W	2666,4	MOR
PS68/295-1	29.08.05	19:33	78° 49,92' N	2° 1,77' W	2714,8	MOR
PS68/295-1	29.08.05	19:43	78° 49,84' N	2° 2,59' W	2713,6	MOR
PS68/295-1	29.08.05	19:44	78° 49,85' N	2° 2,43' W	2713,6	MOR
PS68/295-1	29.08.05	21:01	78° 50,38' N	2° 2,33' W	2711,6	MOR
PS68/296-1	29.08.05	22:21	78° 50,19' N	1° 43,68' W	2709,2	CTD/RO
PS68/297-1	30.08.05	00:28	78° 50,05' N	1° 23,80' W	2680,4	CTD/RO
PS68/298-1	30.08.05	02:25	78° 50,06' N	1° 5,51' W	2530,4	CTD/RO
PS68/298-2	30.08.05	04:02	78° 50,04' N	1° 5,81' W	2545,2	CTD/RO
PS68/299-1	30.08.05	05:45	78° 50,31' N	0° 48,54' W	2662,4	CTD/RO
PS68/299-2	30.08.05	08:31	78° 50,28' N	0° 48,34' W	2663,2	MOR
PS68/299-2	30.08.05	09:56	78° 50,30' N	0° 48,66' W	2662,4	MOR
PS68/300-1	30.08.05	12:02	78° 50,09' N	0° 23,85' E	2582,4	MOR
PS68/300-1	30.08.05	13:33	78° 50,10' N	0° 24,07' E	2581,6	MOR
PS68/300-2	30.08.05	14:36	78° 50,68' N	0° 23,06' E	2579,2	CTD/RO
PS68/301-1	30.08.05	17:00	78° 49,98' N	1° 36,50' E	2547,6	MOR
PS68/301-1	30.08.05	18:28	78° 49,98' N	1° 36,60' E	2547,6	MOR
PS68/301-2	30.08.05	19:30	78° 50,28' N	1° 36,02' E	2546,0	CTD/RO
PS68/302-1	30.08.05	21:28	78° 49,82' N	1° 16,10' E	2530,0	CTD/RO
PS68/303-1	30.08.05	23:16	78° 50,03' N	0° 59,67' E	2486,8	CTD/RO
PS68/304-1	31.08.05	01:15	78° 50,05' N	0° 41,92' E	2470,0	CTD/RO
PS68/305-1	31.08.05	03:40	78° 50,15' N	0° 5,83' E	2625,2	CTD/RO
PS68/306-1	31.08.05	05:43	78° 50,13' N	0° 12,32' W	2643,6	CTD/RO
PS68/307-1	31.08.05	07:49	78° 50,04' N	0° 29,99' W	2688,4	CTD/RO
PS68/308-1	31.08.05	14:19	78° 50,08' N	2° 47,90' E	2492,8	MOR
PS68/308-1	31.08.05	15:55	78° 50,05' N	2° 48,10' E	2491,6	MOR
PS68/308-2	31.08.05	16:19	78° 49,96' N	2° 50,87' E	2483,6	PIES
PS68/308-2	31.08.05	16:53	78° 49,88' N	2° 50,68' E	2484,8	PIES
PS68/309-1	01.09.05	00:02	79° 41,56' N	5° 43,91' E	1590,4	CTD/RO
PS68/310-1	01.09.05	01:45	79° 44,45' N	6° 15,40' E	1106,0	CTD/RO
PS68/311-1	01.09.05	03:41	79° 50,25' N	7° 12,61' E	802,0	CTD/RO
PS68/312-1	01.09.05	05:43	79° 56,93' N	8° 21,16' E	501,6	CTD/RO
PS68/313-1	01.09.05	10:35	80° 39,78' N	8° 25,60' E	859,2	CTD/RO
PS68/314-1	01.09.05	16:38	81° 5,84' N	8° 38,02' E	1077,6	MUC
PS68/314-2	01.09.05	18:57	81° 5,98' N	8° 35,59' E	1078,4	GBG

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/314-3	01.09.05	20:15	81° 6,02' N	8° 36,15' E	1082,0	GC
PS68/315-1	01.09.05	21:48	81° 6,08' N	8° 30,89' E	1101,6	GC
PS68/315-2	01.09.05	22:57	81° 6,06' N	8° 31,34' E	1100,4	GKG
PS68/316-1	02.09.05	00:10	81° 6,15' N	8° 25,83' E	1127,2	GKG
PS68/316-2	02.09.05	01:23	81° 6,05' N	8° 26,26' E	1122,0	GC
PS68/317-1	02.09.05	02:55	81° 6,07' N	8° 22,35' E	1148,0	GC
PS68/317-2	02.09.05	03:55	81° 6,00' N	8° 22,09' E	1149,2	GKG
PS68/318-1	02.09.05	05:15	81° 5,93' N	8° 19,09' E	1152,0	GKG
PS68/318-2	02.09.05	06:31	81° 6,05' N	8° 18,85' E	1157,2	GC
PS68/318-3	02.09.05	07:55	81° 6,09' N	8° 18,05' E	1158,0	CTD/RO
PS68/318-4	02.09.05	09:28	81° 5,55' N	8° 16,12' E	1090,0	CTD/RO
PS68/319-1	02.09.05	11:21	81° 6,02' N	8° 18,19' E	1157,6	GC
PS68/320-1	02.09.05	13:00	81° 6,09' N	8° 9,42' E	1100,8	GC
PS68/320-2	02.09.05	13:46	81° 5,99' N	8° 8,53' E	1106,8	GKG
PS68/320-2	02.09.05	13:50	81° 5,97' N	8° 8,40' E	1106,0	GKG
PS68/320-3	02.09.05	14:09	81° 5,94' N	8° 8,06' E	1105,2	GKG
PS68/320-3	02.09.05	14:23	81° 5,93' N	8° 7,90' E	1104,4	GKG
PS68/321-1	03.09.05	08:17	81° 34,93' N	6° 7,29' E	820,8	CTD/RO
PS68/321-2	03.09.05	08:59	81° 34,74' N	6° 6,62' E	818,0	GKG
PS68/321-3	03.09.05	10:07	81° 35,59' N	6° 10,09' E	826,8	GC
PS68/322-1	03.09.05	11:27	81° 35,95' N	6° 16,49' E	864,0	GC
PS68/322-2	03.09.05	12:49	81° 35,73' N	6° 15,41' E	854,8	GC
PS68/322-3	03.09.05	13:27	81° 35,65' N	6° 14,97' E	851,2	MUC
PS68/322-4	03.09.05	14:33	81° 36,01' N	6° 16,30' E	862,8	GKG
PS68/323-1	03.09.05	15:58	81° 36,03' N	6° 23,49' E	938,8	GKG
PS68/323-2	03.09.05	17:00	81° 35,98' N	6° 22,54' E	934,0	GC
PS68/324-1	03.09.05	23:03	81° 36,04' N	6° 29,02' E	943,6	GC
PS68/324-2	03.09.05	23:56	81° 36,12' N	6° 29,28' E	944,4	GKG
PS68/325-1	04.09.05	01:19	81° 35,90' N	6° 29,06' E	942,4	GKG
PS68/325-2	04.09.05	01:48	81° 35,94' N	6° 29,44' E	944,0	GKG
PS68/325-3	04.09.05	02:46	81° 35,99' N	6° 30,14' E	942,8	GC
PS68/326-1	04.09.05	03:53	81° 35,99' N	6° 25,30' E	943,2	GC
PS68/326-2	04.09.05	04:38	81° 35,94' N	6° 25,52' E	943,2	GKG
PS68/326-2	04.09.05	04:42	81° 35,93' N	6° 25,52' E	943,2	GKG
PS68/327-1	04.09.05	23:40	80° 47,22' N	7° 32,06' E	987,2	CTD/RO
PS68/327-2	05.09.05	00:32	80° 47,64' N	7° 32,15' E	994,8	CTD/RO
PS68/328-1	05.09.05	03:48	80° 28,61' N	5° 52,53' E	604,4	CTD/RO
PS68/328-2	05.09.05	04:28	80° 28,70' N	5° 53,11' E	604,4	MUC
PS68/329-1	05.09.05	06:23	80° 19,76' N	4° 55,22' E	801,6	CTD/RO
PS68/330-1	05.09.05	08:17	80° 13,71' N	4° 16,13' E	1110,0	CTD/RO
PS68/331-1	05.09.05	10:00	80° 8,95' N	3° 45,11' E	1606,8	CTD/RO
PS68/331-2	05.09.05	11:35	80° 9,38' N	3° 42,32' E	1612,8	MUC
PS68/332-1	06.09.05	00:14	78° 49,88' N	3° 0,03' W	2529,6	CTD/RO

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/333-1	06.09.05	02:28	78° 50,06' N	2° 39,99' W	2611,6	CTD/RO
PS68/334-1	06.09.05	04:46	78° 49,99' N	2° 19,96' W	2671,2	CTD/RO
PS68/335-1	06.09.05	07:06	78° 49,88' N	1° 59,95' W	2715,2	CTD/RO
PS68/335-2	06.09.05	08:09	78° 49,88' N	2° 0,06' W	2715,2	MOR
PS68/335-2	06.09.05	09:43	78° 49,90' N	1° 59,99' W	2715,2	MOR
PS68/336-1	06.09.05	12:07	78° 50,02' N	3° 21,16' W	2377,6	CTD/RO
PS68/337-1	06.09.05	14:09	78° 50,02' N	3° 39,89' W	2188,0	CTD/RO
PS68/338-1	06.09.05	16:07	78° 49,95' N	3° 59,84' W	1924,8	CTD/RO
PS68/338-2	06.09.05	17:48	78° 49,95' N	3° 59,68' W	1926,8	CTD/RO
PS68/338-3	06.09.05	18:46	78° 49,92' N	3° 59,05' W	1934,4	MUC
PS68/339-1	06.09.05	20:18	78° 49,73' N	4° 19,86' W	1647,2	CTD/RO
PS68/339-2	06.09.05	21:39	78° 49,77' N	4° 18,53' W	1669,6	CTD/RO
PS68/340-1	06.09.05	23:07	78° 49,41' N	4° 39,97' W	1342,8	CTD/RO
PS68/341-1	07.09.05	01:09	78° 49,53' N	4° 59,67' W	1034,0	CTD/RO
PS68/341-2	07.09.05	02:08	78° 48,75' N	4° 58,53' W	1029,2	MUC
PS68/342-1	07.09.05	03:54	78° 49,99' N	5° 19,24' W	721,6	CTD/RO
PS68/343-1	07.09.05	05:57	78° 49,83' N	5° 40,56' W	434,0	CTD/RO
PS68/343-2	07.09.05	06:31	78° 49,81' N	5° 39,78' W	436,0	MUC
PS68/344-1	07.09.05	08:05	78° 50,27' N	6° 2,57' W	347,6	CTD/RO
PS68/345-1	07.09.05	10:00	78° 48,59' N	6° 30,29' W	285,2	CTD/RO
PS68/346-1	07.09.05	12:03	78° 49,83' N	6° 59,84' W	253,6	CTD/RO
PS68/347-1	07.09.05	14:26	78° 49,95' N	7° 29,69' W	195,2	CTD/RO
PS68/348-1	07.09.05	17:01	78° 49,36' N	7° 59,31' W	219,6	CTD/RO
PS68/349-1	07.09.05	20:42	78° 49,93' N	8° 31,29' W	291,2	CTD/RO
PS68/350-1	07.09.05	22:11	78° 49,68' N	8° 59,95' W	221,6	CTD/RO
PS68/351-1	07.09.05	23:36	78° 49,92' N	9° 29,56' W	195,2	CTD/RO
PS68/352-1	08.09.05	02:10	78° 50,14' N	10° 2,76' W	297,6	CTD/RO
PS68/352-2	08.09.05	02:39	78° 50,06' N	10° 3,36' W	311,2	MUC
PS68/352-3	08.09.05	03:08	78° 49,91' N	10° 3,91' W	330,4	CTD/RO
PS68/353-1	08.09.05	04:44	78° 49,75' N	10° 28,55' W	389,6	CTD/RO
PS68/354-1	08.09.05	06:37	78° 49,98' N	10° 59,15' W	336,0	CTD/RO
PS68/355-1	08.09.05	08:24	78° 49,90' N	11° 29,32' W	236,8	CTD/RO
PS68/356-1	08.09.05	10:11	78° 49,79' N	12° 1,00' W	208,8	CTD/RO
PS68/357-1	08.09.05	12:13	78° 49,77' N	12° 29,82' W	195,6	CTD/RO
PS68/357-2	08.09.05	12:36	78° 49,74' N	12° 30,90' W	195,2	MUC
PS68/357-3	08.09.05	12:44	78° 49,74' N	12° 31,23' W	195,6	MOR
PS68/357-3	08.09.05	14:28	78° 49,84' N	12° 30,44' W	202,8	MOR
PS68/357-3	08.09.05	14:33	78° 49,86' N	12° 30,62' W	186,0	MOR
PS68/358-1	08.09.05	16:13	78° 49,89' N	12° 59,84' W	191,6	CTD/RO
PS68/359-1	08.09.05	18:19	78° 50,25' N	13° 29,78' W	118,0	CTD/RO
PS68/360-1	08.09.05	20:11	78° 50,06' N	13° 58,64' W	106,4	CTD/RO
PS68/361-1	08.09.05	22:23	78° 49,75' N	14° 29,85' W	87,2	CTD/RO
PS68/362-1	09.09.05	00:07	78° 49,47' N	14° 59,77' W	68,0	CTD/RO

Station	Date	Time	Position Lat	Position Lon	Depth [m]	*Gear abbreviation*
PS68/363-1	09.09.05	02:19	78° 50,02' N	15° 29,40' W	68,4	CTD/RO
PS68/364-1	09.09.05	05:12	78° 50,59' N	16° 0,67' W	245,2	CTD/RO
PS68/365-1	09.09.05	06:57	78° 50,23' N	16° 31,50' W	374,0	CTD/RO
PS68/366-1	09.09.05	08:28	78° 49,73' N	16° 58,05' W	390,0	CTD/RO
PS68/367-1	09.09.05	10:17	78° 49,96' N	17° 28,81' W	571,6	CTD/RO
PS68/367-2	09.09.05	10:50	78° 49,96' N	17° 28,83' W	572,0	MUC
PS68/368-1	09.09.05	17:00	78° 50,23' N	15° 34,45' W	78,4	EF
PS68/368-1	09.09.05	17:39	78° 50,34' N	15° 33,98' W	81,2	EF
PS68/369-1	12.09.05	13:35	72° 0,30' N	14° 43,54' E	1286,0	CTD/RO
PS68/369-2	12.09.05	15:07	72° 0,30' N	14° 43,57' E	1286,4	GTC
PS68/370-1	12.09.05	16:05	72° 0,17' N	14° 43,51' E	1288,0	MUC
PS68/370-2	12.09.05	16:44	72° 0,07' N	14° 43,93' E	1289,6	LANDER
PS68/370-2	12.09.05	17:11	72° 0,25' N	14° 43,28' E	1288,8	LANDER
PS68/371-1	12.09.05	18:18	71° 57,45' N	14° 39,93' E	1352,8	CTD/RO
PS68/371-2	12.09.05	19:15	71° 57,63' N	14° 39,79' E	1351,6	MUC

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