

Cruise Report

Compiled by: Dr. Joanna Waniek

F.S.Poseidon Cruise No.: 383

Dates of Cruise: from 20.04.2009 to 04.05.2009

Areas of Research: Physical Oceanography, Marine Biology, Genetics

Port Calls: Ponta Delgad (Acores), Funchal (Madeira)

Institute: Institut für Ostseeforschung Warnemünde, Seestrasse 15, 18119 Rostock

Chief Scientist: Dr. Joanna Waniek

Number of Scientists: 10

Project: (DFG: WA2157/2-1, WA2157/3-1).

Cruise Report

This cruise report consists of 27 pages including cover:

1. Scientific crew
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5. Moorings, scientific equipment and instruments
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1. Scientific crew:

Name	Function	Institute	Leg
Dr. Waniek, Joanna	Chief scientist	IOW	383
Hand, Ines	Technician	IOW	383
Brust, Juliane	PhD Student	IOW	383
Dr. Kuhnt, Tanja	Scientist	BIAF	383
Robotim, Andrea	Student	LNEG	383
Huth, Hartmut	Technician	IOW	383
Thiede, Carl	Scientist	TU Berlin	383
Kebkal, Oleksiy	Technician	Evolomics	383
Lehnert, Gerhard	Technician	IOW	383
Hehl, Uwe	Technician	IOW	383
Total : 10			

IOW Institut für Ostseeforschung Warnemünde
BIAF Actual & Fossil Bio-Indicator, University Angers, France
LNEG Laboratorio Nacional de Engenharia e Geologia, Departamento de
 Geologia Marinha
TU Berlin Technische Universität Berlin, Institut für Konstruktion, Mikro- und
 Medizintechnik, FB Mikrotechnik
Evolomics EvoLogics GmbH, FuE Bionik

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2. Research programme (J. Waniek, IOW)

The objectives of the cruise P383 from Ponta Delgada to Funchal in April/May 2009 (21.04-04.05.2009) on board R/V Poseidon were:

- 1) To recover the Kiel276-26 (33°N, 22°W) mooring and to deploy the Kiel276-27 mooring and
- 2) to investigate the water column properties along the two meridional transects (22°W & 21°W from 31°N to 38°N) in order to localize the position of the Azores Front and to understand the changes in biogeochemical properties.

The work along both meridional transects consisted of combined CTD (2000m) and Multi Closing Net (MCN, 100m, 700m and 2000m) stations, and due to partly heavy weather conditions XBTs. Samples for nutrient analysis, chlorophyll a, suspended particulate matter, foraminifer's biomass and for molecular genetics of foraminifers, and dissolution experiments on planktic foraminifers were taken at selected depths based on the chlorophyll a-fluorescence profiles measured by means of the CTD. Additional in-situ pumps were deployed at Kiel276 and newly developed acoustic modems and DNS (Druck Neutrale Systeme) devices were regularly tested. The work is funded by the DFG through two projects.

3. Narrative of the cruise with technical details (J. Waniek, IOW)

The cruise P383 was carried out in collaboration between the Institut für Ostseeforschung Warnemünde (IOW), and Leibniz-Institut für Meereswissenschaften IFM-GEOMAR in Kiel (both Germany). Additionally, scientists and students from DGM/LNEG in Lisbon (Portugal), University of Angers (France), Technical University Berlin (Germany) and Evologics (Berlin, Germany) participated in the cruise.

20.04: Ponta Delgada. The participants of the P383 embark on RV Poseidon in the morning. After lunch the container is brought and we start unloading of our equipment and setting up of the laboratories. All work is completed in the early afternoon.

21.04: At 08:30 UTC RV Poseidon sails from Ponta Delgada towards our working area in the Madeira basin. We participate in the safety instruction training and at 13:00 arrive at our test station where the CTD and the multi closing net (MSN) are tested. All instruments work without problems. Along our way to the working area two additional XBT probes are deployed successfully.

22.04: We start our work along the 22°W transect southwards. CTD, MSN, XBT and in-situ pumps are deployed at our stations. Weather conditions are relatively good, so the work is going well.

24.05: Midday the weather conditions are getting continuously worse. Station 167 was aborted because of weather after the first deployment of the in-situ pumps. Meanwhile we have winds between 6-7 Bft and waves of 3 m and higher. We are heading southwards and continue our work by deploying XBT probes only instead of CTD and MSN.

- 25.04:** The weather conditions (wind and swell) are improving, but we still are not able to execute our full program. Meanwhile we are at 32°N, 21°W. Here the weather improved so far that the normal work starts again.
- 26.04:** The CTD, MSN and in-situ pumps work continues.
- 27.04:** At 08:00 we are nearby the Kiel276 position and ready to release the mooring. Shortly after 09:00 the mooring is sighted and we start to recover all instruments. One RCM and a pack of 6 buoyancy spheres were recovered damaged. Most likely water intrusion into the RCM was the cause for the damage and loss of the gear.
- 28.04:** We have been working very long last night in order to prepare the Kiel276-27 for deployment. At 08:00 the deployment of the mooring for another 2 years starts. The surface buoy submerges at 11:58. The estimated position of the Kiel276-27 is 32° 57.55'N, 021° 59.55'W. The mooring deployment is followed by two long sessions with in-situ pumps.
- 29.04:** In the late afternoon we departure from the nominal Kiel276 position and continue our work along the 21°W meridian towards north.
- 30.04:** The day starts with problems with the CTD. We cannot establish communication with the CTD, which is a sign for damage to the cable. Thanks to the ship crew (electrician) the cable is repaired and our work continues.
- 01.05:** CTD, MSN and XBT's are being deployed on regular basis. We have used the opportunity for some additional stations along 22°W.
- 02.05:** Today we have finished our last station for this cruise. At 13:30 the scientific work is finished. RV Poseidon is heading towards Funchal. After few hours break we start preparing the boxes and packing our equipment.
- 03.05:** Transit to Funchal (Madeira).
- 04.05:** RV Poseidon reaches Funchal in the early morning of the 04th of May 2009 after completing a successful cruise.
- 05.05:** In the morning A. Rebotim our colleague from Lisbon departures and the rest of us start loading the container, cleaning the laboratories and preparing for departure next day.

4. Scientific report and first results

4.1 Hydrographic sections (J. Waniek, IOW)

Over the duration of the cruise 12 combined CTD / MCN and 15 XBT stations were occupied (see Appendix B). Most of the CTD profiles were carried out down to 2000m depths, whereas the MCN sampling for living foraminifera was carried out by closing net hauls down to 100m, 700m and 2000m depths. Planktic foraminifers have been sampled with a multiple closing net with 100 µm mesh size.

Vertical net hauls have been employed from the sea surface to 2000m water depths. Foraminiferal tests have been picked and processed for further analysis. Rest of the bulk MCN samples have been fixed in formaldehyde for stable isotope analysis (INETI, Lisbon). On each CTD/MSN station samples from the rosette were obtained for chlorophyll a, nutrient concentrations and suspended particulate matter. The samples were stored frozen until analysis at IOW.

4.2. SEM-EDX samples (J. Brust, IOW)

During the POS 383 cruise, filter samples of surface water were taken for scanning electron microscopy - energy dispersive X-ray microanalysis (SEM-EDX) of suspended particulate matter along the 21°W transect from 31°N to 37.30°N at each station. Sampling was performed using the onboard seawater pipe system (aquarium water pump), providing seawater from 5 m depth and by applying 5 to 10 m depth sampling via CTD runs. At the Kiel 276 (33°N, 22°W) station a CTD profile provided water samples to 4700 m depth within selected depth intervals for SEM-EDX analysis.

Seawater was filtrated through Nucleopore polycarbonate filters (0.4 µm pore size) and desalinised by rinsing with “Milli-Q” clean fresh water. SEM-EDX sample processing will be performed at the IOW. The automated particle analysis by means of SEM-EDX will provide data about the chemical properties (major element composition) and species of biogenic and lithogenic particles on each filter sample and their morphological features (size, area, shape).

Larger grained lithogenic particles (sand sized) were also present in plankton net samples at some hydrographical stations and were collected – whenever identified under the optical microscope – for further analysis and mineral identification with the SEM-EDX device.

4.3. Planktic foraminifera (T. Kuhnt, BIAF, A. Rebotim, LNEG, R. Schiebel, BIAF)

4.3.1. Sampling strategy & methods:

Living planktic foraminifera were collected with the multiple closing net for faunistic analyses, stable isotope geochemistry, and biomass analyses. These analyses will help to better understand the role of fronts, in particular the Azores Front, in mediating biogeochemical budgets, as well as their paleoceanography. Specimens were collected from different water intervals (2000-1500 m, 1500-1000 m, 1000-700 m, 700-500 m, 500-300 m, 300-200 m, 200-100 m, 100-80 m, 80-60 m, 60-40 m, 40-20 m, 20-0 m) at Stations 161, 163, 165, 173, 175, 181, 183, 185 and 187. In total, 244 individuals were isolated, identified, and deep frozen for biomass analyses at Angers University.

At each station a second net deployment (0 to 700m) was carried out for the LNEG group to study the ecology of the planktonic foraminifera, their vertical and horizontal distribution, and stable isotopes measurements (Table 1). The net was towed from 0 to 700 m with sampling intervals from 0-100, 100-200, 200-300, 300-500 and 500-700 m, respectively. The plankton samples were fixed with 4% formaldehyde and buffered with hexamethylenetetramine until the pH was 8.2 (to avoid dissolution) and kept in the refrigerator at 4°C.

Table 1 – Total of plankton samples with the corresponding station.

Station	Latitude	Longitude
161	36° 00.00' N	22° 00.00' W
163	35° 00.00' N	22° 00.00' W
165	34° 00.00' N	22° 00.00' W
173	32° 00.00' N	21° 00.00' W
175	33° 08.95' N	21° 58.89' W
181	34° 30.00' N	21° 00.00' W
183	35° 30.00' N	21° 00.00' W
185	37° 30.00' N	22° 00.00' W
187	36° 30.00' N	22° 00.00' W

With the objective of measuring stable isotope ratios, water samples were taken from the CTD rosette sampler. Saturated mercury chloride solution was added to those samples to stop any biological activity. The samples were stored in the refrigerator at 4°C. The samples collected are listed in Table 2.

Table 2 – Water samples taken from the CTD for stable isotopic measurements.

Station	Latitude	Longitude	Sampling depth (m)
161	36° N	22° W	20, 40, 50, 80, 100, 200, 300, 500, 700, 900, 1500, 2000
163	35° N	22° W	20, 40, 60, 80, 100, 200, 300, 500, 700, 900, 1500, 2000
165	34° N	22° W	20, 40, 50, 60, 80, 110, 200, 300, 500, 1000, 1500, 2000
173	32° N	21° W	30, 50, 60, 80, 120, 150, 200, 300, 500, 1000, 1500, 2000
175	33° N	22° W	10, 30, 50, 60, 80, 110, 130, 150, 200, 300, 500, 700, 1000, 2000, 3000, 4000, 4700

4.3.2. Preliminary results:

The living fauna was mainly dominated by *Globorotalia scitula* and *G. hirsuta*. Other frequent species isolated were *G. truncatulinoides*, *G. inflata*, *Neogloboquadrina incompta*, *Globigerinoides ruber*, *Globigerinita glutinata*, *Globigerinella calida*, *Globigerina bulloides* and *Hastigerina pelagica*.

Along transect, from the north to the south, an abundant subsurface planktic foraminiferal live assemblage has been dominated by *Globorotalia scitula*, *Globorotalia hirsuta* and *Globorotalia truncatulinoides*. *Globigerinella siphonifera* and *Globigerinella calida* have been the only shallow dwelling species frequent along the western transect. Occasionally other species have been obtained (*Globigerinoides ruber*, *Globigerinita glutinata*, *N. incompta*). The assemblage of empty shells has been similar to the live assemblage, plus tests of *Globigerinita glutinata* and *Globigerina bulloides*.

The planktic foraminiferal species succession from the beginning to the end of RV Poseidon cruise 383 reflects regional seasonality in the trophic conditions during early summer. At the beginning of the cruise, in late April, a zooplankton peak had been passed, and metazooplankton, in particular copepods were abundant. A species-depleted planktic foraminiferal fauna at surface waters indicates little availability of fresh algal food. Exceptionally low numbers of living planktic foraminifera coincide with high abundance of jellyfish. Towards the end of the cruise in early May, the planktic foraminiferal fauna had not changed significantly, indicating stable summer conditions in dietary situation of planktic foraminifers throughout the cruise.

4.4. Pre-investigations for a deep-sea pressure tolerant systems development project (C.Thiede, TU Berlin)

The aim of the project is the development and introduction of high pressure resistant mechanical and highly integrated electronic components as well as battery systems without pressure vessels for oceanographic and maritime research. Traditionally used pressure tubes or spheres for maritime equipment require expensive body and sealing materials as well as highly precise production technology. Pressure tolerant systems designed as oil compensated systems are well known. The new approach is not to use oil as pressure assigning medium but potting the relevant components with soft compounds like silicone. Thereby complex electronic and micro-mechanic systems can be designed and embedded completely pressure tolerant up to overpressures of more than 1000 bars.

As an example for the introduction of the pressure tolerant technology in maritime systems in a running project a complex Autonomous Unmanned Vehicle has been developed and successfully tested in the Baltic Sea including all components from energy supply over the necessary control systems up to the drives, communication and data transmission systems. All basic pressure tolerant components have been pre-qualified with lab testing facilities for more than 600 bars so that a deep-sea deployment can be initiated.

A combination of new USBL acoustic modems in traditional pressure vessel technology with a pressure tolerant sensor system supplied by a also pressure tolerant battery was operated as a partly pressure tolerant subsystem. The new S2C acoustic modem with USBL module provides reliable long acoustic communication with positioning.

On RV POSEIDON cruise POS383 scientific investigations according the Azores Front in the Madeira basin were combined with a pre-qualification of a combined test system down to 4700m. The Pre-investigations of deep sea pressure tolerant systems has four main tasks. Mounting of potted pressure tolerant components on a sediment trap for long time test, usable test of a pressure tolerant battery power supply, calibrating and testing of a new pressure sensor as well as investigation of a new prototype inertial measurement unit with compass and logging functions.

One of the main tasks of the pre-investigations of pressure tolerant systems on POS383 cruise was to calibrate and test a newly developed pressure sensor (PT600) with pressure tolerant electronic (see fig. 4.3.2). The sensor can process pressures up to 700 bars. A pressure tolerant microcontroller unit (MCU) gives the possibility to post process the data. The sensor was supplied by an also pressure tolerant battery. To obtain the transfer function of the analog-digital converter (ADC) to the real pressure data the sensor was mounted on a CTD. The sensor has a serial RS232 interface to communicate with the Evologic S2C acoustic modem. An on the ship attached acoustic top unit received the sensor data. A computer was used to log the data from the pressure sensor as well as the pressure data that comes from the CTD pressure sensor for a later investigation. So we were able to compare both of the data to design a transfer function. To simplify matters we use a linear transfer function (see Eq. 1).

$$P_r = a \cdot \text{ADC} + b \quad (1)$$

Where P_r is the real calculated pressure in bar. ADC is the value from the 24 bit ADC and a und b are the coefficient we estimate to:

$$\begin{aligned} a &= 5.9508e-4 \\ b &= -160.96 \end{aligned}$$

So we found a well working transfer function for the pressure sensor. The formula was included in the post process program on the pressure sensors MCU to calculate the real pressure. To prove the function we compared the pressure values from the CTD and the PT600 on a 4700 m CTD.

Over the full range of the sensor a maximal variance of 0.127 percent was found. The temperature influence was also investigated. But no anomalies were detected. In all measurements the actual barometric pressure was not considered, as this will be done in future work.

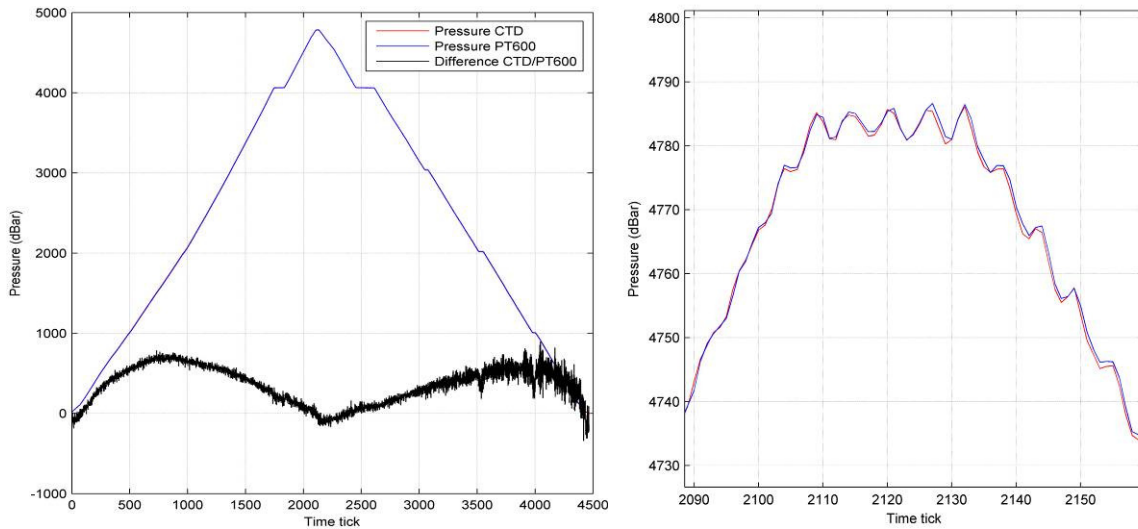


Fig. 4.4.1: Pressure trend on slack the CTD to 4700 m and during heave back to the surface. The black function shows the hundredfold of difference between both pressure trends. The right figure shows the aggrandizement of the left figure on 4700 m.

Further we tested a new developed prototype of a pressure tolerant IMU based on Micro-Electro-Mechanical Systems (MEMS) with compass and logging function (see fig. 4.3.3.) mounted also on the CTD. With help of the acoustic communication link we were able to receive the data frames of the IMU with an update rate of 9 Hz. Simultaneously the data frames were logged on an also pressure tolerant potted SD-Card for later investigation.



Fig. 4.4.2: Tested pressure sensor PT600 with pressure tolerant electronic.



Fig. 4.4.3: Prototype of a pressure tolerant MEMS based IMU.

A on the ship fixed Xsens motion tracking system give us the possibility to calculate the relative motions of the CTD respective to the RV Poseidon. In figure 4.3.4 you can see some measurements of motions of the CTD during slack and heave. The investigation of the collected data is ongoing. But the first results proved the concept of a low cost MEMS based inertial measurement unit for simple navigation tasks.

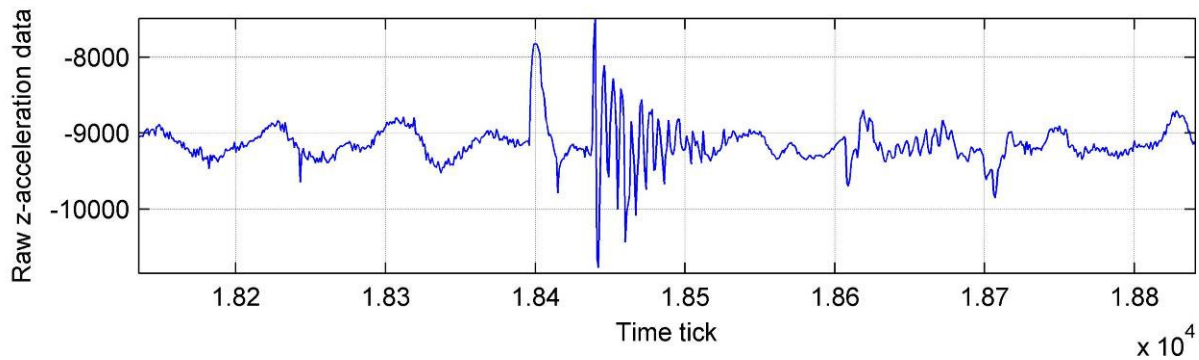


Fig. 4.4.4: Typical z-acceleration of the CTD on heaving. Notice the alternating movement due the sea disturbance (left) as well as swing on stop an start of heave during closing of a water sampler (middle).

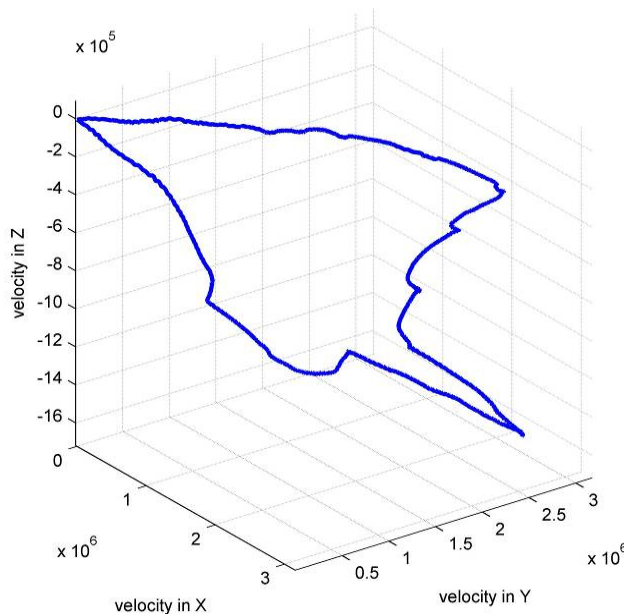


Fig. 4.4.5: Distribution of axis-velocity during a CTD run detected by the IMU. Clearly to see are the stops on heaving during closing of the water samplers.

For power supply all subsystems mounted on the CTD like pressure sensor IMU as well as the Evologics S2C acoustic modem an also pressure tolerant battery was used. For this cruise the battery have a new cast of a combination of new materials. Further a new developed connector system has to be tested on the PO383 cruise. We decided the absolute reliable usability of the connector system even in depth up to 4000 m. The battery was loaded with around 20 Wh / day and shows no problems even on high peak loads (10 A) on some acoustic modem communications at long distances between bottom and top unit.

The battery works very well also under high pressure and temperatures down to 2.5°C in 4700m. The last tests of these batteries were successful finished on this cruise so that batteries are now ready for applications on the marked.

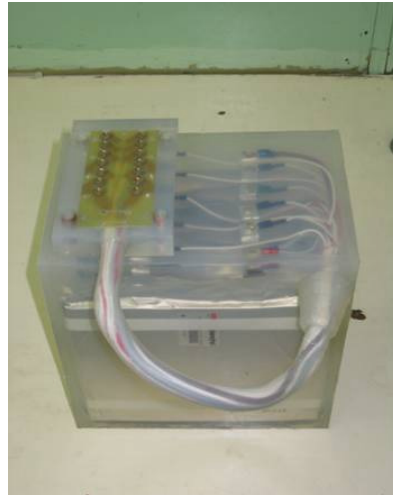


Fig. 4.4.6: The pressure tolerant battery block 24 V, 20Ah

The last task was to prepare a sediment trap on the KI 276 with samples of material for pressure tolerant systems. We mounted two test-batteries; a bag with protection fluid as well as some samples of newly developed elastic syntactic foam (see fig. 4.3.7.). The two year submerge test will give us the possibility to investigate material properties like absorption of water as well as long time behaviour under high pressure (3000 dbar) and low temperatures.

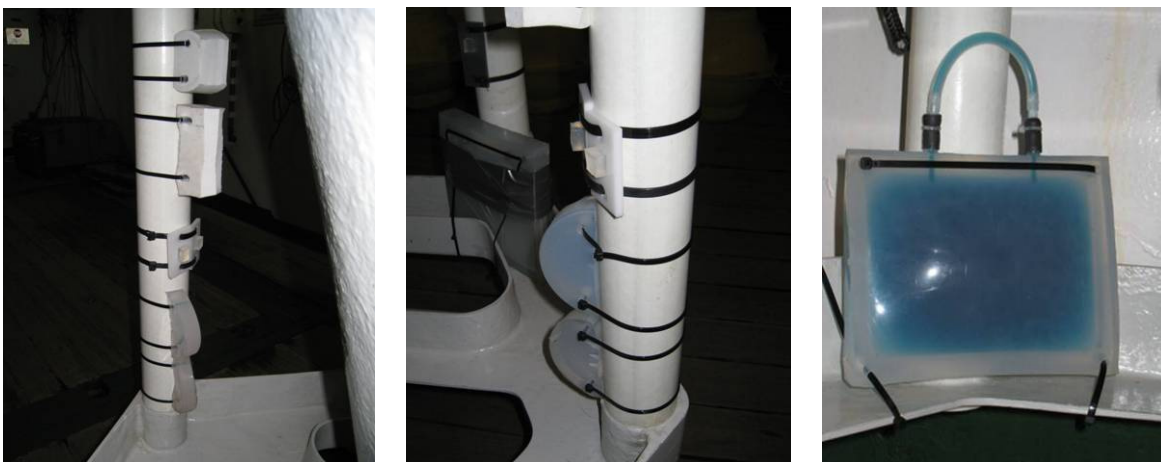


Fig. 4.4.7: Potting samples for long term (2 years) submerged test mounted on a sediment trap on Kiel 276

4.5. Acoustic modems and USBL antenna (O. Kebkal, Evologics)

During the P383 trial phase S2C modems were used for online data delivery from a pressure sensor and an accelerometer for calibration of the sensors. The S2C modems showed good performance and reliability under low energy requirements for data delivery. The modems required about 3W in transmit mode to communicate over distances up to 2500 m and about 5W in transmit mode to communicate over distances up to 4500m.

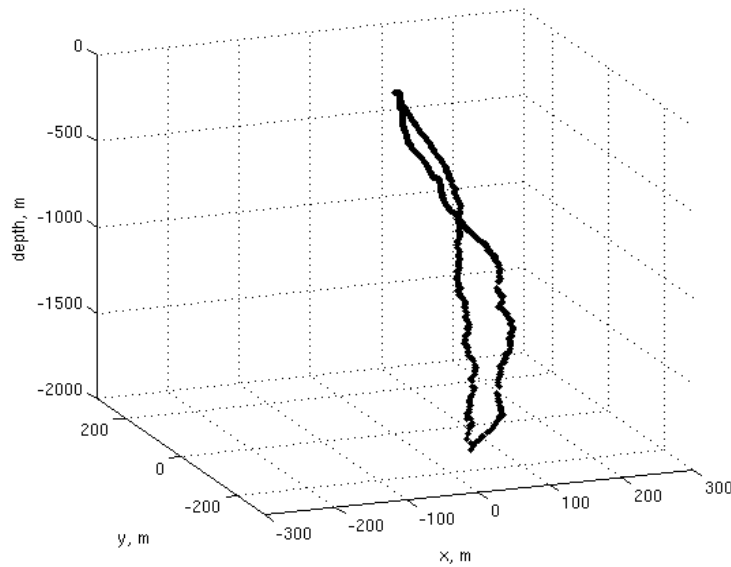


Fig. 4.5.1. S2C USBL positioning of the remote modem relative to ship (depth up to 2000m).

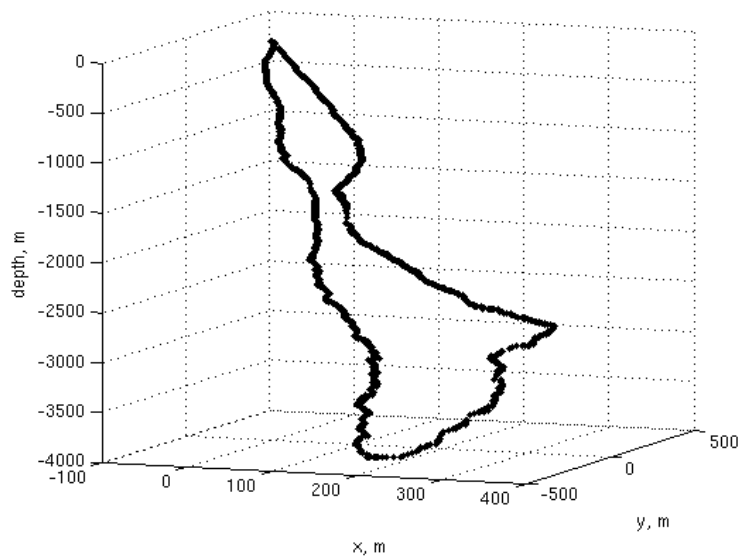


Fig. 4.5.2. S2C USBL positioning of the remote modem relative to ship (depth up to 4000m).

During data delivery, S2C modems provide the possibility to measure relative distance and velocity between the modems with high accuracy (few centimetres for distance measurement and about 0.1 m/s for velocity measurement). Redesigned after last POS377 trials, USBL antenna provided the possibility to measure position of the remote modem. S2C USBL antenna used data from accelerometer to compensate for ship movement and to obtain the position of the remote unit, relative to the ship. The accuracy of the positioning obtained during trials was under 1 percent of the slant range (Fig. 4.5.1 & 4.5.2).

4.6. Mooring work at Kiel276 (J. Waniek, U. Hehl, G. Lehnert, IOW)

On the 27th of April at 08:00 UTC time RV Poseidon arrived at the mooring position Kiel276 and started the recovery of the Kiel276-26 at 32°59.74'N / 022°00.07'W (Station 276, see Appendix B). Using hydrophone the release sequence was send and at 08:12 the mooring released. At 09:10 UTC the surface buoyancy sphere was sighted and the recovery began. At 12:18 UTC the recovery was completed. Two sediment traps (2000m and 3000m) were recovered and 6 Aanderaa current meters (RCM's). From the 6 RCM units one was defective. Most likely the RCM caused damaged to the pack of 6 buoyancy spheres deployed next to it. Those were recovered totally damaged (imploded).

Only 24h later in the morning of the 28th of April 2009 the mooring Kiel276-27 was ready for a new deployment. At 08:00 the deployment of the mooring started and was completed at 11:58 after the top buoy submerged. The estimated position of the Kiel276-27 mooring is according the ship protocol 32° 57.55'N, 021° 59.55'W. The instruments will be recovered in spring of 2011.

See Appendix C for a scheme with the mooring details.

5. Scientific equipment, moorings and instruments

5.1. CTD/ Water Sampling

CTD measurements were performed with IOW-CTD-system SBE911+, SN -721 down to 3600 m, but mostly down to 2000m depths. The system included the following sensors: Temperature SN: 4525, Conductivity SN: 3246, Pressure SN: 90550, Oxygen SBE 43 SN: 0521, Altimeter SN: 1018, Fluorometer: Dr. Haardt Phycoerythrin, Chlorophyll a, Turbidity SN: 12100. Parallel water sampling was done with the integrated SBE32 rosette sampler equipped with a total of 13 Bottles with 5 l volume HYDROBIOS FreeFlow® - Bottles from variable depths.

5.2. XBT

The expandable bathythermograph probe T5 (Lockheed Martin Sippican Inc.) was used during this cruise to measure temperature versus depth. Temperature profiles were obtained every 30nm (see Appendix B) down to 1830 m, while the ship was sailing at 6 knots.

5.3. Multinet Sampling

A Hydrobios multiple opening-closing net was used to collect samples of planktic organisms by vertical hauls (100- μ m mesh size, 50x50 cm² opening).

5.4. PC-Log

A PC-Based programme package consecutively logged the data streams from the ship's navigational units, as well as from the thermosalinograph and from the DWD (Deutscher Wetterdienst) sensors. In parallel the IOW CruiseAssistant system logged the corresponding data streams and provided cruise planning and CTD control with integrated ships data.

5.5 Pressure tolerant marine technologies

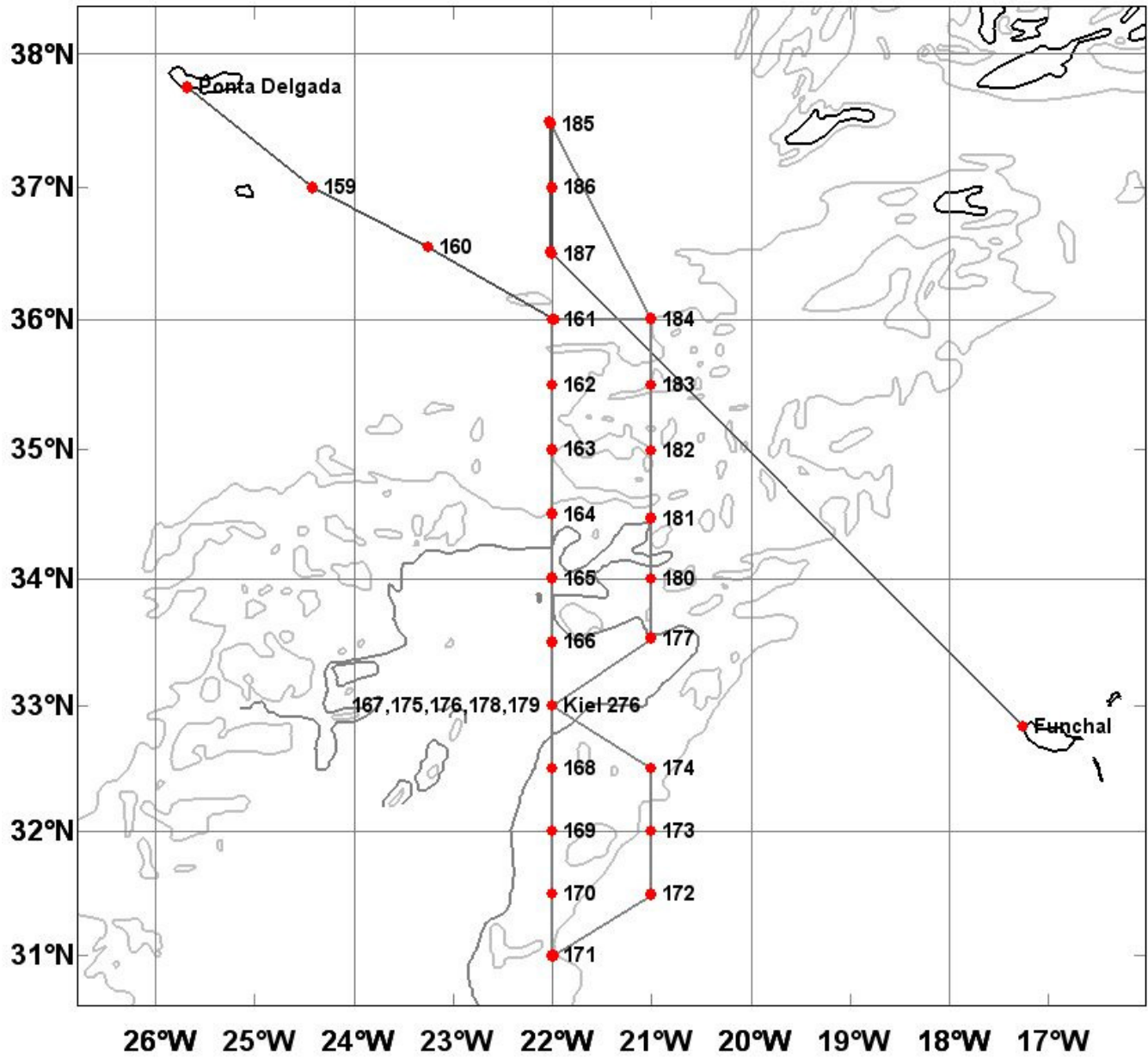
During the cruise a newly developed pressure sensor with pressure tolerant electronic for pressures up to 700 bars and a prototype of a newly developed pressure tolerant inertial measurement system with additional compass module were tested. It also has a logging possibility on a two Gigabyte SD-Card. For detection of the ship motions a Xsense motion tracking system was used. The communication was realized by an Evologics S2C acoustic modem. For power supply we used an also pressure tolerant rechargeable Lithium Polymer battery. The battery has a capacity of 20 Ah by typ. 24 V and is depth rated to 6000m. All systems were mounted on the CTD. The main material for the pressure tolerant coatings is silicon gel. The housings are made from Polyoxymethylen (POM). Samples of coating materials for pressure tolerant technologies as well as two samples of pressure tolerant battery packages was mounted on a sediment-trap for long time submerge test.

6. Acknowledgements

We thank Captain M. Günther and the crew of RV Poseidon for their cooperation and help during this cruise.

7. Appendices

Appendix A: Map P383



Appendix B: Station list P383

Station	Date 2009	Time UTC	Instrument Action	Latitude		Longitude	Water depth / m	Water Temp / ° C	Wire Length /m
158	21/04	13:00	Ship on station	37°	18.14' N	025° 12.37' W	2066.0	16.9	
		13:03	CTD/Ro to water	37°	18.13' N	025° 12.37' W	2068.0	16.9	
		13:19	CTD/Ro at working depth	37°	18.20' N	025° 12.29' W	2065.0	16.8	300
		13:19	Start heaving CTD/ Ro	37°	18.20' N	025° 12.29' W	2065.0	16.8	
		13:25	CTD/Ro on deck	37°	18.23' N	025° 12.25' W	2065.0	16.9	
158-2	21/04	13:35	MCN to water	37°	18.26' N	025° 12.18' W	2064.0	17.1	
		13:39	MCN at workingdepth	37°	18.27' N	025° 12.15' W	2063.0	17.0	100
		13:40	Start heaving MCN	37°	18.27' N	025° 12.15' W	2063.0	17.0	
		13:47	MCN on deck	37°	18.28' N	025° 12.10' W	2060.0	16.9	
		13:49	Station completed	37°	18.29' N	025° 12.08' W	2060.0	16.9	
159	21/04	18:24	Ship on station	37°	00.04' N	024° 25.08' W	3270.0	17.8	
		18:25	XBT 1 to water	37°	00.04' N	024° 24.96' W	3274.0	17.8	1830
		18:31	Station completed	36°	59.71' N	024° 24.32' W	3444.0	17.8	
160	22/04	01:20	Ship on station	36°	30.02' N	023° 15.02' W	4083.0	19.1	
		01:21	XBT 2 to water	36°	30.00' N	023° 14.96' W	4092.0	19.1	1830
		01:26	Station completed	36°	29.77' N	023° 14.40' W	4168.0	19.0	
161	22/04	09:15	Ship on station	35°	59.99' N	022° 00.01' W	4209.0	18.3	
		09:18	MCN to water	35°	59.97' N	021° 59.98' W	4213.0	18.3	
		09:36	Start heaving MCN	35°	59.91' N	021° 59.89' W	4224.0	18.3	700
		10:00	MCN on deck	35°	59.81' N	021° 59.81' W	4231.0	18.3	
161-2	22/04	10:14	MCN to water	35°	59.73' N	021° 59.77' W	4262.0	18.3	
		10:35	Start heaving MCN	35°	59.64' N	021° 59.71' W	4234.0	18.3	700
		10:58	MCN on deck	35°	59.51' N	021° 59.69' W	4242.0	18.3	
161-3	22/04	11:11	MCN to water	35°	59.48' N	021° 59.62' W	4240.0	18.3	
		11:16	Start heaving MCN	35°	59.46' N	021° 59.63' W	4241.0	18.3	100
		11:22	MCN on deck	35°	59.44' N	021° 59.62' W	4244.0	18.3	
161-4	22/04	11:32	CTD/Ro to water	35°	59.42' N	021° 59.59' W	4245.0	18.3	
		12:12	Start heaving CTD/ Ro	35°	59.30' N	021° 59.56' W	4259.0	18.3	2000

Station	Date 2009	Time UTC	Instrument Action	Latitude	Longitude	Water depth / m	Water Temp / o C	Wire Length /m
		12:52	CTD/Ro on deck	35° 59.28' N	021° 59.46' W	4258.0	18.3	
161-5	22/04	12:53	Modem installation	35° 59.28' N	021° 59.46' W	4258.0	18.3	
		13:11	Station completed	35° 59.43' N	021° 59.43' W	4265.0	18.3	
162	22/04	16:30	Ship on station	35° 30.04' N	021° 59.99' W	4936.0	18.5	
		16:31	XBT 3 to water	35° 29.94' N	021° 59.99' W	4935.0	18.5	1830
		16:37	Station completed	35° 29.41' N	021° 59.99' W	4934.0	18.5	
163	22/04	20:01	Ship on station	35° 00.04' N	021° 59.99' W	5018.0	18.6	
		20:09	CTD/Ro to water	35° 00.10' N	021° 59.96' W	5013.0	18.6	
		20:55	Start heaving CTD/ Ro	35° 00.36' N	021° 59.85' W	n.a.	18.6	1999
		21:39	CTD/Ro on deck	35° 00.56' N	021° 59.61' W	4936.0	18.6	
163-2	22/04	21:56	MCN to water	35° 00.62' N	021° 59.52' W	n.a.	18.6	
		22:52	Start heaving MCN	35° 00.78' N	021° 59.16' W	n.a.	18.6	2000
163-3	22/04	23:56	MCN on deck/to water	35° 00.90' N	021° 59.18' W	n.a.	18.6	
	23/04	00:49	Start heaving MCN	35° 01.03' N	021° 59.42' W	n.a.	18.6	2000
		01:56	MCN on deck	35° 01.10' N	021° 59.66' W	n.a.	18.6	
163-4	23/04	02:04	MCN to water	35° 01.13' N	021° 59.72' W	n.a.	18.6	
		02:21	Start heaving MCN	35° 01.17' N	021° 59.82' W	n.a.	18.6	700
		02:44	MCN on deck	35° 01.21' N	021° 59.89' W	n.a.	18.5	
163-5	23/04	02:51	MCN to water	35° 01.21' N	021° 59.92' W	n.a.	18.5	
		03:08	Start heaving MCN	35° 01.20' N	021° 59.97' W	4948.0	18.5	700
		03:31	MCN on deck	35° 01.23' N	021° 00.00' W	n.a.	18.5	
163-6	23/04	03:38	MCN to water	35° 01.24' N	021° 00.01' W	n.a.	18.5	
		03:41	Start heaving MCN	35° 01.26' N	021° 00.03' W	n.a.	18.5	100
		03:46	MCN on deck	35° 01.26' N	021° 00.06' W	n.a.	18.5	
		03:47	Station completed	35° 01.26' N	021° 00.06' W	n.a.	18.5	
164	23/04	07:38	Ship on station	34° 30.08' N	022° 00.00' W	5161.0	18.5	
		07:40	XBT 4 to water	34° 29.95' N	022° 00.00' W	5163.0	18.5	1830
		07:45	Station completed	34° 29.42' N	022° 00.00' W	5159.0	18.5	
165	23/04	11:11	Ship on station	33° 59.99' N	021° 59.99' W	5290.0	18.5	

Station	Date 2009	Time UTC	Instrument Action	Latitude	Longitude	Water depth / m	Water Temp / o C	Wire Length /m
		11:19	CTD/Ro to water	33° 59.98' N	021° 59.99' W	5290.0	18.5	
		11:57	Start heaving CTD/ Ro	33° 59.91' N	021° 59.94' W	n.a.	18.6	2000
		12:37	CTD/Ro on deck	33° 59.88' N	021° 59.79' W	n.a.	18.6	
165-2	23/04	12:48	MCN to water	33° 59.86' N	021° 59.73' W	5288.0	18.6	
		13:09	Start heaving MCN	33° 59.78' N	021° 59.66' W	5288.0	18.6	700
		13:32	MCN on deck	33° 59.76' N	021° 59.59' W	n.a.	18.6	
165-3	23/04	13:40	MCN to water	33° 59.73' N	021° 59.58' W	n.a.	18.6	
		14:01	Start heaving MCN	33° 59.65' N	021° 59.55' W	n.a.	18.6	700
		14:26	MCN on deck	33° 59.67' N	021° 59.48' W	n.a.	18.6	
165-4	23/04	14:32	MCN to water	33° 59.53' N	021° 59.48' W	n.a.	18.6	
		14:35	Start heaving MCN	33° 59.52' N	021° 59.47' W	n.a.	18.6	100
		14:41	MCN on deck	33° 59.50' N	021° 59.46' W	n.a.	18.6	
		14:42	Station completed	33° 59.50' N	021° 59.45' W	n.a.	18.6	
166	23/04	18:11	Ship on station	33° 30.05' N	022° 00.00' W	5270.0	18.5	
		18:12	XBT 5 to water	33° 30.01' N	022° 00.00' W	5270.0	18.5	1830
		18:17	Station completed	33° 29.41' N	022° 00.00' W	5268.0	18.6	
167	23/04	20:33	Ship on station	33° 10.00' N	021° 59.98' W	5232.0	18.8	
		20:36	Cable weight to water	33° 10.00' N	021° 59.98' W	5232.0	18.8	
		20:49	ISP 1 to water	33° 09.99' N	021° 59.97' W	5232.0	18.8	
		22:02	Working depth	33° 09.77' N	021° 59.84' W	2532.0	18.7	2000
	24/04	06:00	Start heaving ISP 1	33° 07.89' N	021° 57.64' W	n.a.	18.5	2000
		06:58	ISP 1 on deck	33° 07.65' N	021° 57.37' W	5228.0	18.5	
		07:00	Cable weight on deck	33° 07.62' N	021° 57.38' W	5228.0	18.5	
		07:05	Station completed	33° 07.59' N	021° 57.39' W	5228.0	18.5	
168	24/04	12:28	Ship on station	32° 30.07' N	022° 00.00' W	5171.0	18.4	
		12:31	XBT 6 to water	32° 29.83' N	022° 00.00' W	n.a.	18.4	1830
		12:36	Station completed	32° 29.27' N	022° 00.00' W	n.a.	18.4	
169	24/04	16:32	Ship on station	31° 59.96' N	022° 00.00' W	n.a.	18.6	
		16:33	XBT 7 to water	31° 59.90' N	022° 00.00' W	n.a.	18.6	1830

Station	Date 2009	Time UTC	Instrument Action	Latitude	Longitude	Water depth / m	Water Temp / o C	Wire Length /m
		16:38	Station completed	31° 59.34' N	022° 00.01' W	n.a.	18.6	
170	24/04	20:19	Ship on station	31° 30.01' N	022° 00.01' W	5033.0	18.8	
		20:20	XBT 8 to water	31° 29.91' N	022° 00.01' W	5034.0	18.7	1830
		20:25	Station completed	31° 29.43' N	022° 00.01' W	5023.0	18.6	
171	24/04	23:54	Ship on station	31° 00.01' N	022° 00.01' W	n.a.	19.1	
		23:55	XBT 9 to water	30° 59.94' N	022° 00.01' W	n.a.	19.1	1830
	25/04	00:01	Station completed	30° 59.42' N	021° 59.98' W	n.a.	19.1	
172	25/04	11:16	Ship on station	31° 29.98' N	021° 59.99' W	n.a.	18.3	
		11:22	XBT 10 to water	31° 29.99' N	021° 59.96' W	4870.0	18.3	1830
		11:28	Station completed	31° 30.02' N	021° 59.93' W	4875.0	18.3	
173	25/04	16:22	Ship on station	31° 59.92' N	021° 00.10' W	n.a.	18.3	
		16:32	CTD/Ro to water	31° 59.94' N	021° 00.06' W	4851.0	18.3	
		17:09	Start heaving CTD/ Ro	32° 00.00' N	021° 00.04' W	4884.0	18.3	2000
		17:54	CTD/Ro on deck	32° 00.00' N	021° 00.06' W	n.a.	18.3	
173-2	25/04	18:11	MCN to water	32° 00.00' N	021° 00.05' W	4849.0	18.3	
		18:32	Start heaving MCN	31° 59.97' N	021° 00.08' W	4849.0	18.3	700
		18:57	MCN on deck	31° 59.97' N	021° 00.08' W	4848.0	18.3	
173-3	25/04	19:03	MCN to water	32° 00.00' N	021° 00.07' W	4848.0	18.3	
		19:25	Start heaving MCN	32° 00.06' N	021° 00.07' W	4846.0	18.3	700
		19:48	MCN on deck	32° 00.10' N	020° 59.99' W	4916.0	18.2	
173-4	25/04	19:55	MCN to water	32° 00.09' N	020° 59.96' W	4845.0	18.2	
		20:01	Start heaving MCN	32° 00.09' N	020° 59.95' W	4938.0	18.2	100
		20:05	MCN on deck	32° 00.08' N	020° 59.95' W	4847.0	18.2	
		20:15	Station completed	32° 00.06' N	020° 59.93' W	4847.0	18.2	
174	26/04	00:35	Ship on station	32° 29.92' N	020° 59.99' W	n.a.	18.4	
		00:35	XBT 11 to water	32° 30.02' N	020° 59.99' W	n.a.	18.4	1830
		00:41	Station completed	32° 30.56' N	020° 59.99' W	n.a.	18.4	
175	26/04	10:08	Ship on station	33° 10.00' N	022° 00.02' W	5232.0	18.3	
		10:13	CTD/Ro to water	33° 09.99' N	022° 00.02' W	5233.0	18.2	

Station	Date 2009	Time UTC	Instrument Action	Latitude	Longitude	Water depth / m	Water Temp / o C	Wire Length /m
		10:31	Start heaving CTD/ Ro	33° 09.94' N	022° 00.04' W	5233.0	18.2	700
		10:51	CTD/Ro on deck	33° 09.94' N	022° 00.03' W	5231.0	18.2	
175-2	26/04	11:03	MCN to water	33° 09.96' N	022° 00.01' W	5231.0	18.2	
		11:24	Start heaving MCN	33° 09.93' N	021° 59.95' W	5232.0	18.2	700
		11:45	MCN on deck	33° 09.92' N	021° 59.93' W	5232.0	18.2	
175-3	26/04	11:53	MCN to water	33° 09.94' N	021° 59.91' W	5322.0	18.2	
		12:12	Start heaving MCN	33° 09.93' N	021° 59.88' W	n.a.	18.3	700
		12:39	MCN on deck	33° 09.84' N	021° 59.80' W	n.a.	18.3	
175-4	26/04	12:45	MCN to water	33° 09.83' N	021° 59.77' W	n.a.	18.3	
		13:43	Start heaving MCN	33° 09.84' N	021° 59.72' W	n.a.	18.4	2000
		14:57	MCN on deck	33° 09.85' N	021° 59.56' W	n.a.	18.4	
175-5	26/04	15:21	MCN to water	33° 09.89' N	021° 59.63' W	n.a.	18.5	
		15:26	Start heaving MCN	33° 09.87' N	021° 59.61' W	n.a.	18.5	100
		15:32	MCN on deck	33° 09.88' N	021° 59.60' W	n.a.	18.5	
175-6	26/04	15:50	CTD/Ro to water	33° 09.93' N	021° 59.68' W	n.a.	18.5	
		17:06	Start heaving CTD/ Ro	33° 09.75' N	021° 59.54' W	5234.0	18.5	4700
		18:25	CTD/Ro on deck	33° 09.71' N	021° 59.27' W	5234.0	18.5	
		18:32	Station completed	33° 09.72' N	021° 59.23' W	5234.0	18.5	
176	27/04	08:00	Ship on station	32° 59.74' N	022° 00.07' W	5215.0	18.2	
		08:08	Hydrophon to water	32° 59.77' N	022° 00.08' W	5216.0	18.1	
		08:12	KI 276-26 released	32° 59.78' N	022° 00.09' W	5216.0	18.1	
		09:10	Hydrophon on deck	32° 59.80' N	021° 59.83' W	5214.0	18.1	
		09:10	KI 276 sighted/ surface	32° 59.80' N	021° 59.83' W	5214.0	18.1	
		09:45	Topbuoy on deck	32° 59.57' N	021° 59.28' W	5210.0	18.2	
		09:50	8 x Benthos on deck	32° 59.54' N	021° 59.31' W	5212.0	18.3	
		09:50	RCM-8 on deck	32° 59.54' N	021° 59.31' W	5212.0	18.3	
		10:26	6 x Benthos on deck	32° 59.64' N	021° 59.57' W	5214.0	18.2	
		10:26	RCM-8 on deck	32° 59.64' N	021° 59.57' W	5214.0	18.2	
		10:35	2 x Benthos on deck	32° 59.42' N	021° 59.60' W	5214.0	18.1	

Station	Date 2009	Time UTC	Instrument Action	Latitude	Longitude	Water depth / m	Water Temp / o C	Wire Length /m
		10:45	4 x Benthos on deck	32° 59.36' N	021° 59.65' W	5212.0	18.1	
		10:45	RCM-8 on deck	32° 59.36' N	021° 59.65' W	5212.0	18.1	
		10:58	3 x Benthos on deck	32° 59.28' N	021° 59.65' W	5215.0	18.2	
		10:58	RCM-8 on deck	32° 59.28' N	021° 59.65' W	5215.0	18.2	
		11:06	5 x Benthos on deck	32° 59.27' N	021° 59.67' W	5214.0	18.1	
		11:10	Sediment-Trap on deck	32° 59.25' N	021° 59.67' W	5135.0	18.2	
		11:28	5 x Benthos on deck	32° 59.12' N	021° 59.71' W	5214.0	18.2	
		11:28	RCM-8 on deck	32° 59.12' N	021° 59.71' W	5214.0	18.2	
		11:31	Sediment-Trap on deck	32° 59.09' N	021° 59.71' W	5213.0	18.2	
		11:43	2 x Benthos on deck	32° 59.02' N	021° 59.73' W	5213.0	18.1	
		12:03	2 x Benthos on deck	32° 58.96' N	021° 59.81' W	5212.0	18.1	
		12:13	2 x Benthos on deck	32° 58.91' N	021° 59.86' W	5214.0	18.1	
		12:17	6 x Benthos on deck	32° 58.88' N	021° 59.85' W	5213.0	18.1	
		12:17	RCM-8 on deck	32° 58.88' N	021° 59.85' W	5213.0	18.1	
		12:18	AR-2 Releaser on deck	32° 58.87' N	021° 59.86' W	5212.0	18.1	
		12:18	Station completed	32° 58.87' N	021° 59.86' W	5212.0	18.1	
177	27/04	22:15	Ship on station	33° 29.99' N	021° 00.03' W	5213.0	18.1	
		22:18	CTD/Ro to water	33° 30.01' N	021° 00.03' W	5214.0	18.1	
		23:05	Start heaving CTD/ Ro	33° 30.08' N	021° 00.18' W	5212.0	18.1	2000
		23:45	CTD/Ro on deck	33° 30.09' N	021° 00.27' W	5215.0	18.1	
		23:50	Station completed	33° 30.09' N	021° 00.27' W	5215.0	18.1	
178	28/04	08:00	Ship on station	32° 55.42' N	022° 00.14' W	5215.0	18.1	
		08:05	Topbuoy to water	32° 55.49' N	022° 00.08' W	5214.0	18.1	
		08:13	8 Benthos and RCM-8 to water	32° 55.67' N	022° 00.01' W	5214.0	18.1	
		08:26	6 Benthos and RCM-8 to water	32° 55.89' N	021° 59.95' W	5215.0	18.1	
		08:36	2 Benthos to water	32° 56.07' N	021° 59.93' W	5213.0	18.1	
		08:45	4 Benthos and RCM-8 to water	32° 56.23' N	021° 59.90' W	5214.0	18.1	
		08:57	3 Benthos and RCM to water	32° 56.45' N	021° 59.88' W	5215.0	18.1	

Station	Date 2009	Time UTC	Instrument Action	Latitude	Longitude	Water depth / m	Water Temp / o C	Wire Length /m
		09:05	5 Benthos to water	32° 56.62' N	021° 59.87' W	5215.0	18.1	
		09:11	Sediment trap to water	32° 56.71' N	021° 59.86' W	5215.0	18.0	
		09:36	5 Benthos and RCM-8 to water	32° 57.24' N	021° 59.83' W	5302.0	18.0	
		09:42	Sediment trap to water	32° 57.31' N	021° 59.81' W	5214.0	18.0	
		09:54	2 Benthos to water	32° 57.53' N	021° 59.78' W	5212.0	18.0	
		10:22	2 Benthos to water	32° 58.07' N	021° 59.70' W	5211.0	18.0	
		10:32	2 Benthos to water	32° 58.27' N	021° 59.66' W	5212.0	18.0	
		10:37	6 Benthos and RCM-8 to water	32° 58.35' N	021° 59.65' W	5211.0	18.0	
		10:37	Releaser AR-2 to water	32° 58.35' N	021° 59.65' W	5211.0	18.0	
		10:49	Anchor weight to water	32° 58.49' N	021° 59.64' W	5212.0	18.0	
		11:42	Topbuoy submerged	32° 57.41' N	021° 59.80' W	5212.0	18.2	
		11:58	Station completed	32° 57.66' N	021° 59.90' W	n.a.	18.2	
179	28/04	18:01	Ship on station	33° 10.00' N	022° 00.07' W	5232.0	18.6	
		18:06	Cable weight to water	33° 10.02' N	022° 00.08' W	5232.0	18.7	
		18:16	ISP 1 to water	33° 10.04' N	022° 00.06' W	5231.0	18.6	
		18:56	ISP 2 to water	33° 10.05' N	022° 00.01' W	5233.0	18.6	
		18:59	Working depth	33° 10.06' N	022° 00.00' W	5231.0	18.6	2000
	29/04	06:00	Start heaving ISP 1 + 2	33° 11.03' N	022° 00.16' W	5229.0	18.5	
		06:09	ISP 2 on deck	33° 11.08' N	022° 00.15' W	5229.0	18.5	
		06:46	ISP 1 on deck	33° 11.37' N	022° 00.03' W	5229.0	18.5	
179-2	29/04	08:10	ISP 1 to water	33° 11.08' N	022° 00.17' W	5229.0	18.5	
		08:57	ISP 2 to water	33° 10.86' N	022° 00.23' W	5229.0	18.5	
		09:05	Working depth	33° 10.84' N	022° 00.25' W	5232.0	18.5	3000
		17:00	Start heaving ISP 1 + 2	33° 09.51' N	021° 58.77' W	5229.0	19.1	
		17:12	ISP 2 on deck	33° 09.48' N	021° 58.69' W	5229.0	19.0	
		17:54	ISP 1 on deck	33° 09.19' N	021° 58.52' W	5228.0	19.0	
		17:56	Cable weight on deck	33° 09.18' N	021° 58.51' W	5228.0	19.0	
		17:58	Station completed	33° 09.14' N	021° 58.50' W	5229.0	19.0	
180	30/04	02:10	Ship on station	33° 59.94' N	021° 00.07' W	n.a.	18.4	

Station	Date 2009	Time UTC	Instrument Action	Latitude	Longitude	Water depth / m	Water Temp / o C	Wire Length /m
		02:11	XBT 12 to water	34° 00.02' N	020° 59.96' W	n.a.	18.4	1830
		02:16	Station completed	34° 00.45' N	020° 59.44' W	n.a.	18.4	
181	30/04	05:51	Ship on station	34° 29.99' N	021° 00.09' W	n.a.	18.1	
		06:00	CTD/Ro to water	34° 29.95' N	021° 00.15' W	5185.0	18.1	
		06:07	CTD/Ro on deck	34° 29.93' N	021° 00.20' W	5185.0	18.1	10
181-2	30/04	08:25	MCN to water	34° 30.24' N	021° 00.04' W	n.a.	18.1	
		08:45	Start heaving MCN	34° 30.28' N	021° 00.01' W	n.a.	18.1	700
		09:07	MCN on deck	34° 30.33' N	020° 59.96' W	5201.0	18.1	
181-3	30/04	09:15	MCN to water	34° 30.36' N	020° 59.98' W	5194.0	18.1	
		09:33	Start heaving MCN	34° 30.39' N	020° 59.96' W	5263.0	18.1	700
		09:54	MCN on deck	34° 30.44' N	020° 59.91' W	5263.0	18.1	
181-4	30/04	10:00	MCN to water	34° 30.44' N	020° 59.90' W	n.a.	18.1	
		10:04	Start heaving MCN	34° 30.47' N	020° 59.91' W	n.a.	18.1	100
		10:10	MCN on deck	34° 30.49' N	020° 59.91' W	n.a.	18.1	
181-5	30/04	10:32	XBT 13 to water	34° 30.60' N	020° 59.89' W	5127.0	18.1	1830
		10:38	Station completed	34° 30.64' N	020° 59.87' W	5127.0	18.2	
182	30/04	14:23	Ship on station	34° 59.90' N	021° 00.01' W	n.a.	18.4	
		14:24	XBT 14 to water	35° 00.00' N	021° 00.01' W	n.a.	18.4	1830
		14:30	Station completed	35° 00.01' N	021° 00.01' W	n.a.	18.4	
183	30/04	18:18	Ship on station	35° 30.02' N	020° 59.90' W	5176.0	18.7	
		18:26	CTD/Ro to water	35° 30.01' N	020° 59.77' W	5176.0	18.7	
		19:09	Start heaving CTD/ Ro	35° 29.90' N	020° 59.18' W	5176.0	18.6	2000
		20:05	CTD/Ro on deck	35° 29.56' N	020° 58.49' W	n.a.	18.5	
183-2	30/04	20:13	MCN to water	35° 29.55' N	020° 58.35' W	5154.0	18.5	
		20:32	Start heaving MCN	35° 29.43' N	020° 58.15' W	5154.0	18.5	700
		20:53	MCN on deck	35° 29.29' N	020° 57.95' W	5134.0	18.5	
183-3	30/04	21:01	MCN to water	35° 29.26' N	020° 57.84' W	5121.0	18.5	
		21:23	Start heaving MCN	35° 29.06' N	020° 57.58' W	5079.0	18.5	700
		21:45	MCN on deck	35° 28.82' N	020° 57.33' W	5057.0	18.5	

Station	Date 2009	Time UTC	Instrument Action	Latitude	Longitude	Water depth / m	Water Temp / o C	Wire Length /m
183-4	30/04	21:52	MCN to water	35° 28.75' N	020° 57.23' W	5050.0	18.5	
		21:56	Start heaving MCN	35° 28.71' N	020° 57.18' W	5048.0	18.5	100
		22:02	MCN on deck	35° 28.65' N	020° 57.11' W	5046.0	18.5	
		22:12	Station completed	35° 28.58' N	020° 56.93' W	5042.0	18.5	
184	01/05	02:06	Ship on station	35° 59.97' N	021° 00.00' W	n.a.	17.7	
		02:06	XBT 15 to water	36° 00.00' N	021° 00.00' W	n.a.	17.7	1830
		02:12	Station completed	36° 00.56' N	021° 00.01' W	n.a.	17.8	
185	01/05	14:43	Ship on station	37° 29.95' N	022° 00.04' W	n.a.	17.4	
		14:52	CTD/Ro to water	37° 29.85' N	022° 00.08' W	n.a.	17.4	
		15:31	Start heaving CTD/ Ro	37° 29.49' N	022° 00.13' W	n.a.	17.3	2000
		16:10	CTD/Ro on deck	37° 29.17' N	022° 00.12' W	n.a.	17.3	
185-2	01/05	16:18	MCN to water	37° 29.10' N	022° 00.10' W	n.a.	17.2	
		16:37	Start heaving MCN	37° 28.96' N	022° 00.12' W	n.a.	17.2	700
		16:57	MCN on deck	37° 28.80' N	022° 00.05' W	n.a.	17.1	
185-3	01/05	17:04	MCN to water	37° 28.74' N	022° 00.07' W	n.a.	17.1	
		17:23	Start heaving MCN	37° 28.57' N	022° 00.09' W	n.a.	17.1	700
		17:42	MCN on deck	37° 28.38' N	022° 00.10' W	n.a.	17.1	
185-4	01/05	18:38	MCN to water	37° 27.80' N	022° 00.14' W	4638.0	17.0	
		18:59	Start heaving MCN	37° 27.57' N	022° 00.14' W	4318.0	17.0	700
		19:20	MCN on deck	37° 27.33' N	022° 00.08' W	4317.0	16.9	
185-5	01/05	19:25	MCN to water	37° 27.28' N	022° 00.06' W	4321.0	16.8	
		19:29	Start heaving MCN	37° 27.25' N	022° 00.07' W	4321.0	16.8	100
		19:34	MCN on deck	37° 27.21' N	022° 00.09' W	4322.0	16.7	
185-6	01/05	19:46	CTD/Ro to water	37° 27.10' N	022° 00.06' W	4312.0	16.7	
		20:49	Start heaving CTD/ Ro	37° 26.70' N	022° 00.24' W	n.a.	16.5	
		21:56	CTD/Ro on deck	37° 26.26' N	022° 00.69' W	n.a.	16.6	4000
185-7	01/05	22:09	MCN to water	37° 26.18' N	022° 00.81' W	n.a.	16.6	
		23:02	Start heaving MCN	37° 25.86' N	022° 01.20' W	4242.0	16.6	2000
		23:55	MCN on deck	37° 25.56' N	022° 01.50' W	4322.0	16.8	

Station	Date 2009	Time UTC	Instrument Action	Latitude	Longitude	Water depth / m	Water Temp / o C	Wire Length /m
	02/05	00:03	Station completed	37° 25.51' N	022° 01.51' W	n.a.	16.8	
186	02/05	03:02	Ship on station	37° 00.09' N	022° 00.02' W	n.a.	16.9	
		03:03	XBT 16 to water	36° 59.96' N	022° 00.01' W	n.a.	16.9	1830
		03:08	Station completed	36° 59.36' N	021° 59.99' W	n.a.	17.0	
187	02/05	06:56	Ship on station	36° 29.99' N	021° 59.97' W	4030.0	16.8	
		07:04	CTD/Ro to water	36° 29.92' N	022° 00.04' W	4030.0	16.8	
		07:11	CTD/Ro on deck	36° 29.88' N	022° 00.08' W	4030.0	16.8	10
		07:17	CTD/Ro to water	36° 29.85' N	022° 00.10' W	4032.0	16.8	
		07:51	Start heaving CTD/ Ro	36° 29.62' N	022° 00.18' W	4031.0	16.8	2000
		08:33	CTD/Ro on deck	36° 29.31' N	022° 00.24' W	4056.0	16.8	
187-2	02/05	08:44	MCN to water	36° 29.22' N	022° 00.23' W	4059.0	16.8	
		09:49	Start heaving MCN	36° 28.55' N	022° 00.22' W	4071.0	16.8	2083
		10:48	MCN on deck	36° 27.69' N	022° 00.15' W	4073.0	16.8	
187-3	02/05	10:55	MCN to water	36° 27.59' N	022° 00.13' W	4073.0	16.8	
		11:20	Start heaving MCN	36° 27.17' N	022° 00.10' W	4175.0	16.9	753
		11:49	MCN on deck	36° 26.65' N	022° 00.27' W	4134.0	17.0	
187-4	02/05	11:56	MCN to water	36° 26.55' N	022° 00.32' W	4141.0	17.0	
		12:24	Start heaving MCN	36° 26.02' N	022° 00.51' W	n.a.	17.2	791
		12:59	MCN on deck	36° 25.36' N	022° 00.80' W	n.a.	17.3	
187-5	02/05	13:05	MCN to water	36° 25.26' N	022° 00.85' W	n.a.	17.2	
		13:09	Start heaving MCN	36° 25.17' N	022° 00.88' W	n.a.	17.2	104
		13:14	MCN on deck	36° 25.06' N	022° 00.92' W	n.a.	17.2	
		13:23	Station completed	36° 24.90' N	022° 00.99' W	n.a.	17.1	
	02/05	13:23	End of Research- and Stationwork					

Appendix C: Mooring design

