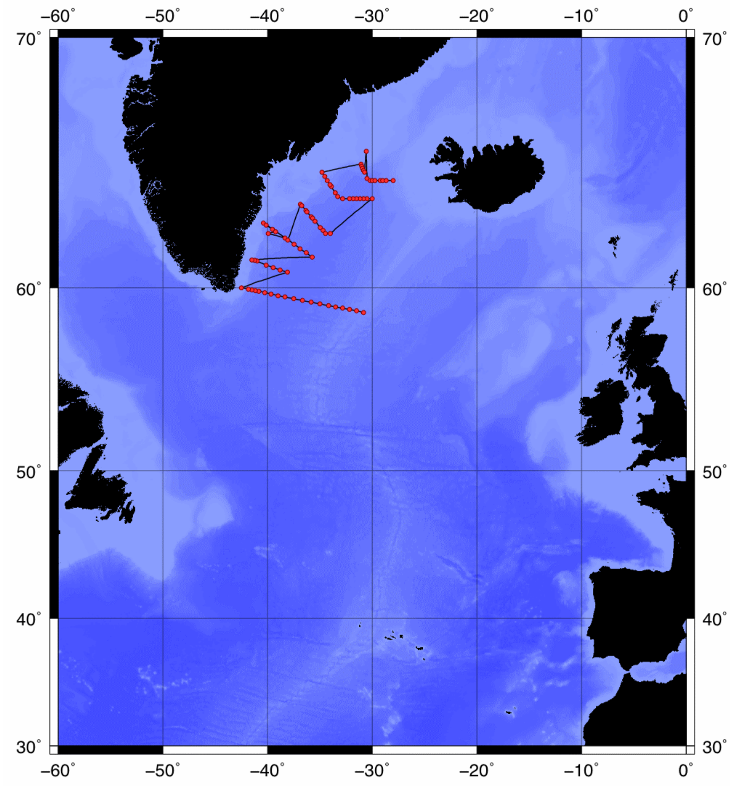
CRUISE REPORT: A01E

(Updated OCT 2012)



Highlights

Cruise Summary Information

WOCE Section Designation	**A01E**
Expedition designation (ExpoCodes)	**06MT20010620**
Chief Scientists	**Jürgen Holfort / IfMH**
Dates	2001 June 20 – 2001 July 15
Ship	R/V METEOR
Ports of call	St. Johns, Newfoundland – Reykjavik, Iceland
Geographic Boundaries	65° 54' N 42° 31' W 27° 59' W 58° 47' N
Stations	146
Floats and drifters deployed	0
Moorings deployed or recovered	9 recovered, 10 deployed

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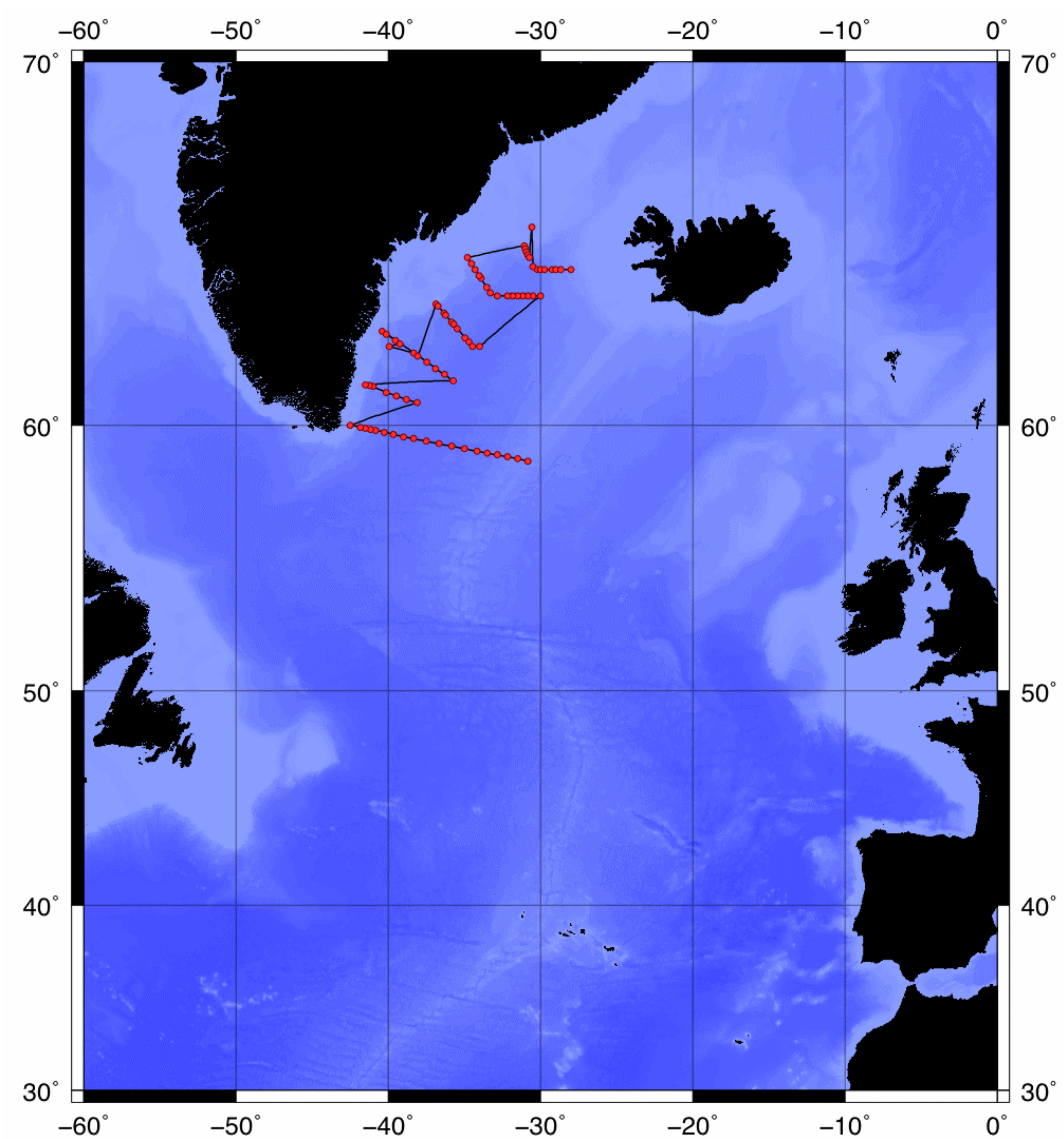
Links To Select Topics

Shaded sections are not relevant to this cruise or were not available when this report was compiled.

Cruise Summary Information	Hydrographic Measurements
Description of Scientific Program	**CTD Data:**
Geographic Boundaries	Acquisition
Cruise Track (Figure): PI CCHDO	Processing
Description of Stations	Calibration
Description of Parameters Sampled	Temperature Pressure
Bottle Depth Distributions (Figure)	Salinities Oxygens
Floats and Drifters Deployed	**Bottle Data**
Moorings Deployed or Recovered	Salinity
	Oxygen
Principal Investigators	Nutrients
Cruise Participants	Carbon System Parameters
	CFCs
Problems and Goals Not Achieved	Helium / Tritium
Other Incidents of Note	Radiocarbon
Underway Data Information	**References**
Navigation Bathymetry	
Acoustic Doppler Current Profiler (ADCP)	
Thermosalinograph	
XBT and/or XCTD	
Meteorological Observations	**Acknowledgments**
Atmospheric Chemistry Data	
Data Processing Notes	

Station Locations • A01E • 06MT20010620 • J. Holfort • *R/V Meteor*

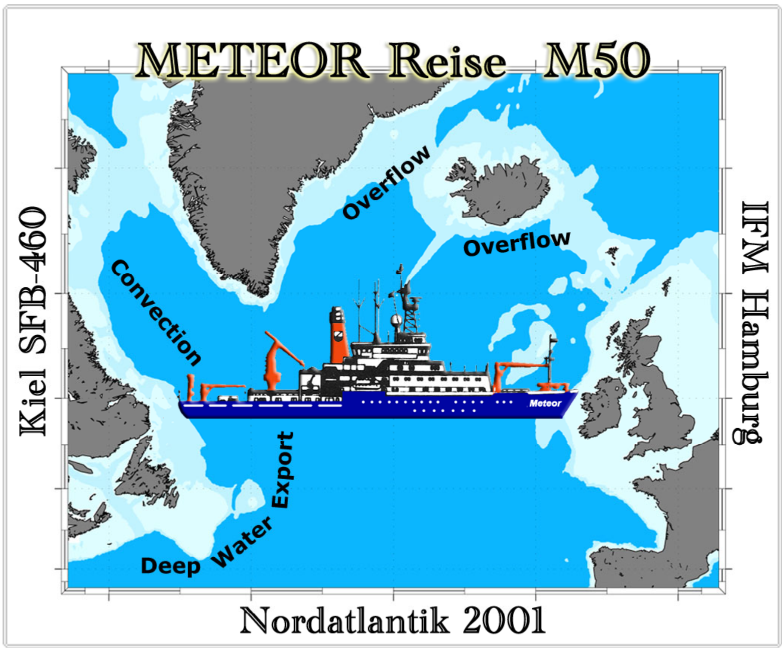


METEOR-Berichte 02-2

North Atlantic 2001

Cruise No. 50

7 May – 12 August 2001



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2002

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Abstract

METEOR-cruise 50 took place in the North Atlantic Ocean with measurements north of 40°N (Figure 1). The cruise began on 7 May 2001 in Halifax and ended on 12 August 2001 at the shipyard in Rendsburg. METEOR-cruise 50 consisted of four legs with activities in Physical Oceanography and Marine Chemistry.

During the first leg (Halifax - St. John's) the changes of the deep circulation and water mass distribution were investigated in the Irminger Sea within the context of the SFB 460 of IfM Kiel. The southern zonal section was a repeat survey of the western part of the WOCE A2 section. For measuring water mass transports a deep reaching profiling Acoustic Doppler current meter (Ocean Surveyor) was used for the first time. Another ADCP was lowered with the CTD (LADCP). To characterize the water masses, CTD hydrography and tracer measurements (Freon) were carried out. The Deep Water Export Array located within the western boundary current off the Grand Banks as well as moorings at 53°N and the Mid-Atlantic Ridge at about 45°N were recovered and redeployed.

The second leg (St. John's - St. John's), also operated by IfM Kiel, was dedicated to mooring work and hydrographic measurements in the Labrador Sea and at the 53°N mooring array, again within the context of the SFB 460. The hydrographic measurements were a continuation of annual repeat surveys since 1996 to investigate the variability of water mass transformation and its relation to the large scale deep circulation. In the Labrador Sea, a number of tomography and convection moorings were recovered and redeployed.

During the third leg, (St.Johns – Reykjavik) mooring work and hydrographic measurements were carried out by IfM Hamburg along sections normal to the southeastern slope of Greenland. The scientific objectives were the long-term description of the composition of the Denmark Strait Overflow and its temporal variability, in continuation of the work of the EU Project VEINS on the Variability of Exchanges in the Northern Seas.

The return leg (Reykjavik - Germany) took place in the overflow regions around Iceland and particularly in the eastern basin of the subpolar North Atlantic. The investigation concentrated primarily on the spreading and mixing of water masses of the region. The field program was part of research initiatives of IfM Kiel (SFB 460) and BSH Hamburg (repeat of WOCE section A1). Observations of the deep circulation and of mass distributions included meaasurements of current, nutrients, CO_2 and tracers. In addition, a research group from GEOMAR Kiel investigated methane sources that were detected during an earlier cruise at the Mid-Atlantic Ridge.

Zusammenfassung

Die METEOR-Reise M50 fand im Nordatlantischen Ozean statt, nördlich von 40°N (Abbildung 1). Die Reise begann am 7. Mai 2001 in Halifax und endete am 12. August 2001 in der Werft Rendsburg. Die METEOR-Fahrt 50 setzte sich aus vier Fahrtabschnitten zusammen, die physikalisch-ozeanographische und meereschemische Arbeiten beinhalteten.

Im ersten Abschnitt (Halifax - St. John's) wurden im Rahmen des SFB 460 der Universität Kiel die Änderungen der Tiefenzirkulation und Wassermassenverteilung in der Irminger See untersucht. Dabei stellte der südliche Zonalschnitt eine wiederholte Aufnahme des westlichen WOCE A2-Schnittes dar. Zum Einsatz für die Bestimmung von Wassermassentransporten kamen erstmalig ein neuer tiefreichender Schiffs-ADCP (ocean surveyor) sowie ein an der CTD-

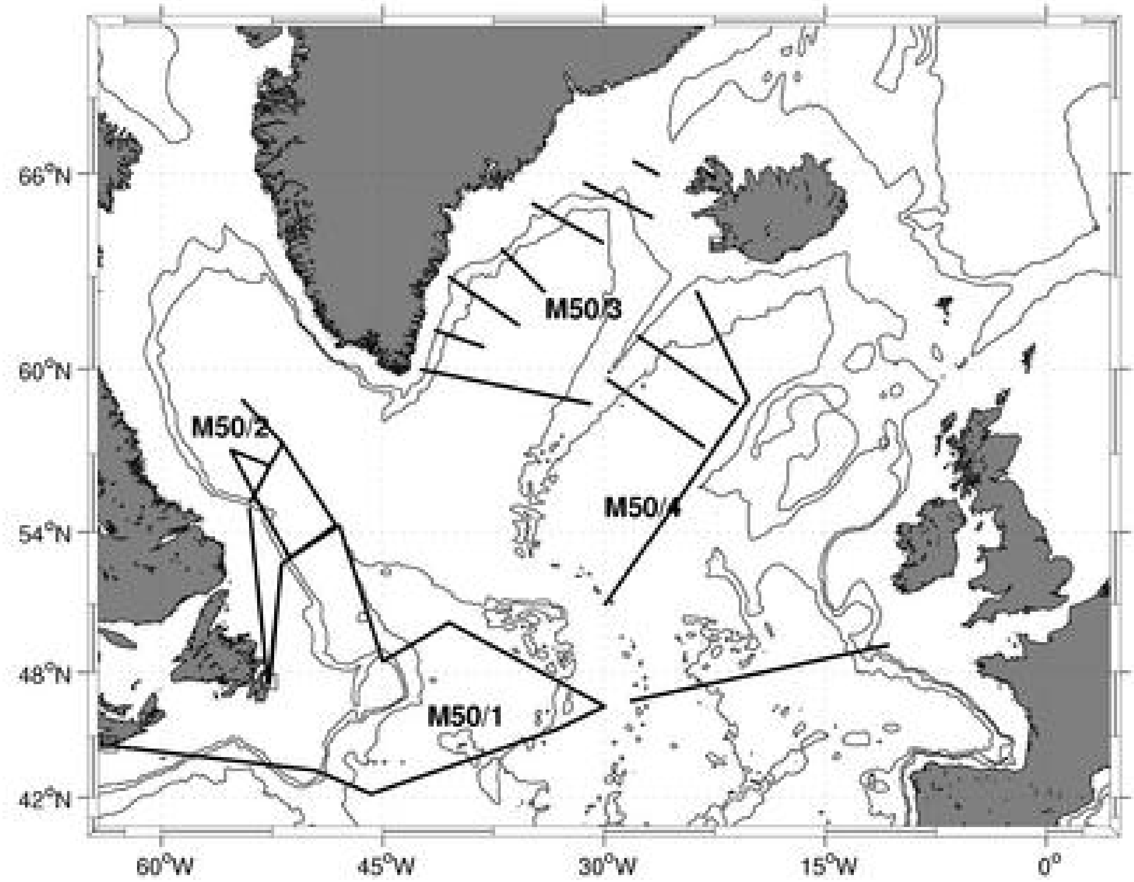


Fig. 1: Cruise track of METEOR cruise M 50.

Sonde mitgefierter ADCP (LADCP). Zur Charakterisierung der Wassermassen wurden CTD-Hydrographie und Tracermessungen (Freone) durchgeführt. Im tiefen westlichen Randstrom bei den Grand Banks wurde der seit 1997 installierte Tiefenwasserexport-Array ausgetauscht. Ebenfalls aufgenommen und wieder ausgelegt wurden Verankerungen bei 53°N sowie am Mittelatlantischen Rücken bei ca. 45°N.

Im zweiten Abschnitt (St. John's - St. John's) standen Verankerungsarbeiten ergänzt durch hydrographische Messungen in der Labradorsee und beim 53°N Verankerungsarray im Vordergrund. Diese Reise fand ebenfalls im Rahmen des Kieler SFB 460 statt. Die hydrographischen Messungen stellten eine Fortführung von jährlich seit 1996 stattfindenden Messungen dar, um die Variabilität der Wassermassentransformation und ihre Auswirkungen auf die Tiefenzirkulation zu untersuchen. Es wurden eine Reihe von Tomographie- und Konvektionsverankerungen geborgen und wieder neu ausgelegt.

Auf dem dritten Fahrtabschnitt (St. Johns – Reykjavik) wurden Verankerungsarbeiten und hydrographische Messungen entlang der Südostküste Grönlands von Kap Farvel bis zur Dänemarkstraße unter der Leitung des Instituts für Meereskunde der Universität Hamburg durchgeführt. Das wissenschaftliche Ziel hierbei ist die längerfristige Zustandsbeschreibung der Overflow-Komponenten im nordwestlichen Atlantik und die Erfassung ihrer zeitlichen Variabilität und schließt dabei an das EU-Projekt VEINS (Variability of Exchanges in the Northern Seas) an.

Während des letzten Fahrtabschnittes (Reykjavik - Deutschland) bestand das Ziel darin, die Ausbreitung und Vermischung von Wassermassen in den Overflow-Gebieten um Island und speziell im östlichen Becken des subpolaren Nordatlantiks zu untersuchen. Die Arbeiten gehörten zu den wiederholt durchgeführten Feldprogrammen des Kieler SFB 460 und des Hamburger Bundesamtes für Seeschiffahrt und Hydrographie (WOCE-Schnitt A2). Die Beobachtungen zur Tiefenzirkulation und zu Massenverteilung mit zugehörigen Strömungsmessungen umfassten auch Nährstoff-, CO_2- und Tracermessungen. Ferner wurde den früher entdeckten Spuren von Methanausscheidungen am Mittelatlantischen Rücken von einer GEOMAR-Forschergruppe aus Kiel nachgegangen.

Reseach Objectives

The research of METEOR cruise M 50 was mainly in the context of the Kiel Sonderforschungsbereich 460 as well as on the VEINS/ASOF projects.

Sonderforschungsbereich SFB 460

The Sonderforschungsbereich SFB 460 „Dynamics of thermohaline circulation variability" started in 1996 at Kiel University. Main objective of the SFB 460 is to investigate the variability of the watermass formation and transport processes in the subpolar North Atlantic and to gain an understanding of its role in the dynamics of the thermohaline circulation and the ocean uptake of anthropogenic CO_2. The variability of circulation and water mass distribution are closely related with climate changes in northern Europe through the North Atlantic Oscillation (NAO). These connections are a focus of the ongoing research.

The research program of the SFB is based on a combination of physical-oceanographic, marine chemistry and meteorological observation programs, which are operated in close interaction with a continuous series of numerical models with moderate (50 km), high (15 km) and very high resolution (5 km), allowing a simulation of current structures and variability over a wide range of space and time scales. The main interests are, first of all, the water mass formation processes and the circulation of deep water in the subpolar North Atlantic, their interaction and integral effects, especially with regard to the uptake of anthropogenic CO_2. Second, the variability of the ocean - atmosphere interaction is investigated, and modelling investigations of large-scale aspects and causes of this variability are supplemented by the analysis of fluxes from different meteorological standard models in comparison with observations.

The legs M50/1, M50/2 and M50/4 were carried out within the context of the SFB 460. Several cruises had been carried out during the last three years to improve the data basis with a wide range of hydrographic, tracer and current measurement techniques for investigating the variability of the circulation in the North Atlantic. During the three M50-legs the study of the pathways of the deep circulation and variability of water mass distribution were of prime interest. Besides the shipboard measurements, a large part of the work was mooring work and the deployment of floats.

The marine chemistry group took samples on legs 1 and 4 for the analysis of total dissolved inorganic carbon, alkalinity, nutrients and dissolved oxygen. All analyses were carried out on board. Nutrients will be used mainly as indicators for water mass properties, while the other parameters are needed to calculate the uptake of anthropogenic CO_2 into the water column. A significant signal can be expected even at greater water depths in the study area. Transport of anthropogenic CO_2 into the Deep Water is mainly through the thermohaline circulation. Hence, the investigations carried out during this cruise will serve to detect variations in later studies within the SFB.

VEINS/ASOF

VEINS (Variability of Exchanges in the Northern Seas) was an EU-MAST Project focussing on the variability of oceanic fluxes between the Arctic Ocean and the Northern North Atlantic for a period of three years. It was aimed at developing a cost-efficient array for the long-term monitoring of the polar and subpolar contributions to the decadal climate variability.

VEINS achieves a synoptic coverage of fluxes through Fram Strait, the Western Barents Shelf, the Iceland-Scotland Ridge and the Denmark Strait, including the continental slope of SE-Greenland. The latter was the work area for cruise leg M50/3, where the fluctuations of the Denmark Strait Overflow Water (DSOW)-transports and the entrainment of Atlantic water are major controls of North Atlantic Deep Water formation.

At present a new program "Arctic Subarctic Ocean Fluxes" (ASOF) is being planned in cooperation between several European partners, the US and Canada. The ASOF objective is monitoring of the ice export from and water mass exchange between the Arctic Ocean and the Atlantic and Pacific for the foreseeable future

Acknowledgements

The 50th cruise of RV METEOR served a multi-disciplinary group of projects in the North Atlantic Ocean. All groups and institutions involved helped to support the coordination work. It is our particular pleasure to thank the captains M. Kull and N. Jakobi and crew of all cruise legs for the flexible, friendly and very helpful attitude and professional assistance during the deployments of the complex moored arrays and the various kinds of shipboard measurement programs.

Special thanks is expressed to *Deutsche Forschungsgemeinschaft* (DFG) for making available the shiptime and funding for cruise M50. Projects of the *Sonderforschungsbereich 460* during several cruise legs were also funded by the DFG.

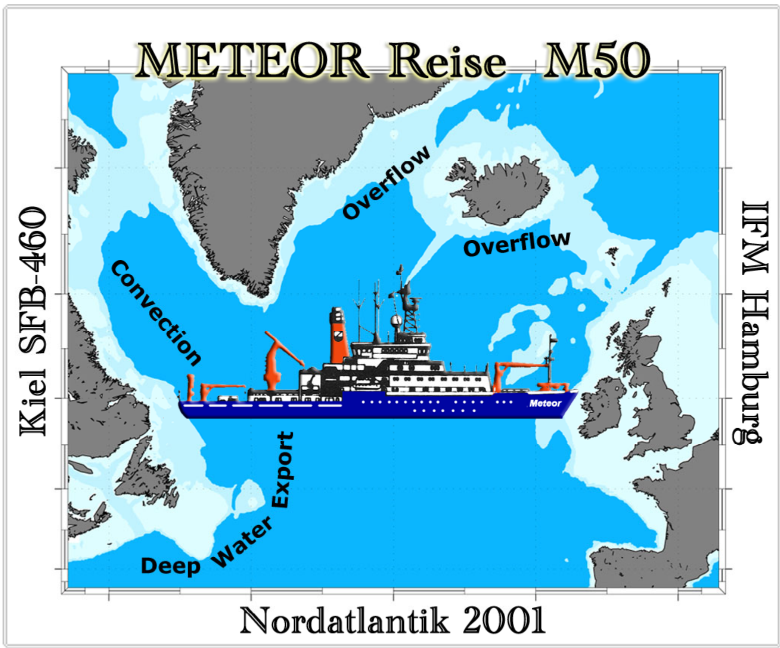
METEOR-Berichte 02-2

North Atlantic 2001

Part 3

Cruise No. 50, Leg 3

20 June – 15 July 2001, St. John's – Reykjavik



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2002

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3.1 Participants M 50/3

Name	Speciality	Institute
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3.2 Research Program

The cruise leg M50/3 was a continuation of the work done in the EC- project VEINS (Variability of exchanges in the Northern Seas), where eighteen countries contributed to field work and modeling of the transport fluctuations through the major ocean passages between the Arctic Ocean and the Northern North Atlantic. This cruise focussed on the fluxes and the changes in the properties of water masses in the area from the Denmark Strait to the southern tip of Greenland. It is a repeat of the METEOR cruise M39/5 in 1997, the VALDIVIA cruise 173 in 1998, the METEOR cruise M45/4 in 1999 and the Poseidon cruise 263 in 2000.

The ideas about the composition of the Denmark Strait Overflow Water (DSOW) have changed considerably within the last couple of years. This changing view did also arise due to the long term measurements within the VEINS program. Some of these measurements were also done on previous cruises with FS METEOR. Actually the overflow is related to the waters of the western boundary currents of the Nordic Seas. This results in Arctic, Polar and Atlantic contributions to the Denmark Strait Overflow. The present concept consists of equal contributions of Arctic Intermediate Waters, Arctic Ocean Deep Waters and recirculated Atlantic Water in the composition of overflow waters.

Of course this composition can change with time. On longer temporal scales the atmospheric forcing changes, and the formation of water masses depends also on this forcing. The predominant signal of this changes is the North Atlantic Oscillation. The exact nature of the relations between changes in atmospheric forcing and changes in the composition and strength of the overflow is still unclear and a subject of our investigations. But recently a coherence was found between inter-annual temperature changes of the DSOW at 64°N, changes in the temperature in the Greenland Sea and also with changes in the Atlantic Waters in the Westspitsbergen Current.

For several years now hydrographic sections were taken regularly along the East Greenland continental slope south of Denmark Strait. Several moorings are deployed along one of this sections at about 64°N. This mooring line consists of 6 moorings with current meters, two inverted echo sounders and one bottom mounted ADCP. This field word is a cooperative effort of institutions from Germany, Iceland, Finland and Great Britain.

The METEOR cruise 50/3 aims at repeating those six standard sections, with the difference that the southernmost section will be extended till the Mid-Atlantic Ridge (Fig. 3.1). For a better characterization of water masses, CFC's and SF_6 measurements will be taken on these sections. The moorings will be re-covered and then deployed again. A new kind of mooring was deployed on the shelf last year with FS POSEIDON. This mooring consists of a tube, about 50m long, with 2 integrated temperature and salinity sensors (microcats). The goal of the tube itself is to protect the sensor from being destroyed by ice. This mooring will also be recovered and two such moorings will be deployed.

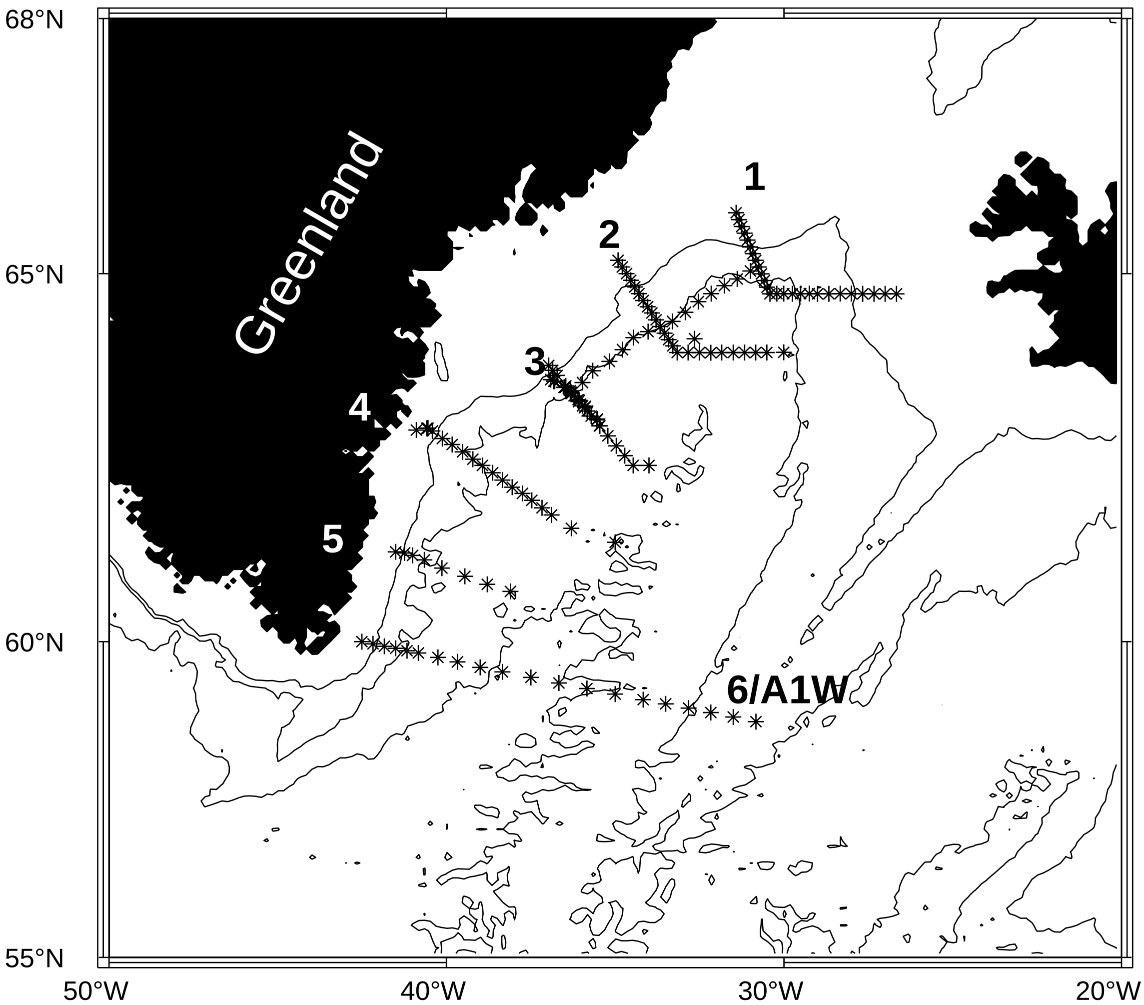


Fig. 3.1: Positions of the stations made during M50/3 and numbers of the VEINS hydrographic sections. The mooring array is located along section 3, the tube moorings are located on the shelf at the western end of section 4. The spacing of depth isolines is 1000 m.

3.3 Narrative of the Cruise

The RV METEOR left St. John's on June 21, 2001 and headed to 58°47,8' N 030°49,8' W, a point above the Mid-Atlantic-Ridge, arriving on June 25. From there a hydrographic section was taken towards the southern tip of Greenland. This section was a repeat of the western part of WOCE section A1E, the eastern part was occupied at the same time by RV COMMANDER JACK. Regretfully, due to problems with the CTD cable on RV COMMANDER JACK, the ships didn't meet and there is a time gap of 5 days between both parts.

This first section, the westernmost stations compromising also VEINS section 6, was finished on June 28. The hydrographic work continued with VEINS section 5, a section perpendicular to the continental shelf north of the first section. The CTD system worked very well and also showed no problems during the rest of the cruise. Station positions and section numbering are given in table 1 in chapter 3.6 and shown in figure 3.1.

The survey of the next two sections was interrupted by mooring work. While CTD work can also be done during night and not so good weather, we needed daylight and fine weather for the mooring work. We recovered one and deployed two tube moorings at the western end of section

4. The tube could only be recovered in two pieces, but no instrument was lost. The deployment of the tubes, with a length of about 45 m quite bulky, was much easier as expected. The weather was also very fine during deployment and we had a fantastic view of the Greenland coast. Along section 3 a total of eight moorings were successfully recovered and deployed.

After the mooring work we continued the hydrographic work with 3 sections perpendicular to the continental rise, connected with stations along a water depth of about 2000 m. As the weather had been quite reasonable during the whole cruise, we had enough time to increase the spatial resolution of this last sections up to about 5 nautical miles between stations. Due to ice section 1 could not started as far north on the shelf as planned.

Along the CTD sections, although not at every station, water was sampled at 10 to 20 levels for analysis of CFC's. At some selected stations water samples were taken for the analysis of SF6 in the overflow water, at other stations some samples were taken for the analysis of alkenones.

Continuos measurements were taken with up to two vessel mounted ADCP's. The pCO_2 in air and surface waters were analyzed, surface waters were filtered for the determination of alkenons and meteorological measurements were done on a routinely basis. The acquisition computer (an old 286) of the 150 Hz ADCP broke done on July 8 and could not be repaired. Also many of the data was also lost, because the hard disk couldn't be read from another computer. But the second ADCP with 75 Hz showed no problems during the whole cruise.

RV METEOR arrived in the port of Reykjavik on July 15, 2001.

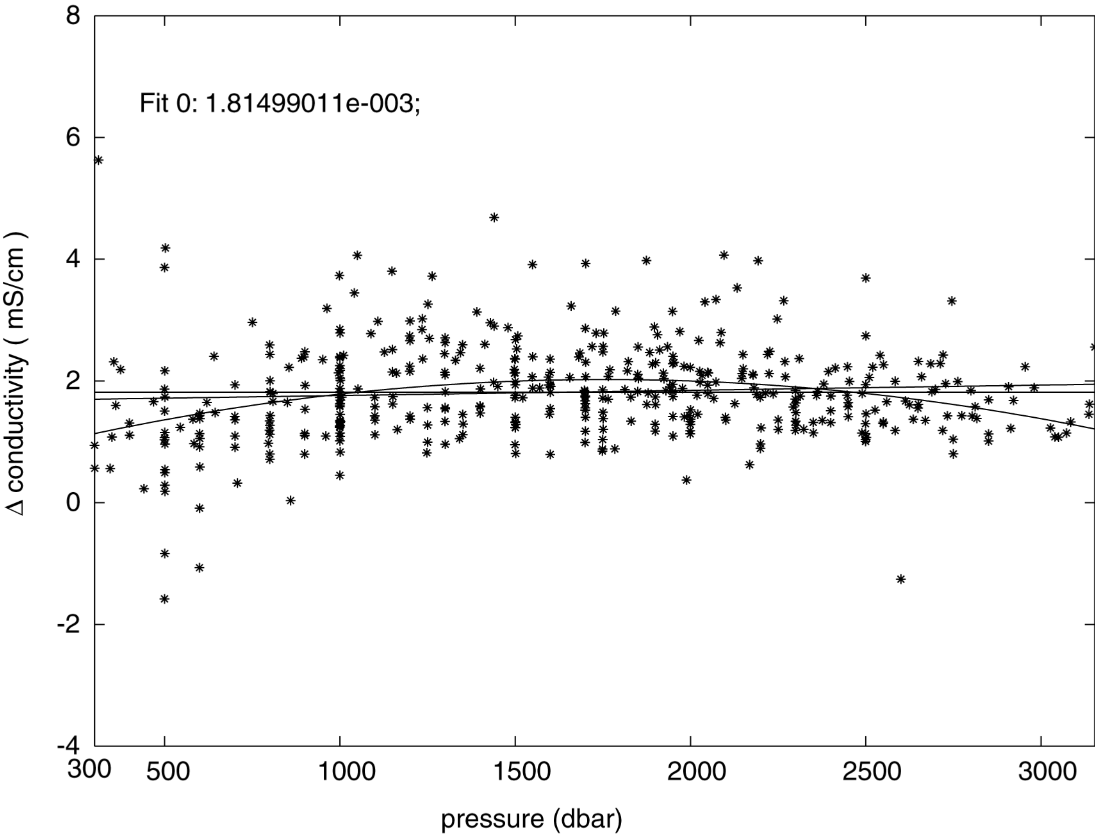
3.4 Preliminary Results

3.4.1 Hydrography

The hydrographic measurements were done with a Seabird CTD, the same instrument as the legs before. The pressure offset in air of 0.0 to 0.2 dbar and was neglected, a comparison with the reversing thermometers showed that no in situ calibration of temperature and pressure were necessary. Bottle salinities were determined with an AUTOSAL salinometer, which was calibrated using standard seawater. The conductivity showed a constant offset of 0.0018 mS/cm, after calibration the accuracy for conductivity (respective salinity) is better then 0.003 (see Figure 3.2). Samples for oxygen were taken and analyzed regularly. This values were used to calibrate the oxygen sensor on the CTD.

At section 1 (see Figure 3.3) the Denmark Strait Overflow water can be clearly seen as a layer of low salinity and temperature sitting on the Greenland slope. This layer can be traced till the southernmost section 6, although with increasing temperature and salinity due to mixing with ambient water. The core of the overflow, located at about 1500 m to 2000 m depth, is connected with the also dense, cold, low salinity waters on the shelf. The water on the shelf is only slightly less dense (σ_2~37.10 kg/m^3) then the overflow (σ_2~37.20 kg/m^3). So there is the possibility that part of the waters denominated overflow does not originate from the Denmark Strait sill but comes from the shelf.

In comparison with previous cruises and historic data (see Figure 3.4) it can be noted: Compared to last year (2000) the salinity (and temperature) of the overflow increased slightly, but did not reach the high salinity values of 1996 and are comparable to the values in the years 1994 and 1995.



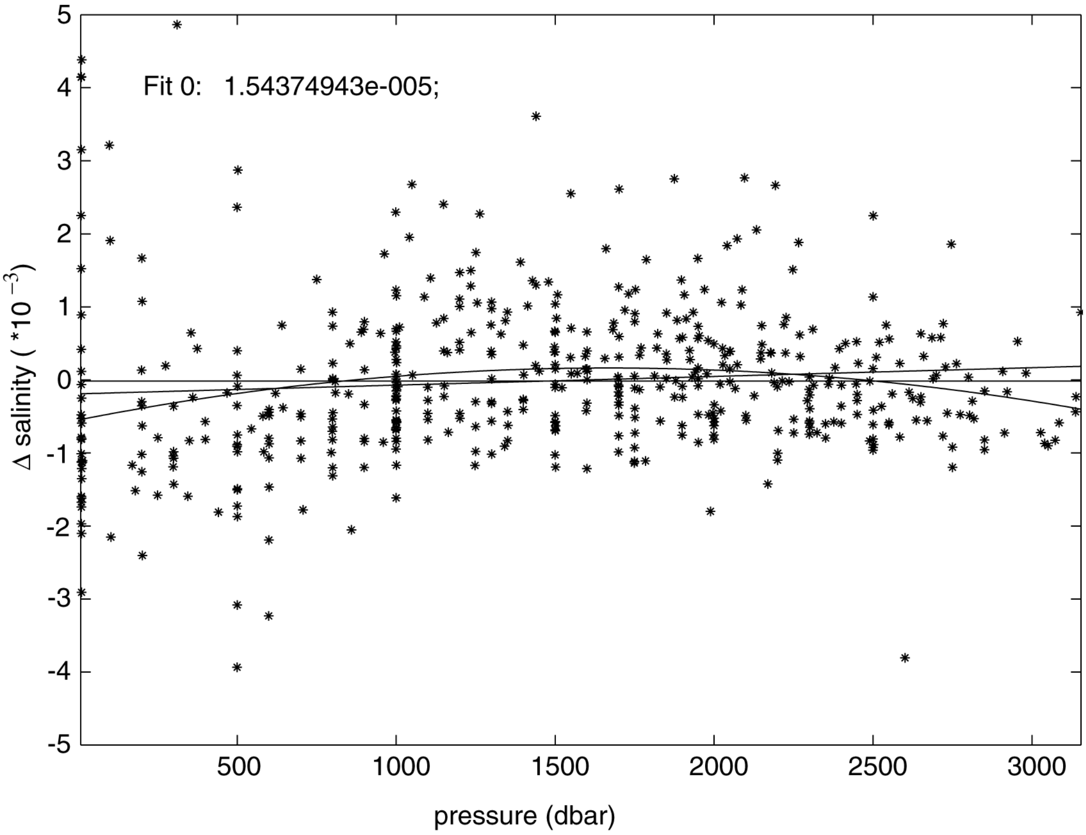
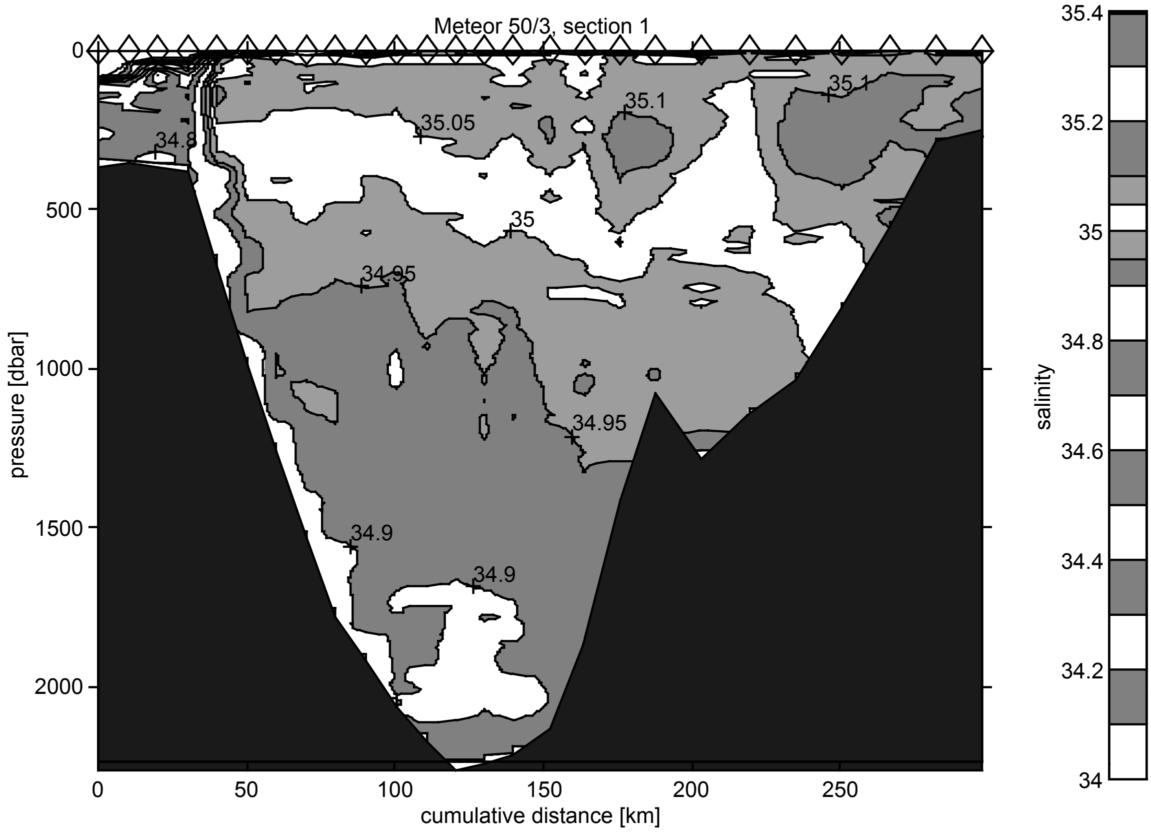


Fig. 3.2: Difference between CTD and bottle data in conductivity before calibration (a) and in salinity after calibration (b).



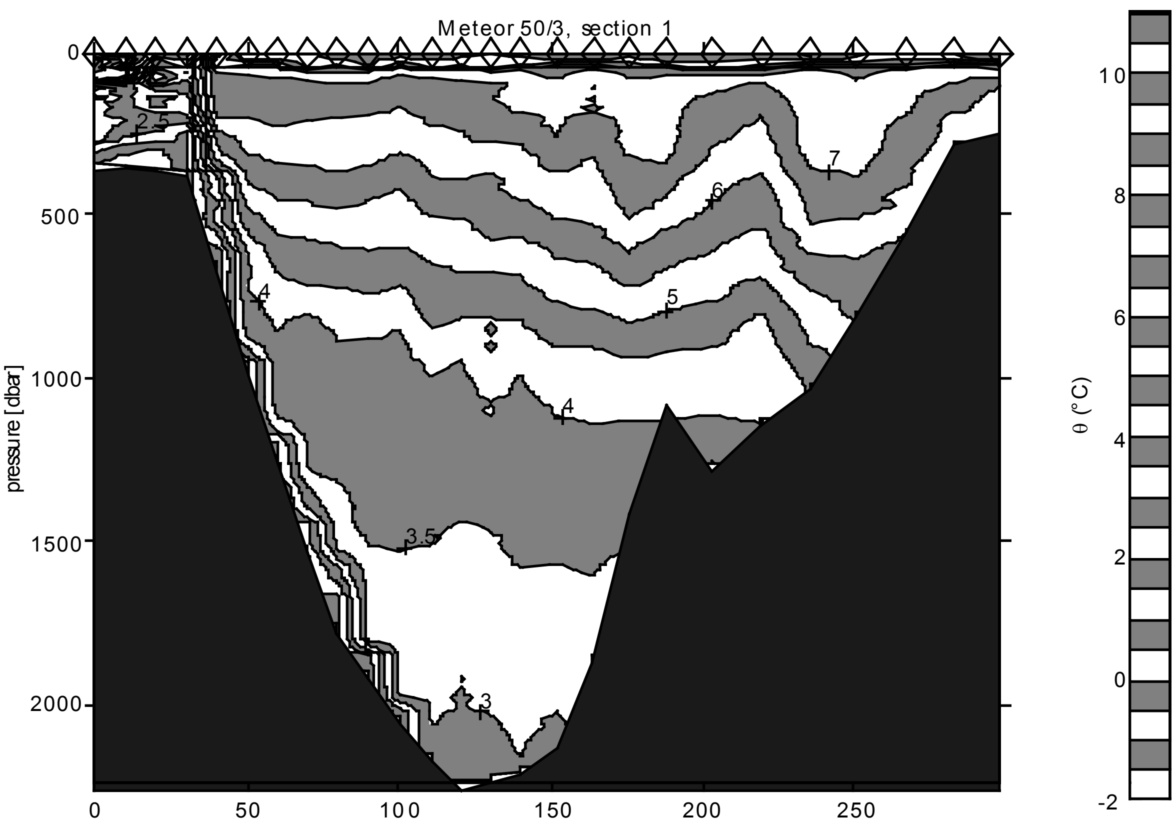
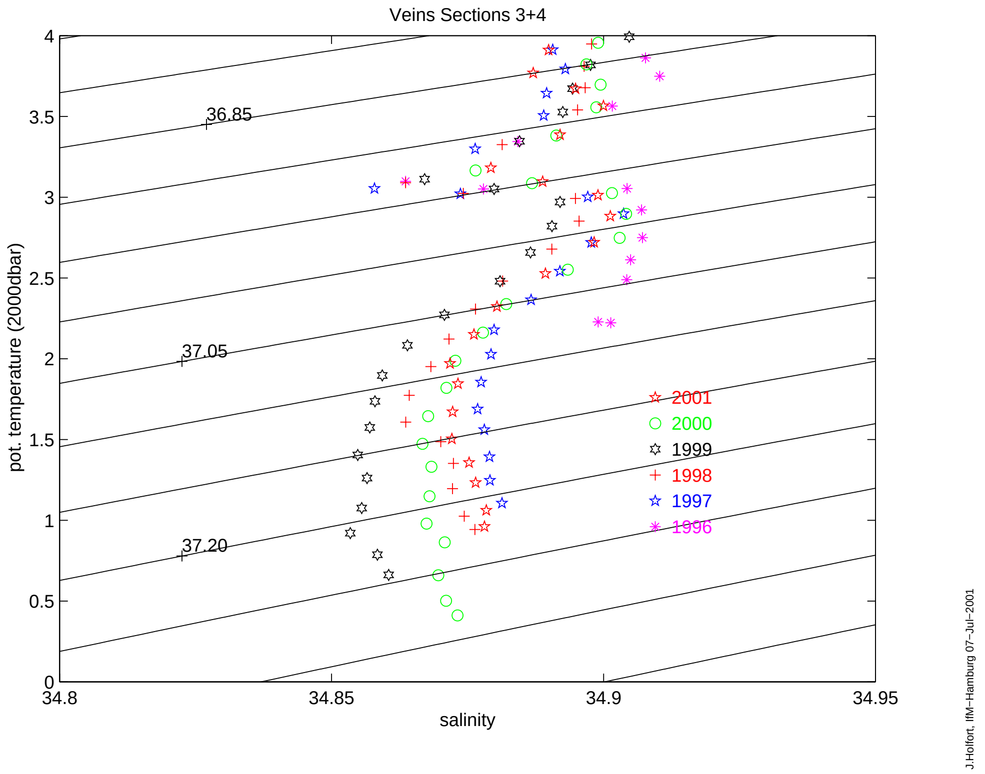


Fig. 3.3: Salinity (a) and potential temperature (b) along section 1.



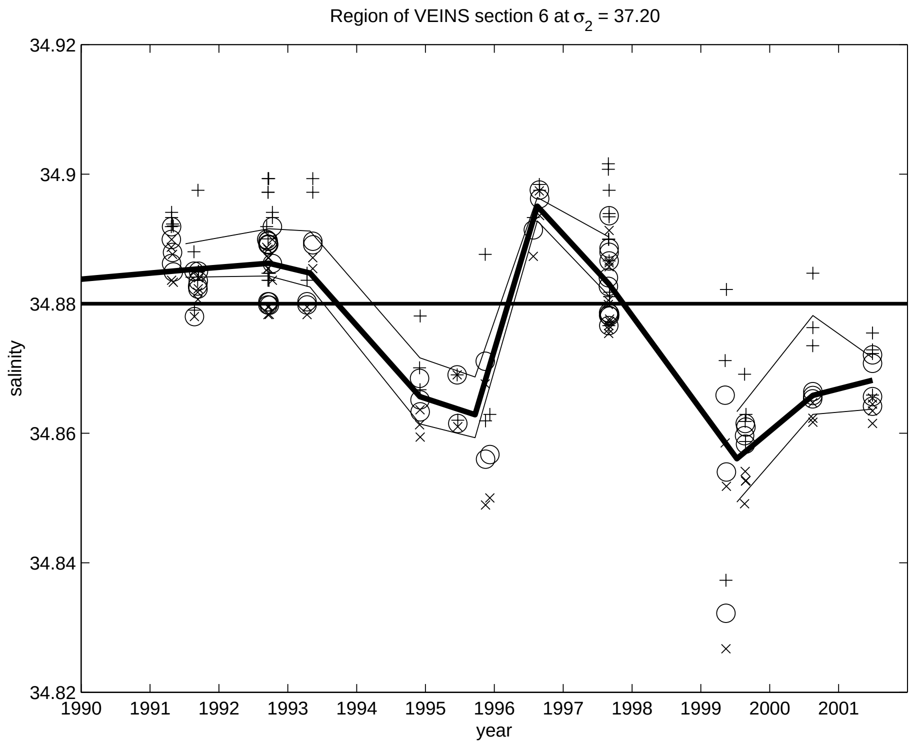
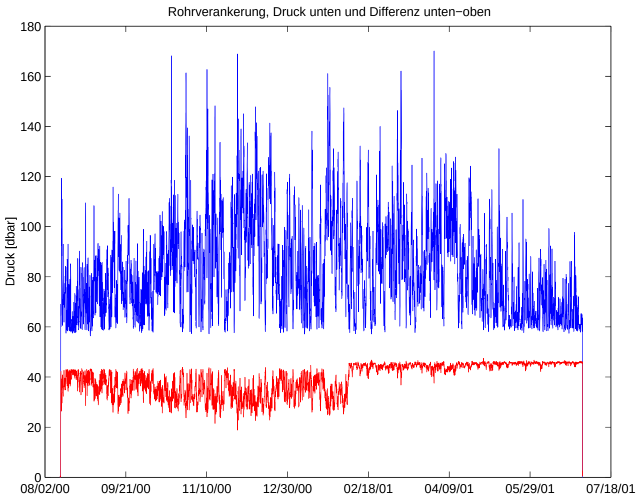


Fig. 3.4: a) Mean θ/S (averaged along isopycnals) diagrams for sections 3 and 4 of cruise M50/3 compared to previous cruises. b) Salinities of stations in the region of VEINS section 6 for a density layer around σ_2=37.20 kg/m^3. Circles are the median values of each profile in the density range +- 0.07, crosses and stars the minimum, respective maximum salinities in the density range +- 0.10. The median values of each year are connected with lines, the heavy line being the median values.

3.4.2 Moorings

The current and temperature data from the recovered Aandera current meters was available shortly after recovery. Data from the inverted echo sounders needs more processing and is still not available.

The recovered tube moorings had fallen apart in two pieces. It did not break, but split into two pieces because of loosened screws. From the pressure record (see Figure 3.5) it can be deduced that it happened in the end of January 2001. After this the two parts were connected just with an rope of 45 m length. The new tubes that were deployed have another connection between the individual elements, that should be more durable. The whole mooring tilted quite strongly, resulting in depth excursion of more than 100 m. Because it also happened after the tube went apart it is not ice but most probably the effect of strong currents. The drag on the tube is too strong compared to its buoyancy, the new tubes have a smaller diameter and should therefore have a better drag/buoyancy relation. The dominant signals in the pressure signal (and therefore also in the velocity, although no current meter was attached to the mooring) are the tides. There is no peak at the inertial frequency.



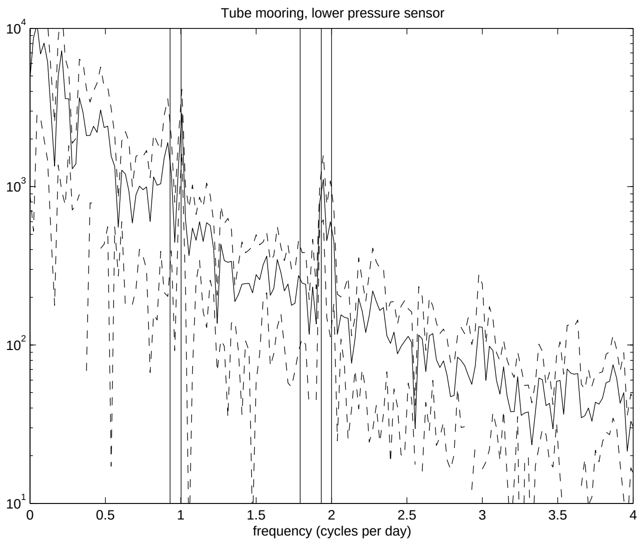


Fig. 3.5: a) Time series of pressure at the lower instrument of the tube mooring and difference of pressures between the upper and lower instrument. b) Power spectrum of the pressure at the lower instrument. Vertical lines gives the frequencies of the M2, S2, K1 O1 tides and of the inertia frequency.

3.4.3 Tracer Measurements (CFC-11 and CFC-12)

The discussion of the measurements of this leg are given in the chapter for leg M50/4.

3.4.4 Alkenones

(A. Kirch)

Alkenones are methyl and ethyl ketones consisting of chains of 37-40 carbon atoms with two double bonds up to four. These compounds are produced, probably as membrane lipids, by various Haptophyceae algae. In marine environments the coccolithophorid species *Emiliania huxleyi* is dominant and is well-known for its large blooms in the euphotic zone of the oceans.

The biosynthesis of alkenones in marine systems depends on the ambient water temperature. For example, in low temperature regimes, the amount of higher unsaturated ketones is increasing with temperature. The degree of unsaturation of C_{37} alkenones (only methyl ketones) is usually expressed in terms of U^{K}_{37} and $U^{K'}_{37}$ indices. Since the U^{K}_{37} and $U^{K'}_{37}$ indexes (the compositions of the alkenones) remain unchanged when released after the end of coccolithophorid blooms, they can be traced from the the euphotic zone down to the sediment. Successful temperature calibrations in field and laboratory experiments allows the use of U^{K}_{37} and $U^{K'}_{37}$ indices for the reconstruction of sea surface paleotemperatures.

The estimate of paleo-pCO_2 by measuring the $\delta^{13}C$ values of the alkenones, might add a valuable new aspect to the application of alkenones as biomarkers. Atmospheric CO_2 exchanges across the atmosphere-ocean interface. Dissolved CO_2 is transformed into organic carbon, for example during the biosynthesis of the alkenones, resulting in a characteristic isotopic signature. However, the isotopic signature may also influenced by environmental and growth conditions, such as the availability of light and nutrients, which makes the reconstruction of the pCO_2 doubtful.

The aim of our study is the determination of the ^{13}C isotopic signature of long-chain unsaturated methyl ketones (C_{37} alkenones) during coccolithophorid blooms in the North Atlantic Ocean. The ^{13}C signal will be observed from the formation of alkenones during the bloom until the burial in the sediment.

During the cruise METEOR M50/3 samples were taken for the analysis of the alkenones in the euphotic zone (from the surface down to the chlorophyll maximum). Additionally, complementary samples for the determination of particulate organic carbon (POC), suspended particulate material (SPM), chlorophyll and nutrients were taken. pCO_2 was measured almost continuously as described for M50/1 (see leg 1, 1.4.5).

A comprehensive list of the samples taken during the cruise is given in table 2 in chapter 3.6.

3.5 Weather and Ice Conditions during M50/3

When the METEOR left St. John's, NF, Canada, on June 21, 2001, a gale center of 990 hPa had just entered the Labrador Sea, moving east and filling slowly. Northwesterly winds of 6 to 7 Bft were felt on the ship's position while she headed northeast for the starting position of the first of several hydrographic sections in waters off Southeastern Greenland. On June 23, a trough encircling the slowly filling gale center caused a temporary intensification from 1000 hPa to 995 hPa at 53 North 25 West. At the same time, a flat low just east of Southeastern Greenland had intensified to 1000 hPa, and between those two lows the METEOR experienced southwesterly winds of 5 Bft on June 25 when hydrographic work was about to begin. Filling of the low over the Irminger Sea reduced wind velocity to 4 Bft and direction to back east so that work was unhampered. When the research vessel reached Walloe, southeastern Greenland, on June 28, northeasterly winds were up to 6 Bft just because of the coast's proximity. This was shown when the ship went out into the Irminger Sea, heading for the starting position for the next hydrographic section on June 29 when wind force was down to 4 Bft again. Meanwhile the wedge of high pressure that extended from central to southern Greenland over the Inland Ice had weakened so that winds remained northerly 4 Bft on June 30 when the ship reached mooring arrays at 63°North so close to the coast that it showed clearly and in bright sunshine. The air masses originated from over the Inland Ice indeed because an air temperature of 2°C was the chilliest one recorded during the cruise.

At the same time a low migrating east from Newfoundland had reached the area southeast of Greenland, central pressure being 992 hPa. As it turned northeast during July 1, northeasterly winds increased to 7 Bft on the METEOR's probing position. As the low started to fill winds were slow to abate to North 5 Bft on July 2, but by July 3 conditions were light and variable, and the opportunity was being taken to recover and deploy again a new type of mooring consisting of a tube 50 m long with built-in CTD instruments.

However, a gale center that had been tracked from southwest of the Great Lakes to the northern rim of Hudson Bay, then swinging east, had reached the Labrador Sea by July 3, filling there but inducing a new low on the east coast of southern Greenland that quickly intensified into a gale center 1003 hPa by July 4 when the METEOR experienced North to Northwest 7 Bft. These gales were short-lived because the gale center quickly moved away to Iceland. During the next two days winds were light and variable. However, meanwhile the gale center from the Labrador Sea was following the track taken by the low it had induced, central pressure in the Irminger Sea being 1000 hPa by July 7 when the METEOR observed strong northwesterly to northerly winds of 6 Bft. The low then filled further swinging southeast and eventually merging with the next of it's kind.

In June, a prominent feature of the average North Atlantic weather chart had been absent: the Azores High. If it was there, it had been weaker than normal, or the subtropical high could be found near to its winter position at Bermuda. Now it established itself just west of the Azores with a central pressure of over 1030 hPa. Opposing a low, albeit a weak one, in the vicinity of Iceland, the scene is set for quick developments starting in the greater Newfoundland area. There was no long wait: during July 8, a low of 1003 hPa passed Goose Bay, Labrador, Canada, heading east and developing into a gale center by noon of the same day at 55 North 43 West. By July 9, central pressure was 993 hPa at 57 North 20 West, and by July 11, central pressure was 997 hPa at the Scottish eastern coast. The storm center then turned northeast to lie to the south of the Lofot islands, Norway, in the evening of July 12, central pressure being 991 hPa. During July 9, a vital part of the cold air masses involved in the circulation of the gale center passed Denmark Strait, and METEOR, working to the west of that passage, observed northeasterly gales of 7 to 8 Bft. So she was not being hard hit.

When the ship reached the area south of Ammassalik, eastern Greenland, winds were down to light and variable, and as a low to the leeward side of the high mountains in that area was forming there was an exceptional view from afar including a fantastic Fata Morgana that emphasized the rim of the ice that barred access to the coast, not to mention hills being shown upside down in a considerable height above the ground.

During the last few days of the voyage there were light to moderate westerly winds that backed to moderate easterlies when our research vessel headed for Reykjavik, Iceland, calling there on July 15.

Ice charts were closely monitored as they were issued by the Danish Meteorological Institute, being sent to the ship by the Institut für Meereskunde, University of Kiel, or by the Bundesamt für Seeschifffahrt und Hydrographie, Hamburg. When the ship was still on her way to Greenland, accessibility of mooring positions near the coast was in question, but when this question became vital, new ice charts reassured free access to the positions. Icebergs were seen but a few.

3.6 List of Stations

Table 1: CTD-Station List

EXPO-CODE	Section Name	Stat. No.	Cast No.	Cast Type	Date mmddyy	Time UTC	Code	Position Latitude	Position Longitude	Code	Bottom depth	Meter Wheel	Max Press.	Bottom Dist.	Comments
06ME50/3		161	01	ROS/CTD	062101	1220	BE	50 18.67 N	47 48.99 W	GPS	2710				
06ME50/3		161	01	ROS/CTD	062101	1318	BO	50 18.62 N	47 49.23 W	GPS	2714	2682	1500		Test Station
06ME50/3		161	01	ROS/CTD	062101	1411	EN	50 18.29 N	47 49.48 W	GPS	2715				
06ME50/3	VEINS-6	162	01	ROS/CTD	062501	1442	BE	58 47.79 N	30 49.68 W	GPS	1264				
06ME50/3	VEINS-6	162	01	ROS/CTD	062501	1507	BO	58 47.75 N	30 49.34 W	GPS	1225		1237	14	
06ME50/3	VEINS-6	162	01	ROS/CTD	062501	1545	EN	58 47.63 N	30 48.92 W	GPS	1259				
06ME50/3	VEINS-6	163	01	ROS/CTD	062501	1733	BE	58 52.02 N	31 30.00 W	GPS	1518				
06ME50/3	VEINS-6	163	01	ROS/CTD	062501	1827	BO	58 52.03 N	31 29.88 W	GPS	1513	1487	1505	14	
06ME50/3	VEINS-6	163	01	ROS/CTD	062501	1913	EN	58 52.02 N	31 29.91 W	GPS	1516				
06ME50/3	VEINS-6	164	01	ROS/CTD	062501	2145	BE	58 56.18 N	32 10.18 W	GPS	1770				
06ME50/3	VEINS-6	164	01	ROS/CTD	062501	2221	BO	58 56.04 N	32 09.56 W	GPS	1778	1751	1770	14	
06ME50/3	VEINS-6	164	01	ROS/CTD	062501	2326	EN	58 56.09 N	32 09.07 W	GPS	1627				
06ME50/3	VEINS-6	165	01	ROS/CTD	062601	0141	BE	59 00.28 N	32 49.54 W	GPS	2157				
06ME50/3	VEINS-6	165	01	ROS/CTD	062601	0223	BO	59 00.53 N	32 48.44 W	GPS	2136		2126	15	
06ME50/3	VEINS-6	165	01	ROS/CTD	062601	0312	EN	59 00.72 N	32 47.31 W	GPS	2141				
06ME50/3	VEINS-6	166	01	ROS/CTD	062601	0543	BE	59 04.04 N	33 30.06 W	GPS	2315				
06ME50/3	VEINS-6	166	01	ROS/CTD	062601	0621	BO	59 04.10 N	33 29.68 W	GPS	2329	2295	2322	14	
06ME50/3	VEINS-6	166	01	ROS/CTD	062601	0721	EN	59 04.18 N	33 29.44 W	GPS	2325				
06ME50/3	VEINS-6	167	01	ROS/CTD	062601	0926	BE	59 07.91 N	34 10.38 W	GPS	2302				
06ME50/3	VEINS-6	167	01	ROS/CTD	062601	1014	BO	59 07.82 N	34 10.38 W	GPS	2298	2268	2293	14	
06ME50/3	VEINS-6	167	01	ROS/CTD	062601	1117	EN	59 07.87 N	34 10.11 W	GPS	2281				
06ME50/3	VEINS-6	168	01	ROS/CTD	062601	1529	BE	59 13.05 N	34 59.88 W	GPS	2726				
06ME50/3	VEINS-6	168	01	ROS/CTD	062601	1621	BO	59 13.06 N	34 59.77 W	GPS	2709		2733	15	
06ME50/3	VEINS-6	168	01	ROS/CTD	062601	1724	EN	59 13.01 N	34 59.86 W	GPS	2281				
06ME50/3	VEINS-6	169	01	ROS/CTD	062601	1946	BE	59 18.01 N	35 50.08 W	GPS	3119				
06ME50/3	VEINS-6	169	01	ROS/CTD	062601	2048	BO	59 17.91 N	35 50.12 W	GPS	3120	3097	3137	14	
06ME50/3	VEINS-6	169	01	ROS/CTD	062601	2200	EN	59 17.82 N	35 50.24 W	GPS	3120				
06ME50/3	VEINS-6	170	01	ROS/CTD	062701	0025	BE	59 22.98 N	36 40.11 W	GPS	3121				
06ME50/3	VEINS-6	170	01	ROS/CTD	062701	0124	BO	59 23.04 N	36 39.86 W	GPS	3100	3101	3139	15	
06ME50/3	VEINS-6	170	01	ROS/CTD	062701	0231	EN	59 23.15 N	36 39.58 W	GPS	3120				
06ME50/3	VEINS-6	171	01	ROS/CTD	062701	0501	BE	59 27.99 N	37 29.99 W	GPS	3139				
06ME50/3	VEINS-6	171	01	ROS/CTD	062701	0608	BO	59 28.02 N	37 30.02 W	GPS	3139	3111	3154	14	
06ME50/3	VEINS-6	171	01	ROS/CTD	062701	0723	EN	59 28.11 N	37 29.93 W	GPS	3140				
06ME50/3	VEINS-6	172	01	ROS/CTD	062701	0951	BE	59 33.04 N	38 20.34 W	GPS	3060				
06ME50/3	VEINS-6	172	01	ROS/CTD	062701	1051	BO	59 33.10 N	38 20.32 W	GPS	3061	3040	3072	14	
06ME50/3	VEINS-6	172	01	ROS/CTD	062701	1204	EN	59 33.11 N	38 20.15 W	GPS	3061				
06ME50/3	VEINS-6	173	01	ROS/CTD	062701	1358	BE	59 36.98 N	38 59.98 W	GPS	2946				
06ME50/3	VEINS-6	173	01	ROS/CTD	062701	1455	BO	59 36.96 N	39 00.04 W	GPS	2944		2954	12	
06ME50/3	VEINS-6	173	01	ROS/CTD	062701	1600	EN	59 37.01 N	38 59.85 W	GPS	2947				
06ME50/3	VEINS-6	174	01	ROS/CTD	062701	1804	BE	59 42.06 N	39 40.11 W	GPS	2795				
06ME50/3	VEINS-6	174	01	ROS/CTD	062701	1900	BO	59 42.08 N	39 40.00 W	GPS	2796	2764	2800	14	
06ME50/3	VEINS-6	174	01	ROS/CTD	062701	2005	EN	59 42.03 N	39 40.10 W	GPS	2798				
06ME50/3	VEINS-6	175	01	ROS/CTD	062701	2157	BE	59 45.97 N	40 15.17 W	GPS	2638				
06ME50/3	VEINS-6	175	01	ROS/CTD	062701	2246	BO	59 45.87 N	40 15.34 W	GPS	2636	2611	2636	14	
06ME50/3	VEINS-6	175	01	ROS/CTD	062701	2345	EN	59 45.94 N	40 15.43 W	GPS	2638				
06ME50/3	VEINS-6	176	01	ROS/CTD	062801	0130	BE	59 49.97 N	40 50.04 W	GPS	2383				
06ME50/3	VEINS-6	176	01	ROS/CTD	062801	0215	BO	59 50.03 N	40 50.08 W	GPS	2381	2354	2376	15	
06ME50/3	VEINS-6	176	01	ROS/CTD	062801	0303	EN	59 50.11 N	40 50.35 W	GPS	2375				
06ME50/3	VEINS-6	177	01	ROS/CTD	062801	0409	BE	59 51.95 N	41 09.93 W	GPS	2061				
06ME50/3	VEINS-6	177	01	ROS/CTD	062801	0449	BO	59 52.00 N	41 10.04 W	GPS	2036	2036	2049	14	
06ME50/3	VEINS-6	177	01	ROS/CTD	062801	0537	EN	59 52.00 N	41 10.11 W	GPS	2059				

06ME50/3	VEINS-6	178	01	ROS/CTD	062801	0642	BE	59 53.98 N	41 30.14 W	GPS	1905				
06ME50/3	VEINS-6	178	01	ROS/CTD	062801	0723	BO	59 53.96 N	41 30.15 W	GPS	1905	1872	1892	14	
06ME50/3	VEINS-6	178	01	ROS/CTD	062801	0808	EN	59 53.98 N	41 30.07 W	GPS	1906				
06ME50/3	VEINS-6	179	01	ROS/CTD	062801	0912	BE	59 55.86 N	41 50.36 W	GPS	1828				
06ME50/3	VEINS-6	179	01	ROS/CTD	062801	0949	BO	59 55.68 N	41 50.80 W	GPS	1828	1797	1812	14	
06ME50/3	VEINS-6	179	01	ROS/CTD	062801	1041	EN	59 55.53 N	41 51.58 W	GPS	1827				
06ME50/3	VEINS-6	180	01	ROS/CTD	062801	1140	BE	59 58.04 N	42 10.42 W	GPS	516				
06ME50/3	VEINS-6	180	01	ROS/CTD	062801	1154	BO	59 57.98 N	42 10.72 W	GPS	485		468	14	
06ME50/3	VEINS-6	180	01	ROS/CTD	062801	1211	EN	59 57.90 N	42 10.96 W	GPS	479				
06ME50/3	VEINS-6	181	01	ROS/CTD	062801	1316	BE	59 59.90 N	42 30.16 W	GPS	190				
06ME50/3	VEINS-6	181	01	ROS/CTD	062801	1323	BO	59 59.89 N	42 30.35 W	GPS	188		172	14	
06ME50/3	VEINS-6	181	01	ROS/CTD	062801	1335	EN	59 59.85 N	42 30.49 W	GPS	186				
06ME50/3	VEINS-5	182	01	ROS/CTD	062901	0325	BE	60 44.00 N	38 06.20 W	GPS	2905				
06ME50/3	VEINS-5	182	01	ROS/CTD	062901	0425	BO	60 44.00 N	38 05.98 W	GPS	2903	2880	2913	14	
06ME50/3	VEINS-5	182	01	ROS/CTD	062901	0527	EN	60 44.01 N	38 05.99 W	GPS	2902				
06ME50/3	VEINS-5	183	01	ROS/CTD	062901	0728	BE	60 50.01 N	38 47.28 W	GPS	2813				
06ME50/3	VEINS-5	183	01	ROS/CTD	062901	0824	BO	60 50.06 N	38 47.17 W	GPS	2813	2781	2817	14	
06ME50/3	VEINS-5	183	01	ROS/CTD	062901	0927	EN	60 50.16 N	38 46.98 W	GPS	2814				
06ME50/3	VEINS-5	184	01	ROS/CTD	062901	1122	BE	60 56.92 N	39 27.07 W	GPS	2580				
06ME50/3	VEINS-5	184	01	ROS/CTD	062901	1213	BO	60 57.11 N	39 26.68 W	GPS	2584	2551	2584	14	
06ME50/3	VEINS-5	184	01	ROS/CTD	062901	1312	EN	60 57.15 N	39 26.44 W	GPS	2586				
06ME50/3	VEINS-5	185	01	ROS/CTD	062901	1511	BE	61 03.98 N	40 08.06 W	GPS	2192				
06ME50/3	VEINS-5	185	01	ROS/CTD	062901	1553	BO	61 04.02 N	40 08.08 W	GPS	2188	2145	2181	14	
06ME50/3	VEINS-5	185	01	ROS/CTD	062901	1643	EN	61 04.05 N	40 08.04 W	GPS	2189				
06ME50/3	VEINS-5	186	01	ROS/CTD	062901	1820	BE	61 10.99 N	40 39.29 W	GPS	1895				
06ME50/3	VEINS-5	186	01	ROS/CTD	062901	1900	BO	61 10.98 N	40 39.14 W	GPS	1896	1868	1884	14	
06ME50/3	VEINS-5	186	01	ROS/CTD	062901	1939	EN	61 11.05 N	40 39.12 W	GPS	1894				
06ME50/3	VEINS-5	187	01	ROS/CTD	062901	2051	BE	61 14.94 N	41 00.03 W	GPS	1798				
06ME50/3	VEINS-5	187	01	ROS/CTD	062901	2130	BO	61 14.68 N	41 00.31 W	GPS	1803	1796	1790	14	
06ME50/3	VEINS-5	187	01	ROS/CTD	062901	2214	EN	61 14.35 N	41 00.73 W	GPS	1817				
06ME50/3	VEINS-5	188	01	ROS/CTD	062901	2303	BE	61 16.87 N	41 14.58 W	GPS	1423				
06ME50/3	VEINS-5	188	01	ROS/CTD	062901	2334	BO	61 16.64 N	41 14.80 W	GPS	1451	1429	1440	14	
06ME50/3	VEINS-5	188	01	ROS/CTD	063001	0006	EN	61 16.34 N	41 15.00 W	GPS	1477				
06ME50/3	VEINS-5	189	01	ROS/CTD	063001	0100	BE	61 17.97 N	41 30.30 W	GPS	236				
06ME50/3	VEINS-5	189	01	ROS/CTD	063001	0109	BO	61 17.98 N	41 30.40 W	GPS	240	219	223	14	
06ME50/3	VEINS-5	189	01	ROS/CTD	063001	0121	EN	61 17.97 N	41 30.41 W	GPS	240				
06ME50/3	VEINS-4	190	01	MOR	063001	1106	BE	63 00.00 N	40 33.10 W	GPS	300				Recovery of mooring tube
06ME50/3	VEINS-4	190	01	MOR	063001	1208	EN	63 00.60 N	40 35.30 W	GPS	300				
06ME50/3	VEINS-3	191	01	ROS/CTD	070101	0104	BE	63 02.00 N	35 27.15 W	GPS	2656				
06ME50/3	VEINS-3	191	01	ROS/CTD	070101	0149	BO	63 02.01 N	35 27.18 W	GPS			2658	14	
06ME50/3	VEINS-3	191	04	ROS/CTD	070101	0527	EN	63 01.97 N	35 27.14 W	GPS					4 JOJO Profiles
06ME50/3	VEINS-3	192	01	MOR	070101	0658	BE	63 06.90 N	35 32.60 W	GPS	2590				
06ME50/3	VEINS-3	192	01	MOR	070101	0817	EN	63 07.10 N	35 32.40 W	GPS					Recovery of mooring G2
06ME50/3	VEINS-3	193	01	MOR	070101	0940	BE	63 16.70 N	35 54.00 W	GPS	2536				
06ME50/3	VEINS-3	193	01	MOR	070101	1120	EN	63 17.00 N	35 52.60 W	GPS					Recovery of mooring UK2
06ME50/3	VEINS-3	194	01	MOR	070101	1207	BE	63 21.40 N	36 05.30 W	GPS	2200				
06ME50/3	VEINS-3	194	01	MOR	070101	1322	EN	63 21.60 N	36 06.20 W	GPS					Recovery of mooring G1(FI)
06ME50/3	VEINS-3	195	01	MOR	070101	1415	BE	63 27.90 N	36 18.00 W	GPS	1998				
06ME50/3	VEINS-3	195	01	MOR	070101	1533	EN	63 28.00 N	36 19.50 W	GPS					Recovery of mooring UK1/IES
06ME50/3	VEINS-3	196	01	MOR	070101	1533	BE	63 28.00 N	36 19.50 W	GPS	1987				
06ME50/3	VEINS-3	196	01	MOR	070101	1630	EN	63 28.50 N	36 20.20 W	GPS					Recovery of mooring UK1
06ME50/3	VEINS-3	197	01	MOR	070101	1715	BE	63 32.70 N	36 31.00 W	GPS	1780				
06ME50/3	VEINS-3	197	01	MOR	070101	1816	EN	63 33.20 N	36 33.00 W	GPS					Recovery of mooring F2
06ME50/3	VEINS-3	198	01	MOR	070101	1912	BE	63 37.60 N	36 49.30 W	GPS	1598				
06ME50/3	VEINS-3	198	01	MOR	070101	2010	EN	63 38.20 N	36 49.60 W	GPS					Recovery of mooring F1(G)
06ME50/3	VEINS-4	199	01	ROS/CTD	070201	0900	BE	61 25.99 N	35 00.00 W	GPS	2911				
06ME50/3	VEINS-4	199	01	ROS/CTD	070201	0955	BO	61 26.17 N	35 44.57 W	GPS	2911	2900	2921	14	
06ME50/3	VEINS-4	199	01	ROS/CTD	070201	1109	EN	61 26.37 N	35 44.56 W	GPS	2912				
06ME50/3	VEINS-4	200	01	ROS/CTD	070201	1311	BE	61 37.91 N	36 18.01 W	GPS	2800				
06ME50/3	VEINS-4	200	01	ROS/CTD	070201	1405	BO	61 38.17 N	36 18.45 W	GPS	2797	2768	2804	14	
06ME50/3	VEINS-4	200	01	ROS/CTD	070201	1508	EN	61 38.43 N	36 18.27 W	GPS	2797				
06ME50/3	VEINS-4	201	01	ROS/CTD	070201	1712	BE	61 49.06 N	36 53.16 W	GPS	2684				
06ME50/3	VEINS-4	201	01	ROS/CTD	070201	1806	BO	61 49.09 N	36 53.15 W	GPS	2687	2640	2688	15	
06ME50/3	VEINS-4	201	01	ROS/CTD	070201	1910	EN	61 49.04 N	36 52.95 W	GPS	2687				
06ME50/3	VEINS-4	202	01	ROS/CTD	070201	2022	BE	61 54.97 N	37 09.97 W	GPS	2625				
06ME50/3	VEINS-4	202	01	ROS/CTD	070201	2113	BO	61 55.10 N	37 10.11 W	GPS	2623	2590	2624	14	
06ME50/3	VEINS-4	202	01	ROS/CTD	070201	2207	EN	61 55.23 N	37 10.69 W	GPS	2621				
06ME50/3	VEINS-4	203	01	ROS/CTD	070201	2310	BE	62 01.30 N	37 28.38 W	GPS	2561				
06ME50/3	VEINS-4	203	01	ROS/CTD	070201	2358	BO	62 01.65 N	37 29.37 W	GPS	2559	2535	2560	14	
06ME50/3	VEINS-4	203	01	ROS/CTD	070301	0058	EN	62 02.07 N	37 30.50 W	GPS	2555				
06ME50/3	VEINS-4	204	01	ROS/CTD	070301	0156	BE	62 06.90 N	37 44.98 W	GPS	2526				
06ME50/3	VEINS-4	204	01	ROS/CTD	070301	0245	BO	62 06.69 N	37 45.06 W	GPS	2529	2496	2526	13	
06ME50/3	VEINS-4	204	01	ROS/CTD	070301	0332	EN	62 06.84 N	37 45.28 W	GPS	2530				
06ME50/3	VEINS-4	205	01	MOR	070301	1440	BE	63 00.20 N	40 32.70 W	GPS	303				Deployment Tube04
06ME50/3	VEINS-4	206	01	MOR	070301	1638	BE	62 58.60 N	40 53.30 W	GPS	300				Deployment Tube03
06ME50/3	VEINS-4	207	01	ROS/CTD	070301	1745	BE	63 00.00 N	40 35.01 W	GPS	403				
06ME50/3	VEINS-4	207	01	ROS/CTD	070301	1800	BO	62 59.99 N	40 35.17 W	GPS	409	387	392	14	

06ME50/3	VEINS-4	207	01	ROS/CTD	070301	1811	EN	63 00.01 N	40 35.33 W	GPS	414				
06ME50/3	VEINS-4	208	01	ROS/CTD	070301	1853	BE	62 57.92 N	40 24.84 W	GPS	220				
06ME50/3	VEINS-4	208	01	ROS/CTD	070301	1903	BO	62 57.93 N	40 24.97 W	GPS	218	205	208	14	
06ME50/3	VEINS-4	208	01	ROS/CTD	070301	1912	EN	62 57.96 N	40 25.06 W	GPS	218				
06ME50/3	VEINS-4	209	01	ROS/CTD	070301	2018	BE	62 51.93 N	40 07.04 W	GPS	1698				
06ME50/3	VEINS-4	209	01	ROS/CTD	070301	2054	BO	62 52.01 N	40 07.13 W	GPS	1694	1670	1684	14	
06ME50/3	VEINS-4	209	01	ROS/CTD	070301	2134	EN	62 51.96 N	40 07.05 W	GPS	1695				
06ME50/3	VEINS-4	210	01	ROS/CTD	070301	2236	BE	62 46.95 N	39 49.95 W	GPS	1931				
06ME50/3	VEINS-4	210	01	ROS/CTD	070301	2313	BO	62 46.91 N	39 49.14 W	GPS	1932	1906	1924	14	
06ME50/3	VEINS-4	210	01	ROS/CTD	070301	2351	EN	62 46.80 N	39 49.36 W	GPS	1935				
06ME50/3	VEINS-4	211	01	ROS/CTD	070401	0100	BE	62 40.98 N	39 31.11 W	GPS	1974				
06ME50/3	VEINS-4	211	01	ROS/CTD	070401	0136	BO	62 40.95 N	39 31.10 W	GPS	1974	1932	1953	14	
06ME50/3	VEINS-4	211	01	ROS/CTD	070401	0217	EN	62 40.96 N	39 31.05 W	GPS	1976				
06ME50/3	VEINS-4	212	01	ROS/CTD	070401	0330	BE	62 35.02 N	39 13.11 W	GPS	2029				
06ME50/3	VEINS-4	212	01	ROS/CTD	070401	0405	BO	62 35.07 N	39 13.02 W	GPS	2030	1999	2019	14	
06ME50/3	VEINS-4	212	01	ROS/CTD	070401	0444	EN	62 35.08 N	39 12.95 W	GPS	2032				
06ME50/3	VEINS-4	213	01	ROS/CTD	070401	0550	BE	62 30.00 N	38 56.12 W	GPS	2166				
06ME50/3	VEINS-4	213	01	ROS/CTD	070401	0635	BO	62 30.05 N	38 56.31 W	GPS	2160	2125	2150	14	
06ME50/3	VEINS-4	213	01	ROS/CTD	070401	0725	EN	62 30.19 N	38 56.77 W	GPS	2165				
06ME50/3	VEINS-4	214	01	ROS/CTD	070401	0845	BE	62 23.98 N	38 37.97 W	GPS	2280				
06ME50/3	VEINS-4	214	01	ROS/CTD	070401	0930	BO	62 24.20 N	38 38.68 W	GPS	2269	2250	2266	14	
06ME50/3	VEINS-4	214	01	ROS/CTD	070401	1013	EN	62 24.38 N	38 38.96 W	GPS					
06ME50/3	VEINS-4	215	01	ROS/CTD	070401	1143	BE	62 17.90 N	38 20.53 W	GPS	2368				
06ME50/3	VEINS-4	215	01	ROS/CTD	070401	1228	BO	62 17.88 N	38 20.61 W	GPS	2366	2334	2365	14	
06ME50/3	VEINS-4	215	01	ROS/CTD	070401	1320	EN	62 17.84 N	38 20.58 W	GPS	2369				
06ME50/3	VEINS-4	216	01	ROS/CTD	070401	1429	BE	62 12.08 N	38 03.04 W	GPS	2491				
06ME50/3	VEINS-4	216	01	ROS/CTD	070401	1518	BO	62 12.01 N	38 02.96 W	GPS	2490	2460	2488	14	
06ME50/3	VEINS-4	216	01	ROS/CTD	070401	1608	EN	62 12.02 N	38 03.02 W	GPS	2490				
06ME50/3	VEINS-3	217	01	ROS/CTD	070501	0205	BE	63 49.97 N	36 58.15 W	GPS	357				
06ME50/3	VEINS-3	217	01	ROS/CTD	070501	0215	BO	63 50.03 N	36 58.51 W	GPS	356	334	335	14	
06ME50/3	VEINS-3	217	01	ROS/CTD	070501	0224	EN	63 50.02 N	36 58.67 W	GPS	354				
06ME50/3	VEINS-3	218	01	ROS/CTD	070501	0311	BE	63 46.01 N	36 51.15 W	GPS	629				
06ME50/3	VEINS-3	218	01	ROS/CTD	070501	0328	BO	63 46.06 N	36 51.37 W	GPS	580	568	571	14	
06ME50/3	VEINS-3	218	01	ROS/CTD	070501	0340	EN	63 46.13 N	36 51.52 W	GPS	550				
06ME50/3	VEINS-3	219	01	ROS/CTD	070501	0425	BE	63 42.03 N	36 43.13 W	GPS	1715				
06ME50/3	VEINS-3	219	01	ROS/CTD	070501	0500	BO	63 42.08 N	36 43.22 W	GPS	1711	1691	1696	14	
06ME50/3	VEINS-3	219	01	ROS/CTD	070501	0541	EN	63 42.01 N	36 43.72 W	GPS	1675				
06ME50/3	VEINS-3	220	01	ROS/CTD	070501	0654	BE	63 33.89 N	36 27.91 W	GPS	1800				
06ME50/3	VEINS-3	220	01	ROS/CTD	070501	0733	BO	63 33.83 N	36 28.09 W	GPS	1796	1766	1785	14	
06ME50/3	VEINS-3	220	01	ROS/CTD	070501	0807	EN	63 33.77 N	36 28.25 W	GPS	1792				
06ME50/3	VEINS-3	221	01	MOR	070501	0829	BE	63 32.60 N	36 29.10 W	GPS					Recovery of mooring F2/ADCP
06ME50/3	VEINS-3	221	01	MOR	070501	0928	EN	63 31.90 N	36 28.60 W	GPS					
06ME50/3	VEINS-3	222	01	ROS/CTD	070501	1010	BE	63 29.98 N	36 20.00 W	GPS	1942				
06ME50/3	VEINS-3	222	01	ROS/CTD	070501	1049	BO	63 29.95 N	36 20.13 W	GPS	1942	1909	1930	14	
06ME50/3	VEINS-3	222	01	ROS/CTD	070501	1135	EN	63 29.96 N	36 19.79 W	GPS	1949				
06ME50/3	VEINS-3	223	01	MOR	070501	1157	BE	63 28.70 N	36 18.80 W	GPS					Deployment of mooring UK1/IES-2001
06ME50/3	VEINS-3	223	01	MOR	070501	1245	EN	63 28.69 N	36 18.81 W	GPS					
06ME50/3	VEINS-3	224	01	ROS/CTD	070501	1246	BE	63 28.69 N	36 18.76 W	GPS	1988		80		CO2
06ME50/3	VEINS-3	224	01	ROS/CTD	070501	1305	EN	63 28.74 N	36 18.97 W	GPS	1987				
06ME50/3	VEINS-3	225	01	MOR	070501	1414	BE	63 22.40 N	36 03.80 W	GPS					Deployment of mooring G1-2001
06ME50/3	VEINS-3	225	01	MOR	070501	1502	EN	63 21.80 N	36 04.30 W	GPS					
06ME50/3	VEINS-3	226	01	MOR	070501	1547	BE	63 17.60 N	35 52.90 W	GPS					Deployment of mooring UK2-2001
06ME50/3	VEINS-3	226	01	MOR	070501	1619	EN	63 17.00 N	35 53.10 W	GPS					
06ME50/3	VEINS-3	227	01	MOR	070501	1742	BE	63 07.50 N	35 31.50 W	GPS					Deployment of mooring G2-2001
06ME50/3	VEINS-3	227	01	MOR	070501	1805	EN	63 07.00 N	35 31.90 W	GPS					
06ME50/3	VEINS-3	228	01	ROS/CTD	070501	2034	BE	63 25.99 N	36 13.11 W	GPS	2097				
06ME50/3	VEINS-3	228	01	ROS/CTD	070501	2115	BO	63 25.96 N	36 13.10 W	GPS	2100	2075	2097	14	
06ME50/3	VEINS-3	228	01	ROS/CTD	070501	2202	EN	63 25.93 N	36 13.53 W	GPS	2096				
06ME50/3	VEINS-3	229	01	ROS/CTD	070501	2248	BE	63 23.02 N	36 06.00 W	GPS	2201				
06ME50/3	VEINS-3	229	01	ROS/CTD	070501	2331	BO	63 21.89 N	36 06.55 W	GPS	2198	2172	2194	14	
06ME50/3	VEINS-3	229	01	ROS/CTD	070601	0015	EN	63 21.94 N	36 07.00 W	GPS	2198				
06ME50/3	VEINS-3	230	01	ROS/CTD	070601	0108	BE	63 18.09 N	35 58.13 W	GPS	2306				
06ME50/3	VEINS-3	230	01	ROS/CTD	070601	0154	BO	63 17.98 N	35 58.35 W	GPS	2306		2298	14	
06ME50/3	VEINS-3	230	01	ROS/CTD	070601	0235	EN	63 17.89 N	35 58.21 W	GPS	2310				
06ME50/3	VEINS-3	231	01	ROS/CTD	070601	0329	BE	63 14.03 N	35 49.65 W	GPS	2415				
06ME50/3	VEINS-3	231	01	ROS/CTD	070601	0414	BO	63 14.01 N	35 49.95 W	GPS	2419	2384	2413	14	
06ME50/3	VEINS-3	231	01	ROS/CTD	070601	0515	EN	63 14.00 N	35 50.09 W	GPS	2417				
06ME50/3	VEINS-3	232	01	ROS/CTD	070601	0602	BE	63 09.97 N	35 42.89 W	GPS	2511				
06ME50/3	VEINS-3	232	01	ROS/CTD	070601	0653	BO	63 10.00 N	35 42.95 W	GPS	2511	2478	2510	14	
06ME50/3	VEINS-3	232	01	ROS/CTD	070601	0742	EN	63 10.02 N	35 42.95 W	GPS	2510				
06ME50/3	VEINS-3	233	01	ROS/CTD	070601	0850	BE	63 02.01 N	35 27.98 W	GPS	2655				
06ME50/3	VEINS-3	233	01	ROS/CTD	070601	0940	BO	63 02.04 N	35 27.84 W	GPS	2654	2636	2660	14	
06ME50/3	VEINS-3	233	01	ROS/CTD	070601	1036	EN	63 01.93 N	35 27.99 W	GPS	2654				
06ME50/3	VEINS-3	234	01	ROS/CTD	070601	1233	BE	62 54.09 N	35 13.00 W	GPS	2717				
06ME50/3	VEINS-3	234	01	ROS/CTD	070601	1312	BO	62 54.27 N	35 12.27 W	GPS	2718	2700	2720	13	
06ME50/3	VEINS-3	234	01	ROS/CTD	070601	1400	EN	62 54.10 N	35 11.57 W	GPS	2719				
06ME50/3	VEINS-3	235	01	ROS/CTD	070601	1506	BE	62 45.98 N	34 58.07 W	GPS	2764				
06ME50/3	VEINS-3	235	01	ROS/CTD	070601	1559	BO	62 46.16 N	34 57.58 W	GPS	2773	2745	2775	14	
06ME50/3	VEINS-3	235	01	ROS/CTD	070601	1700	EN	62 46.30 N	34 57.68 W	GPS	2773				
06ME50/3	VEINS-3	236	01	ROS/CTD	070601	1808	BE	62 37.93 N	34 42.95 W	GPS	2806				
06ME50/3	VEINS-3	236	01	ROS/CTD	070601	1906	BO	62 38.16 N	34 42.67 W	GPS	2806	2792	2813	14	
06ME50/3	VEINS-3	236	01	ROS/CTD	070601	2002	EN	62 38.33 N	34 42.53 W	GPS	2806				
06ME50/3	VEINS-3	237	01	ROS/CTD	070601	2111	BE	62 29.91 N	34 28.00 W	GPS	2842				
06ME50/3	VEINS-3	237	01	ROS/CTD	070601	2206	BO	62 29.97 N	34 28.10 W	GPS	2842	2812	2850	14	

06ME50/3	VEINS-3	237	01	ROS/CTD	070601	2311	EN	62 29.97 N	34 28.21 W	GPS	2841				
06ME50/3	VEINS-3	238	01	ROS/CTD	070701	0033	BE	62 30.03 N	33 59.95 W	GPS	2899				
06ME50/3	VEINS-3	238	01	ROS/CTD	070701	0125	BO	62 30.07 N	34 00.15 W	GPS	2920	2848	2907	16	
06ME50/3	VEINS-3	238	01	ROS/CTD	070701	0224	EN	62 30.33 N	34 00.76 W	GPS	2895				
06ME50/3		239	01	ROS/CTD	070701	1030	BE	63 27.83 N	36 17.85 W	GPS	2013		100		CO2
06ME50/3		239	01	ROS/CTD	070701	1048	EN	63 27.83 N	36 18.63 W	GPS	2007				
06ME50/3	VEINS-3	239	02	MOR	070701	1101	BE	63 28.40 N	36 17.90 W	GPS					Deployment of mooring UK1-2001
06ME50/3	VEINS-3	239	02	MOR	070701	1135	EN	63 28.90 N	36 17.90 W	GPS					
06ME50/3	VEINS-3	240	01	MOR	070701	1221	BE	63 32.80 N	36 30.10 W	GPS					Deployment of mooring F2-2001
06ME50/3	VEINS-3	240	01	MOR	070701	1413	EN	63 33.30 N	36 30.30 W	GPS					
06ME50/3	VEINS-3	241	01	MOR	070701	1445	BE	63 37.60 N	36 47.40 W	GPS					Deployment of mooring F1-2001
06ME50/3	VEINS-3	241	01	MOR	070701	1515	EN	63 38.30 N	36 47.70 W	GPS					
06ME50/3	VEINS-3	242	01	MOR	070701	1551	BE	63 38.70 N	36 54.70 W	GPS					Deployment of mooring O1-2001
06ME50/3	VEINS-3	242	01	MOR	070701	1611	EN	63 39.00 N	36 54.40 W	GPS					
06ME50/3		243	01	ROS/CTD	070701	1843	BE	63 36.53 N	35 58.27 W	GPS	2040				
06ME50/3		243	01	ROS/CTD	070701	1925	BO	63 36.31 N	35 58.44 W	GPS	2039	2005	2024	14	
06ME50/3		243	01	ROS/CTD	070701	2006	EN	63 36.34 N	35 58.74 W	GPS	2031				
06ME50/3		244	01	ROS/CTD	070701	2132	BE	63 45.69 N	35 39.85 W	GPS					
06ME50/3		244	01	ROS/CTD	070701	2219	BO	63 45.77 N	35 40.32 W	GPS	2144	2125	2146	14	
06ME50/3		244	01	ROS/CTD	070701	2300	EN	63 45.67 N	35 40.41 W	GPS	2147				
06ME50/3		245	01	ROS/CTD	070801	0020	BE	63 52.98 N	35 10.22 W	GPS	2021				
06ME50/3		245	01	ROS/CTD	070801	0111	BO	63 53.00 N	35 10.32 W	GPS	2032	2006	2028	14	
06ME50/3		245	01	ROS/CTD	070801	0147	EN	63 53.02 N	35 10.37 W	GPS	2022				
06ME50/3		246	01	ROS/CTD	070801	0314	BE	64 02.20 N	34 47.05 W	GPS	1973				
06ME50/3		246	01	ROS/CTD	070801	0354	BO	64 02.13 N	34 47.11 W	GPS	1973	1983	1977	14	
06ME50/3		246	01	ROS/CTD	070801	0430	EN	64 02.08 N	34 47.05 W	GPS	1976				
06ME50/3		247	01	ROS/CTD	070801	0551	BE	64 11.40 N	34 27.43 W	GPS	1971				
06ME50/3		247	01	ROS/CTD	070801	0633	BO	64 11.28 N	34 27.86 W	GPS	1982	1985	1982	14	
06ME50/3		247	01	ROS/CTD	070801	0715	EN	64 11.21 N	34 28.40 W	GPS	1984				
06ME50/3		248	01	ROS/CTD	070801	0837	BE	64 16.06 N	34 01.45 W	GPS	1974				
06ME50/3		248	01	ROS/CTD	070801	0918	BO	64 16.24 N	34 01.93 W	GPS	1972		1975	14	
06ME50/3		248	01	ROS/CTD	070801	0959	EN	64 16.56 N	34 02.34 W	GPS	1963				
06ME50/3		249	01	ROS/CTD	070801	1327	BE	64 10.65 N	32 38.67 W	GPS	2478		100		CO2
06ME50/3		249	01	ROS/CTD	070801	1344	EN	64 10.69 N	32 38.80 W	GPS	2478				
06ME50/3	VEINS-2	250	01	ROS/CTD	070801	2023	BE	64 00.07 N	30 00.18 W	GPS	2076				
06ME50/3	VEINS-2	250	01	ROS/CTD	070801	2105	BO	64 00.40 N	30 00.39 W	GPS	2038	2093	2066	14	
06ME50/3	VEINS-2	250	01	ROS/CTD	070801	2150	EN	64 00.71 N	30 00.82 W	GPS	2040				
06ME50/3	VEINS-2	251	01	ROS/CTD	070801	2306	BE	63 59.97 N	30 30.36 W	GPS	2500				
06ME50/3	VEINS-2	251	01	ROS/CTD	070801	2353	BO	64 00.12 N	30 30.40 W	GPS	2502	2469	2492	14	
06ME50/3	VEINS-2	251	01	ROS/CTD	070901	0041	EN	64 00.17 N	30 30.42 W	GPS	2499				
06ME50/3	VEINS-2	252	01	ROS/CTD	070901	0138	BE	63 59.96 N	30 50.11 W	GPS	2686				
06ME50/3	VEINS-2	252	01	ROS/CTD	070901	0230	BO	64 00.03 N	30 49.94 W	GPS	2684	2656	2685	14	
06ME50/3	VEINS-2	252	01	ROS/CTD	070901	0324	EN	64 00.08 N	30 50.21 W	GPS	2686				
06ME50/3	VEINS-2	253	01	ROS/CTD	070901	0421	BE	63 59.94 N	31 10.03 W	GPS	2717				
06ME50/3	VEINS-2	253	01	ROS/CTD	070901	0513	BO	63 59.99 N	31 10.00 W	GPS	2714	2684	2720	14	
06ME50/3	VEINS-2	253	01	ROS/CTD	070901	0606	EN	64 00.00 N	31 10.05 W	GPS	2722				
06ME50/3	VEINS-2	254	01	ROS/CTD	070901	0702	BE	63 59.95 N	31 30.23 W	GPS	2744				
06ME50/3	VEINS-2	254	01	ROS/CTD	070901	0756	BO	64 00.03 N	31 30.37 W	GPS	2744	2708	2746	14	
06ME50/3	VEINS-2	254	01	ROS/CTD	070901	0858	EN	63 59.89 N	31 30.58 W	GPS	2744				
06ME50/3	VEINS-2	255	01	ROS/CTD	070901	0953	BE	63 59.94 N	31 50.50 W	GPS	2732				
06ME50/3	VEINS-2	255	01	ROS/CTD	070901	1024	BO	64 00.09 N	31 51.09 W	GPS	2730	2693	2729	14	
06ME50/3	VEINS-2	255	01	ROS/CTD	070901	1136	EN	64 00.28 N	31 51.48 W	GPS	2727				
06ME50/3	VEINS-2	256	01	ROS/CTD	070901	1240	BE	63 59.77 N	32 10.11 W	GPS	2713				
06ME50/3	VEINS-2	256	01	ROS/CTD	070901	1331	BO	63 59.95 N	32 10.22 W	GPS	2689	2672	2700	14	
06ME50/3	VEINS-2	256	01	ROS/CTD	070901	1426	EN	64 00.20 N	32 10.53 W	GPS	2687				
06ME50/3	VEINS-2	257	01	ROS/CTD	070901	1543	BE	63 59.90 N	32 30.07 W	GPS	2644				
06ME50/3	VEINS-2	257	01	ROS/CTD	070901	1635	BO	64 00.00 N	32 30.60 W	GPS	2642	2620	2650	14	
06ME50/3	VEINS-2	257	01	ROS/CTD	070901	1726	EN	64 00.16 N	32 30.90 W	GPS	2639				
06ME50/3	VEINS-2	258	01	ROS/CTD	070901	1829	BE	63 59.96 N	32 50.22 W	GPS	2542				
06ME50/3	VEINS-2	258	01	ROS/CTD	070901	1921	BO	64 00.09 N	32 50.96 W	GPS	2530	2518	2542	14	
06ME50/3	VEINS-2	258	01	ROS/CTD	070901	2015	EN	64 00.13 N	32 51.70 W	GPS	2531				
06ME50/3	VEINS-2	259	01	ROS/CTD	070901	2117	BE	63 59.96 N	33 09.86 W	GPS	2443				
06ME50/3	VEINS-2	259	01	ROS/CTD	070901	2205	BO	64 00.14 N	33 10.54 W	GPS	2437	2419	2444	14	
06ME50/3	VEINS-2	259	01	ROS/CTD	070901	2251	EN	64 00.34 N	33 11.36 W	GPS	2434				
06ME50/3	VEINS-2	260	01	ROS/CTD	070901	2345	BE	64 05.04 N	33 17.51 W	GPS	2348				
06ME50/3	VEINS-2	260	01	ROS/CTD	071001	0031	BO	64 05.30 N	33 18.65 W	GPS	2337	2329	2341	14	
06ME50/3	VEINS-2	260	01	ROS/CTD	071001	0123	EN	64 05.66 N	33 19.50 W	GPS	2325				
06ME50/3	VEINS-2	261	01	ROS/CTD	071001	0208	BE	64 09.96 N	33 25.05 W	GPS	2228				
06ME50/3	VEINS-2	261	01	ROS/CTD	071001	0253	BO	64 10.21 N	33 25.56 W	GPS	2220	2214	2225	13	
06ME50/3	VEINS-2	261	01	ROS/CTD	071001	0331	EN	64 10.30 N	33 26.02 W	GPS	2220				
06ME50/3	VEINS-2	262	01	ROS/CTD	071001	0416	BE	64 14.95 N	33 32.42 W	GPS	2085				
06ME50/3	VEINS-2	262	01	ROS/CTD	071001	0455	BO	64 15.06 N	33 32.71 W	GPS	2082	2067	2085	14	
06ME50/3	VEINS-2	262	01	ROS/CTD	071001	0541	EN	64 15.07 N	33 32.96 W	GPS	2083				
06ME50/3	VEINS-2	263	01	ROS/CTD	071001	0629	BE	64 20.00 N	33 40.16 W	GPS	1928				
06ME50/3	VEINS-2	263	01	ROS/CTD	071001	0710	BO	64 20.01 N	33 40.37 W	GPS	1929	1899	1923	14	
06ME50/3	VEINS-2	263	01	ROS/CTD	071001	0753	EN	64 20.07 N	33 40.57 W	GPS	1927				
06ME50/3	VEINS-2	264	01	ROS/CTD	071001	0848	BE	64 25.04 N	33 47.42 W	GPS	1772				
06ME50/3	VEINS-2	264	01	ROS/CTD	071001	0923	BO	64 25.20 N	33 47.44 W	GPS	1770	1749	1764	14	
06ME50/3	VEINS-2	264	01	ROS/CTD	071001	0959	EN	64 25.23 N	33 47.28 W	GPS	1769				
06ME50/3	VEINS-2	265	01	ROS/CTD	071001	1111	BE	64 30.30 N	33 54.95 W	GPS	1599				
06ME50/3	VEINS-2	265	01	ROS/CTD	071001	1143	BO	64 30.37 N	33 54.74 W	GPS	1598	1615	1593	14	
06ME50/3	VEINS-2	265	01	ROS/CTD	071001	1219	EN	64 30.48 N	33 54.08 W	GPS	1597				
06ME50/3	VEINS-2	266	01	ROS/CTD	071001	1308	BE	64 35.03 N	34 02.45 W	GPS	1424				
06ME50/3	VEINS-2	266	01	ROS/CTD	071001	1338	BO	64 35.01 N	34 02.55 W	GPS	1424	1401	1414	14	
06ME50/3	VEINS-2	266	01	ROS/CTD	071001	1409	EN	64 35.01 N	34 02.54 W	GPS	1423				

06ME50/3	VEINS-2	267	01	ROS/CTD	071001	1500	BE	64 39.91 N	34 10.22 W	GPS	1244			
06ME50/3	VEINS-2	267	01	ROS/CTD	071001	1526	BO	64 39.82 N	34 11.09 W	GPS	1247	1231	1235	15
06ME50/3	VEINS-2	267	01	ROS/CTD	071001	1550	EN	64 39.80 N	34 12.67 W	GPS	1246			
06ME50/3	VEINS-2	268	01	ROS/CTD	071001	1643	BE	64 45.02 N	34 17.61 W	GPS	1116			
06ME50/3	VEINS-2	268	01	ROS/CTD	071001	1711	BO	64 44.93 N	34 18.25 W	GPS	1120	1098	1108	14
06ME50/3	VEINS-2	268	01	ROS/CTD	071001	1737	EN	64 44.82 N	34 18.94 W	GPS	1124			
06ME50/3	VEINS-2	269	01	ROS/CTD	071001	1833	BE	64 50.02 N	34 25.06 W	GPS	1047			
06ME50/3	VEINS-2	269	01	ROS/CTD	071001	1859	BO	64 50.07 N	34 25.07 W	GPS	1048	1031	1041	11
06ME50/3	VEINS-2	269	01	ROS/CTD	071001	1922	EN	64 50.03 N	34 25.03 W	GPS	1051			
06ME50/3	VEINS-2	270	01	ROS/CTD	071001	2016	BE	64 55.10 N	34 32.46 W	GPS	869			
06ME50/3	VEINS-2	270	01	ROS/CTD	071001	2040	BO	64 55.15 N	34 32.72 W	GPS	864	846	855	14
06ME50/3	VEINS-2	270	01	ROS/CTD	071001	2102	EN	64 55.13 N	34 33.00 W	GPS	863			
06ME50/3	VEINS-2	271	01	ROS/CTD	071001	2208	BE	65 00.03 N	34 40.02 W	GPS	373			
06ME50/3	VEINS-2	271	01	ROS/CTD	071001	2221	BO	65 00.00 N	34 40.29 W	GPS	376	372	374	14
06ME50/3	VEINS-2	271	01	ROS/CTD	071001	2230	EN	64 59.96 N	34 40.49 W	GPS	387			
06ME50/3	VEINS-2	272	01	ROS/CTD	071001	2316	BE	65 05.08 N	34 47.48 W	GPS	364			
06ME50/3	VEINS-2	272	01	ROS/CTD	071001	2331	BO	65 05.01 N	34 47.54 W	GPS	365	357	360	14
06ME50/3	VEINS-2	272	01	ROS/CTD	071001	2342	EN	65 05.00 N	34 47.53 W	GPS	364			
06ME50/3	VEINS-2	273	01	ROS/CTD	071101	0035	BE	65 09.96 N	34 54.91 W	GPS	282			
06ME50/3	VEINS-2	273	01	ROS/CTD	071101	0044	BO	65 10.02 N	34 54.92 W	GPS	282	272	274	14
06ME50/3	VEINS-2	273	01	ROS/CTD	071101	0053	EN	65 10.00 N	34 54.81 W	GPS	280			
06ME50/3		274	01	ROS/CTD	071101	0616	BE	64 23.96 N	33 17.97 W	GPS	1992			
06ME50/3		274	01	ROS/CTD	071101	0700	BO	64 24.10 N	33 18.29 W	GPS	1990	1969	1989	11
06ME50/3		274	01	ROS/CTD	071101	0740	EN	64 24.20 N	33 18.59 W	GPS	1985			
06ME50/3		275	01	ROS/CTD	071101	0858	BE	64 30.95 N	32 54.96 W	GPS	2086			
06ME50/3		275	01	ROS/CTD	071101	0938	BO	64 31.21 N	32 55.13 W	GPS	2081	2058	2087	5
06ME50/3		275	01	ROS/CTD	071101	1020	EN	64 31.32 N	32 55.64 W	GPS	2077			
06ME50/3		276	01	ROS/CTD	071101	1137	BE	64 38.96 N	32 31.98 W	GPS	2177			
06ME50/3		276	01	ROS/CTD	071101	1219	BO	64 39.15 N	32 32.05 W	GPS	2131	2154	2178	14
06ME50/3		276	01	ROS/CTD	071101	1257	EN	64 39.19 N	32 32.33 W	GPS	2171			
06ME50/3		277	01	ROS/CTD	071101	1409	BE	64 45.06 N	32 09.12 W	GPS	2243			
06ME50/3		277	01	ROS/CTD	071101	1454	BO	64 44.94 N	32 09.05 W	GPS	2246	2224	2248	12
06ME50/3		277	01	ROS/CTD	071101	1533	EN	64 44.86 N	32 08.87 W	GPS	2247			
06ME50/3		278	01	ROS/CTD	071101	1648	BE	64 51.04 N	31 46.01 W	GPS	2174			
06ME50/3		278	01	ROS/CTD	071101	1734	BO	64 50.88 N	31 46.28 W	GPS	2176	2155	2179	11
06ME50/3		278	01	ROS/CTD	071101	1818	EN	64 50.79 N	31 46.15 W	GPS	2178			
06ME50/3		279	01	ROS/CTD	071101	1929	BE	64 56.03 N	31 23.02 W	GPS	2065			
06ME50/3		279	01	ROS/CTD	071101	2013	BO	64 55.93 N	31 23.36 W	GPS	2071	2047	2073	11
06ME50/3		279	01	ROS/CTD	071101	2052	EN	64 55.89 N	31 23.57 W	GPS	2073			
06ME50/3		280	01	ROS/CTD	071101	2203	BE	65 02.09 N	30 59.72 W	GPS	1821			
06ME50/3		280	01	ROS/CTD	071101	2237	BO	65 02.08 N	30 59.93 W	GPS	1820	1804	1820	14
06ME50/3		280	01	ROS/CTD	071101	2317	EN	65 02.09 N	31 00.22 W	GPS	1818			
06ME50/3	VEINS-1	281	01	ROS/CTD	071201	0358	BE	65 45.05 N	31 25.07 W	GPS	367			
06ME50/3	VEINS-1	281	01	ROS/CTD	071201	0413	BO	65 45.16 N	31 25.22 W	GPS	360	343	344	23
06ME50/3	VEINS-1	281	01	ROS/CTD	071201	0422	BN	65 45.20 N	31 25.30 W	GPS	362			
06ME50/3	VEINS-1	282	01	ROS/CTD	071201	0517	BE	65 39.90 N	31 19.99 W	GPS	351			
06ME50/3	VEINS-1	282	01	ROS/CTD	071201	0533	BO	65 39.87 N	31 20.27 W	GPS	352	339	342	11
06ME50/3	VEINS-1	282	01	ROS/CTD	071201	0543	EN	65 39.94 N	31 20.39 W	GPS	350			
06ME50/3	VEINS-1	283	01	ROS/CTD	071201	0631	BE	65 34.99 N	31 15.03 W	GPS	362			
06ME50/3	VEINS-1	283	01	ROS/CTD	071201	0646	BO	65 35.03 N	31 15.21 W	GPS	359	350	355	11
06ME50/3	VEINS-1	283	01	ROS/CTD	071201	0658	EN	65 35.02 N	31 15.41 W	GPS	360			
06ME50/3	VEINS-1	284	01	ROS/CTD	071201	0745	BE	65 30.00 N	31 09.93 W	GPS	377			
06ME50/3	VEINS-1	284	01	ROS/CTD	071201	0800	BO	65 30.11 N	31 10.11 W	GPS	376	354	359	11
06ME50/3	VEINS-1	284	01	ROS/CTD	071201	0809	EN	65 30.17 N	31 10.42 W	GPS	378			
06ME50/3	VEINS-1	285	01	ROS/CTD	071201	0856	BE	65 25.00 N	31 04.78 W	GPS	670			
06ME50/3	VEINS-1	285	01	ROS/CTD	071201	0914	BO	65 25.33 N	31 04.55 W	GPS	644	657	640	14
06ME50/3	VEINS-1	285	01	ROS/CTD	071201	0930	EN	65 25.56 N	31 04.51 W	GPS	628			
06ME50/3	VEINS-1	286	01	ROS/CTD	071201	1027	BE	65 19.98 N	30 59.95 W	GPS	973			
06ME50/3	VEINS-1	286	01	ROS/CTD	071201	1047	BO	65 20.06 N	30 59.82 W	GPS	968	960	965	14
06ME50/3	VEINS-1	286	01	ROS/CTD	071201	1111	EN	65 20.20 N	30 59.81 W	GPS	961			
06ME50/3	VEINS-1	287	01	ROS/CTD	071201	1203	BE	65 15.05 N	30 55.11 W	GPS	1240			
06ME50/3	VEINS-1	287	01	ROS/CTD	071201	1229	BO	65 15.05 N	30 55.13 W	GPS	1240	1228	1234	14
06ME50/3	VEINS-1	287	01	ROS/CTD	071201	1258	EN	65 15.00 N	30 55.16 W	GPS	1243			
06ME50/3	VEINS-1	288	01	ROS/CTD	071201	1346	BE	65 10.00 N	30 50.02 W	GPS	1512			
06ME50/3	VEINS-1	288	01	ROS/CTD	071201	1417	BO	65 09.94 N	30 49.78 W	GPS	1515	1506	1508	13
06ME50/3	VEINS-1	288	01	ROS/CTD	071201	1449	EN	65 09.87 N	30 49.48 W	GPS	1516			
06ME50/3	VEINS-1	289	01	ROS/CTD	071201	1535	BE	65 05.08 N	30 44.98 W	GPS	1759			
06ME50/3	VEINS-1	289	01	ROS/CTD	071201	1612	BO	65 05.03 N	30 45.34 W	GPS	1757	1739	1753	13
06ME50/3	VEINS-1	289	01	ROS/CTD	071201	1651	EN	65 04.81 N	30 45.44 W	GPS	1763			
06ME50/3	VEINS-1	290	01	ROS/CTD	071201	1736	BE	64 59.88 N	30 39.97 W	GPS	1894			
06ME50/3	VEINS-1	290	01	ROS/CTD	071201	1817	BO	64 59.76 N	30 40.79 W	GPS	1901	1882	1898	11
06ME50/3	VEINS-1	290	01	ROS/CTD	071201	1855	EN	64 59.74 N	30 41.19 W	GPS	1899			
06ME50/3	VEINS-1	291	01	ROS/CTD	071201	1940	BE	64 54.88 N	30 34.82 W	GPS	2035			
06ME50/3	VEINS-1	291	01	ROS/CTD	071201	2024	BO	64 54.69 N	30 35.03 W	GPS	2020	2041	2041	11
06ME50/3	VEINS-1	291	01	ROS/CTD	071201	2112	EN	64 54.46 N	30 35.02 W	GPS	2046			
06ME50/3	VEINS-1	292	01	ROS/CTD	071201	2156	BE	64 49.86 N	30 29.93 W	GPS	2143			
06ME50/3	VEINS-1	292	01	ROS/CTD	071201	2236	BO	64 49.87 N	30 30.05 W	GPS	2144	2127	2147	14
06ME50/3	VEINS-1	292	01	ROS/CTD	071201	2320	EN	64 49.79 N	30 30.29 W	GPS	2144			
06ME50/3	VEINS-1	293	01	ROS/CTD	071301	0010	BE	64 44.94 N	30 24.93 W	GPS	2230			
06ME50/3	VEINS-1	293	01	ROS/CTD	071301	0055	BO	64 44.94 N	30 24.79 W	GPS	2228	2236	2236	14
06ME50/3	VEINS-1	293	01	ROS/CTD	071301	0133	EN	64 45.00 N	30 24.66 W	GPS	2227			
06ME50/3	VEINS-1	294	01	ROS/CTD	071301	0221	BE	64 45.08 N	30 12.66 W	GPS	2208			
06ME50/3	VEINS-1	294	01	ROS/CTD	071301	0303	BO	64 44.95 N	30 12.53 W	GPS	2208	2186	2214	13
06ME50/3	VEINS-1	294	01	ROS/CTD	071301	0350	EN	64 44.99 N	30 12.64 W	GPS	2207			
06ME50/3	VEINS-1	295	01	ROS/CTD	071301	0438	BE	64 44.98 N	30 00.15 W	GPS	2184			
06ME50/3	VEINS-1	295	01	ROS/CTD	071301	0523	BO	64 44.98 N	30 00.07 W	GPS	2183	2162	2189	11
06ME50/3	VEINS-1	295	01	ROS/CTD	071301	0610	EN	64 45.00 N	30 00.09 W	GPS	2180			
06ME50/3	VEINS-1	296	01	ROS/CTD	071301	0704	BE	64 44.94 N	29 44.94 W	GPS	2100			
06ME50/3	VEINS-1	296	01	ROS/CTD	071301	0749	BO	64 45.01 N	29 45.09 W	GPS	2114	2107	2133	18

06ME50/3	VEINS-1	296	01	ROS/CTD	071301	0834	EN	64 45.09 N	29 45.10 W	GPS	2114			
06ME50/3	VEINS-1	297	01	ROS/CTD	071301	0934	BE	64 44.98 N	29 30.13 W	GPS	1843			
06ME50/3	VEINS-1	297	01	ROS/CTD	071301	1011	BO	64 45.00 N	29 30.36 W	GPS	1843	1830	1851	14
06ME50/3	VEINS-1	297	01	ROS/CTD	071301	1045	EN	64 45.08 N	29 30.52 W	GPS	1847			
06ME50/3	VEINS-1	298	01	ROS/CTD	071301	1152	BE	64 44.96 N	29 14.89 W	GPS	1405			
06ME50/3	VEINS-1	298	01	ROS/CTD	071301	1220	BO	64 45.00 N	29 15.03 W	GPS	1384	1416	1429	14
06ME50/3	VEINS-1	298	01	ROS/CTD	071301	1253	EN	64 45.03 N	29 15.02 W	GPS	1383			
06ME50/3	VEINS-1	299	01	ROS/CTD	071301	1348	BE	64 44.93 N	29 00.13 W	GPS	1064			
06ME50/3	VEINS-1	299	01	ROS/CTD	071301	1413	BO	64 44.76 N	29 00.10 W	GPS	1066	1079	1088	12
06ME50/3	VEINS-1	299	01	ROS/CTD	071301	1438	EN	64 44.65 N	29 00.19 W	GPS	1062			
06ME50/3	VEINS-1	300	01	ROS/CTD	071301	1548	BE	64 44.93 N	28 40.09 W	GPS	1266			
06ME50/3	VEINS-1	300	01	ROS/CTD	071301	1617	BO	64 44.84 N	28 40.18 W	GPS	1266	1249	1269	13
06ME50/3	VEINS-1	300	01	ROS/CTD	071301	1644	EN	64 44.81 N	28 40.08 W	GPS	1270			
06ME50/3	VEINS-1	301	01	ROS/CTD	071301	1753	BE	64 44.99 N	28 19.97 W	GPS	1133			
06ME50/3	VEINS-1	301	01	ROS/CTD	071301	1829	BO	64 45.02 N	28 20.08 W	GPS	1136	1115	1127	11
06ME50/3	VEINS-1	301	01	ROS/CTD	071301	1843	EN	64 45.01 N	28 19.96 W	GPS	1130			
06ME50/3	VEINS-1	302	01	ROS/CTD	071301	1953	BE	64 45.02 N	27 59.97 W	GPS	1022			
06ME50/3	VEINS-1	302	01	ROS/CTD	071301	2017	BO	64 45.02 N	28 00.00 W	GPS	1023	1010	1017	11
06ME50/3	VEINS-1	302	01	ROS/CTD	071301	2040	EN	64 45.03 N	27 59.93 W	GPS	1021			
06ME50/3	VEINS-1	303	01	ROS/CTD	071301	2147	BE	64 44.95 N	27 39.87 W	GPS	800			
06ME50/3	VEINS-1	303	01	ROS/CTD	071301	2206	BO	64 44.95 N	27 39.96 W	GPS	804	768	795	14
06ME50/3	VEINS-1	303	01	ROS/CTD	071301	2220	EN	64 44.98 N	27 39.88 W	GPS	799			
06ME50/3	VEINS-1	304	01	ROS/CTD	071301	2330	BE	64 44.86 N	27 19.84 W	GPS	545			
06ME50/3	VEINS-1	304	01	ROS/CTD	071301	2346	BO	64 44.76 N	27 19.95 W	GPS	546	539	540	14
06ME50/3	VEINS-1	304	01	ROS/CTD	071301	2356	EN	64 44.73 N	27 19.96 W	GPS	547			
06ME50/3	VEINS-1	305	01	ROS/CTD	071401	0109	BE	64 44.93 N	27 00.24 W	GPS	283			
06ME50/3	VEINS-1	305	01	ROS/CTD	071401	0120	BO	64 44.87 N	27 00.13 W	GPS	281	273	275	12
06ME50/3	VEINS-1	305	01	ROS/CTD	071401	0126	EN	64 44.88 N	27 00.04 W	GPS	281			
06ME50/3	VEINS-1	306	01	ROS/CTD	071401	0231	BE	64 44.88 N	26 39.99 W	GPS	249			
06ME50/3	VEINS-1	306	01	ROS/CTD	071401	0242	BO	64 44.76 N	26 40.13 W	GPS	249	240	240	14
06ME50/3	VEINS-1	306	01	ROS/CTD	071401	0248	EN	64 44.75 N	26 40.20 W	GPS	248			

Table 2: List of the alkenone samples and associated filters for chlorophyll, particulate organic carbon, SPM and nutrient samples. Water source was a seawater pump or CTD bottles.

Number	Date	Source	Chlorophyll	POC	SPM	Nutrients
1	22.06.2001	Pump	X	x	X	X
2	22.06.2001	Pump	X	x	X	-
3	23.06.2001	Pump	X	x	x	-
4	23.06.2001	pump	X	x	x	-
5	23.06.2001	pump	X	x	x	-
6	24.05.2001	pump	X	x	x	-
7	24.05.2001	pump	X	x	x	-
8	24.05.2001	pump	X	x	x	x
9	24.05.2001	pump	-	-	-	-
10	24.05.2001	pump	X	x	x	-
11	25.05.2001	pump	X	x	x	-
12	25.05.2001	pump	X	x	x	-
13	25.05.2001	pump	-	-	-	-
14	25.05.2001	pump	X	x	x	-
15	25.05.2001	pump	X	x	x	-
16	26.06.2001	pump	X	x	x	-
17	26.06.2001	pump	X	x	x	-
18	26.06.2001	pump	-	-	-	-
19	27.06.2001	pump	X	x	x	x
20	27.06.2001	pump	X	x	x	-
21	28.06.2001	pump	X	x	x	-
22	28.06.2001	pump	-	-	-	-
23	29.06.2001	pump	X	x	x	x
24	29.06.2001	pump	-	-	-	-
25	30.06.2001	pump	X	x	x	x
26	30.06.2001	pump	-	-	-	-
27	30.06.2001	pump	-	-	-	-
28	01.07.2001	pump	X	x	x	x
29	01.07.2001	pump	-	-	-	-
30	01.07.2001	pump	X	x	x	-

Number	Date	Source	Chlorophyll	POC	SPM	Nutrients
31	01.07.2001	pump	X	x	x	x
32	02.07.2001	pump	-	-	-	-
33	02.07.2001	pump	X	x	x	-
34	02.07.2001	pump	-	-	-	-
35	03.07.2001	pump	X	x	x	x
36	03.07.2001	pump	-	-	-	-
37	03.07.2001	pump	X	x	x	-
38	04.04.2001	pump	-	-	-	-
39	04.04.2001	pump	X	x	x	x
40	04.04.2001	pump	-	-	-	-
41	05.07.2001	pump	X	x	x	x
42	05.07.2001	CTD	X	x	x	x
43	05.07.2001	CTD	X	x	x	x
44	05.07.2001	CTD	X	x	x	x
45	05.07.2001	pump	-	-	-	-
46	06.07.2001	pump	X	x	x	x
47	06.07.2001	pump	-	-	-	-
48	07.07.2001	pump	X	x	x	x
49	07.07.2001	CTD	X	x	x	x
50	07.07.2001	CTD	X	x	x	x
51	07.07.2001	CTD	x	x	x	x
52	07.07.2001	pump	-	-	-	-
53	08.07.2001	pump	x	x	x	x
54	08.07.2001	pump	-	-	-	-
55	08.07.2001	CTD	x	x	x	x
56	08.07.2001	CTD	x	x	x	x
57	08.07.2001	CTD	x	x	x	x
58	08.07.2001	pump	-	-	-	-
59	09.07.2001	pump	-	-	-	-
60	09.07.2001	pump	-	-	-	-
61	10.07.2001	pump	x	x	x	x
62	10.07.2001	pump	-	-	-	-
63	10.07.2001	pump	-	-	-	-
64	11.07.2001	pump	x	x	x	x
65	11.07.2001	pump	x	x	x	x
66	12.07.2001	CTD	x	x	x	x
67	12.07.2001	pump	-	-	-	-
68	zu AF66	pump	-	-	-	-
69	12.07.2001	pump	x	x	x	x
70	12.07.2001	pump	-	-	-	-
71	12.07.2001	pump	-	-	-	-
72	12.07.2001	pump	-	-	-	-
73	12.07.2001	pump	x	x	x	x
74	12.07.2001	pump	-	-	-	-
75	13.07.2001	pump	-	-	-	-
76	13.07.2001	pump	-	-	-	-
77	13.07.2001	pump	x	x	x	x
78	13.07.2001	pump	-	-	-	-
79	13.07.2001	pump	-	-	-	-
80	13.07.2001	pump	-	-	-	-
81	13.07.2001	pump	-	-	-	-
82	13.07.2001	pump	-	-	-	-

3.7 Concluding Remarks

Sincere thanks goes to the crew of the RV METEOR for highly professional assistance and to the authorities of Greenland and Island for the research permission.

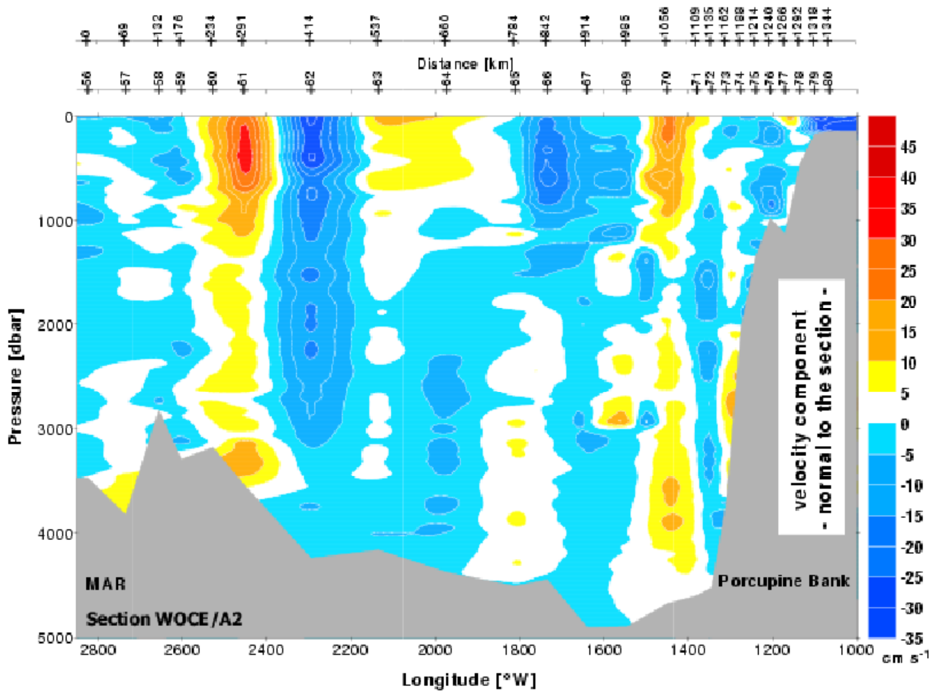


Fig. 4.15: Distribution of meridional velocity from the LADCP measurements for the eastern part of WOCE-section A2.

The instantaneous meridional velocity distribution observed with the LADCP across A2 (Fig. 4.15) shows various eddy structures in the upper water column. The velocities in the centre of the basin are negligible. There are velocity signals directly at the topography corresponding to the northward spreading deep MW at 3000 m at the eastern end of the section. Unexpectedly we also found a northward current at the depth range of ISOW on the eastern side of the MAR, which is in contradiction to the assumed southward spreading of the ISOW along the topography. Nevertheless, it should be noted that the velocities in general are rather low and, as already noted above, the velocity data do not incorporate a tidal correction. The latter may even lead to a reversal of the current direction is this area.

4.4.2 Tracer Oceanography

(M. Bleischwitz, K. Bulsiewicz, R. Steinfeldt)

Material and Methods

During legs 3 and 4 water samples have been collected from 10 liter-NISKIN bottles for the analysis of the **c**hloro**f**luoro**c**arbons (CFC-11 and CFC-12). Additionally on leg 4 Helium samples have been collected into copper tubes. These samples will be measured later with a specially designed noble gas mass spectrometer at the laboratory in Bremen. Measurements of the CFC-concentrations in the water samples have been performed on board using a gas chromatographic system with capillary column and Electron Capture Detector (ECD).

CFC sampling has been performed on 132 stations, and helium samples where taken on 9 stations (Fig. 4.16). A total of 2048 CFC data and 96 helium data have been obtained.

A detector drift affected the accuracy and precison for the CFC-11 data. The blank for CFC-11 and CFC-12 was negligable. Accuracy was checked by analysing 75 water samples at least twice. It was found to be 0.3% for CFC-12 and 0.6% for CFC-11. CFC-contamination of the Niskin bottles was checked at a test station in the deep eastern basin, where all bottles were tripped at the same depth. This water is 'old', exhibiting low CFC-concentrations. All measurements on this station show nearly the same data, which indicates clean Niskin bottles. The CFC concentration of the gas standard used to calibrate the water samples are not reported on the SIO93 scale. This standard gas will be recalibrated at the laboratory in Bremen.

The anthropogenic compounds CFC-11 and CFC-12 have been released into the environment since several decades. The atmospheric release of CFC-11 and CFC-12 started in the 1930s and showed initially exponential increase, since the 1980s the increase is slowing down. Because of their transient nature the CFCs provide time information on the ventilation of water masses.

Helium samples were taken near the Mid-Atlantic Ridge, were sources of methan had been detected. The data will show in how far ^3He is also released by these sources and if a correlation between anomalies of methane and ^3He exists.

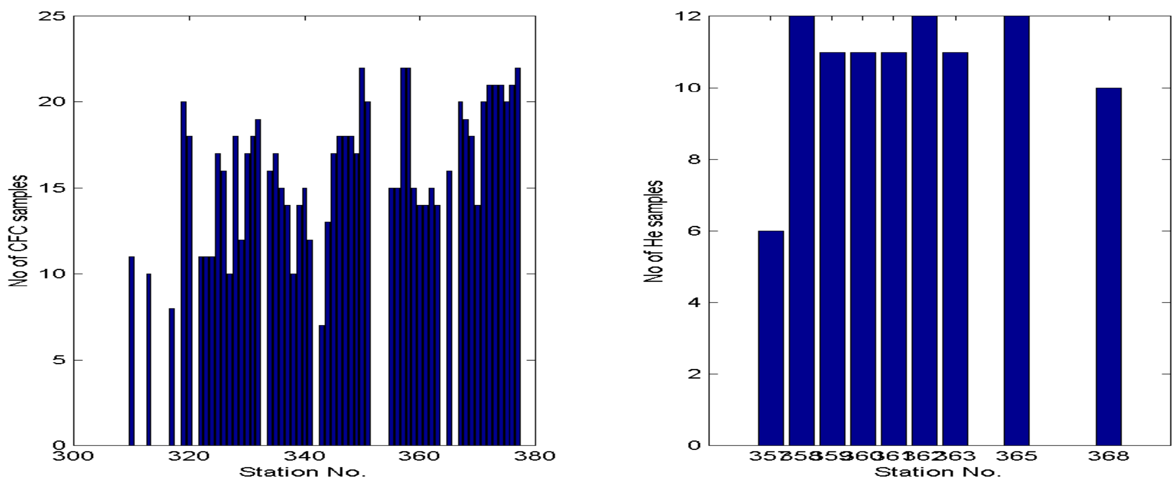


Fig 4.16: Number of tracer samples taken during M 50/4.

Preliminary Results

The tracer investigation along the East Greenland continental slope south of Denmark Strait during leg 3 continues earlier investigations in 1997 and 1999. The main purpose of the sampling was to study the circulation and to analyze the variability of the composition of the Denmark Strait Overflow Water (DSOW).

Figure 4.17 shows the concentration of CFC-12 on the three sections throughout the Iceland Basin (**I**, **A** and **B** from north to south). Both deep water masses (ISOW and LSW) can be found on all three sections. The ISOW is confined to a terrain following boundary layer and shows maxima of CFC-concentration and salinity. It does not reach the deepest part of the Iceland Basin, but spreads along the Reykjanes Ridge. At the southernmost section B the CFC-concentrations near the bottom are considerable lower (0.1 - 0.2 pmol/kg), supporting the finding that a great part of ISOW leaves the Iceland Basin through gaps in the Reykjanes Ridge into the Western Atlantic. The LSW (density range $27.74<\sigma_\theta<27.8$ kg/m³ indicated by isopycnals) is characterized by a salinity minimum (dashed line). Whereas temperature and salinity show a linear transition between the ISOW and the LSW, the CFC-data show that these two newly ventilated water masses are separated by older deep water.

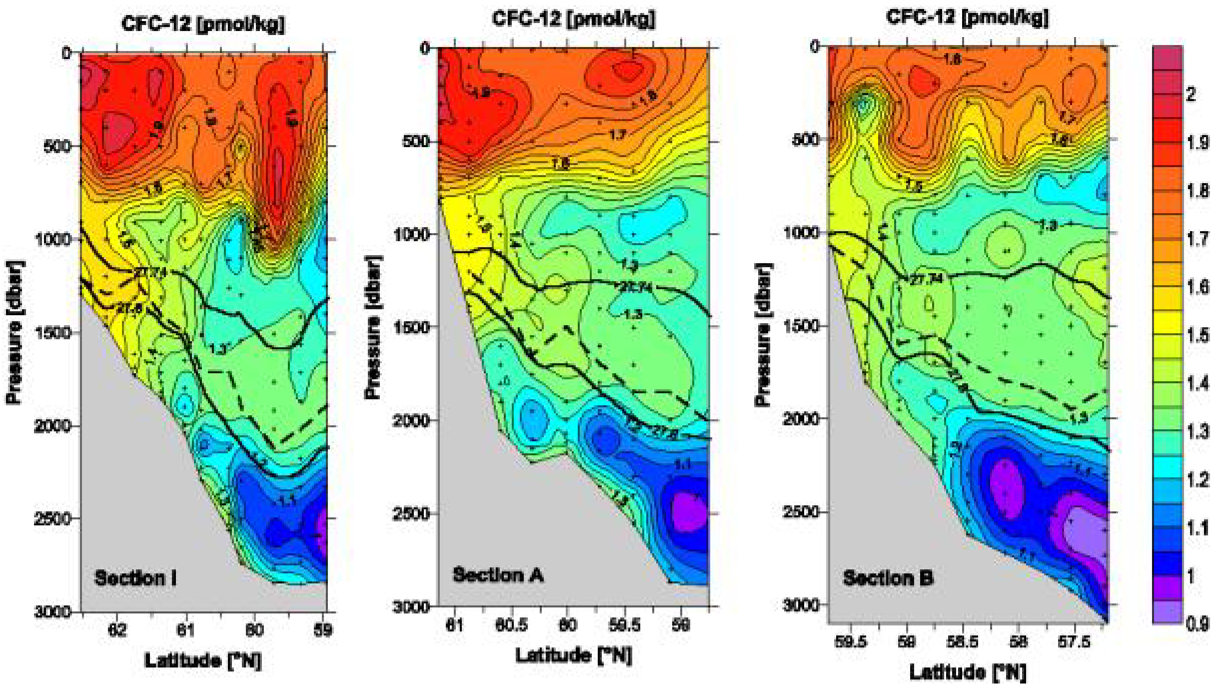


Fig. 4.17: CFC-12 distribution on sections I, A and B in the Iceland Basin.

LSW enters the Eastern Atlantic near the Charlie Gibbs Fracture Zone (CGFZ) and spreads in eastern and northern direction. The northern path can be traced from the comparison of CGFC-concentrations in the LSW-layer at the stations located near the GFZ and on the three sections inside the Iceland Basin (Figure 4.18). The concentrations are highest at the GFZ and decrease weakly from section **B** to sections **A** and **I**, indicating a short spreading time of LSW from the GFZ to the north of the Iceland Basin of only a few years. Not only the CFC-concentration inside the LSW, but also its volume decreases towards the north. Whereas at section **B** a marked core of LSW is present, at sections **A** and **I** a greater amount of more saline water influenced by ISOW can be found in the density range between $27.74<\sigma_\theta<27.8$ kg/m³.

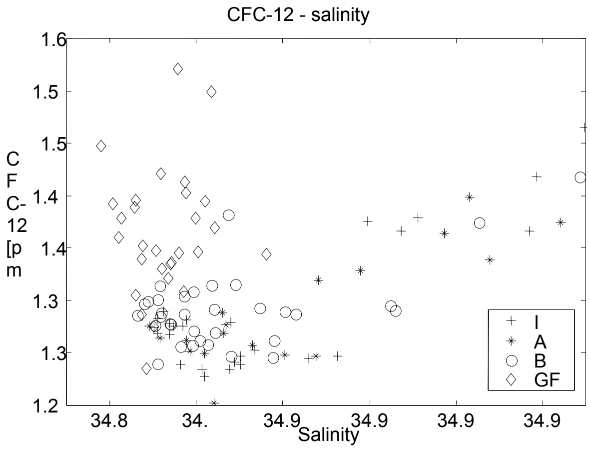


Fig. 4.18: CFC-12 vs salinity correlation in the LSW- density range 27.74<σ_θ <27.8 kg/m³ for different sets of stations. I, A and B: M50/4-sections in the Iceland Basin; GF: M50/4-stations near the Charlie Gibbs Fracture Zone.

4.4.3 Marine Chemistry

(K. Friis, J.D. Afghan, H. Lueger, F. Malien, T. Steinhoff)

On leg 4 the CO_2 group from Kiel (SFB 460, subprogram A5) continued the research program that started on leg 1 and is described above. The same analytical equipment was used and methodologies were applied.

C_T, A_T and pH Quality Control

The quality control of the various parameters of the carbonate system were performed by help of certified reference materials (CRM) and duplicate analysis that were taken approximately every tenth to twentieth sample. These standards are used to determine the accuracy and performance of the systems. The duplicates show the precision of the analytical instrument. For the pH quality control the CRM measurements allows assessment of the long term precision during the cruise as far, as a specific CRM batch is used for the whole cruise. An overview of the quality controls is shown in Tab. 4.1 and in Fig. 4.19 A-F. All controls show a very good agreement with the achievable accuracy and precision estimates according to Millero et al. (1993) (see also leg 1).

CCHDO Data Processing Notes

Date	Person	Data Type	Action	Summary
2008-04-24	*Bob Key*	BTL	Submitted	temp/ctdsal/pres/ctdoxy/cfc11/cfc12

Detailed Notes

According to the data report the file is still missing nutrients and perhaps a few oxygen measurements. I also have the full CTD records which I can/will send when I'm able to revive the other computer.

Cruise dates:6/20-7/15/2001
Chief Scientist:J. Holfort; IfM-Hamburg, Hamburg, Germany
Ship and cruise designation:Meteor 50_3; SFB460; VEINS
Repeat of MT39/5(1997) and MT45/4(1999)
EXPOCODE: 06MT20010620
Region: St. John's to Reykjavik; Stations east of southern Greenland
6 sections
77 stations with 24 place Rosette

Hydro: Who - J.Holfort; Status - final; S Plus - up to date
Notes: Seabird CTD
CTD files from Holfort 4/4/08. Data interpolated to bottle
positions of CFC samples.
Depth estimated from pressure and location
bottom depth estimated from global topography
See Holfort and Albrecht, 2007.
Nuts/O2: Who - ; Status - ; S Plus -
Notes: measured, no data in file
fCO2: Who - ; Status - ; S Plus -
Notes: underway only
CFC: Who - M.Rhein; Status - final; S Plus - up to date
Notes: data from R.Steinfeldt 12/18/06
CFC-11: SIO-93 scale, accuracy 1.5%
CFC-12: SIO-93 scale, accuracy 1.5%
See Kieke et al, 2006.
Other: Alkenones (A.Krich, no data in file)

References:

Holfort, et al., Meteor-Berichte 02-2, North Atlantic 2001 Part 3, Cruise No. 50, Leg 3, Inst. Meereskunde deer Univ. Hamburg, 20pp, 2002. Holfort, J. and T. Albrecht, Atmospheric forcing of salinity in the overflow of Denmark Strait, Ocean Sci., 3, 411-416, 2007.

Kieke, D., M. Rhein, L. Stramma, W. M. Smethie, D. A. LeBel, and W. Zenk, 2006. Changes in the CFC Inventories and Formation Rates of Upper Labrador Sea Water, 1997-2001, J. Phys. Oceanogr, 36, 64-86.

Date	Person	Data Type	Action	Summary
2008-04-30	*Bob Key*	CTD	Submitted	via data submission p & email

Detailed Notes

I just submitted the CTD zip file via the web tool. In case it didn't work, since it's not too big, I've also attached it here.

2010-09-09	*Justin Fields*	BTL	Website Update	Copied from CARINA collection

Detailed Notes

This bottle file was part of the CARINA collection compiled by Bob Key.

2012-10-	*Jerry Kappa*	CrsRpt	Submitted	PDF version ready to go online

Detailed Notes

I've placed 1 new version of the cruise report:

ar25_06MT20010620do.pdf

into the co2clivar/atlantic/ar25/ar25_06MT20010620/ directory.

It includes summary pages and CCHDO data processing notes as well as a linked Table of Contents and links to figures, tables and appendices.

It will be available on the cchdo website following the next update script run.