BERICHTE
aus dem Fachbereich Geowissenschaften
der Universität Bremen

No. 237

Ruhland, G., C. Barrera,
K. Dehning, S. Klar, E. Kopiske,
J.J. Koester, V. Martinez Garcia,
M. Moehlmann, M. Villagarcia,
J.B. Wynar

REPORT AND PRELIMINARY RESULTS OF POSEIDON CRUISE 319
LAS PALMAS (SPAIN) - LAS PALMAS (SPAIN)
December 06th - December 17th, 2004

Berichte, Fachbereich Geowissenschaften, Universität Bremen, No.237 ,
50 pages, Bremen 2005

ISSN 0931-0800

The „Berichte aus dem Fachbereich Geowissenschaften“ are produced at irregular intervals by the Department of Geosciences, Bremen University.
They serve for the publication of experimental works, Ph.D.-theses and scientific contributions made by members of the department.

Reports can be ordered from:

Monika Bachur
Forschungszentrum Ozeanränder, RCOM
Universität Bremen
Postfach 330 440
D 28334 Bremen
Phone: (49) 421 218 - 8960
Fax: (49) 421 218 - 3116
e-mail: mbachur@uni-bremen.de

Citation:
Ruhland, G. and participants
Report and preliminary results of Poseidon Cruise 319, Las Palmas – Las Palmas, 06.12.-17.12.2004.
Berichte, Fachbereich Geowissenschaften, Universität Bremen, No. 237, 50 pages, Bremen, 2005.

ISSN 0931-0800

CONTENTS

1. Participants R/V Poseidon Cruise 319

Name	Domain	Institution
Ruhland, Götz	Marine Geology (Chief Scientist)	MARUM
Dehning, Klaus	Technician	MARUM
Klar, Steffen	Technician DOLAN	MARUM
Kopiske, Eberhard	Technician DOLAN	MARUM
Köster, Jana Jorina	Marine Geology	MARUM
Möhlmann, Marc	Technician	MARUM
Villagarcia, Marimar, Dr.	Marine Chemistry	ICCM
Barrera, Carlos	Marine Chemistry	ICCM
Martinez Garcia, Vivian	Marine Chemistry	ICCM
Wynar, John Basil	Marine Technician	SOC

Institutions

MARUM Zentrum für Marine Umweltwissenschaften der Uniersität Bremen, Leobener Str, 28359 Bremen, Germany

ICCM Instituto Canario de Ciencias Marinas, Apto. Correos 55, 35200 Telde de Gran Canaria, Spain

SOC Southampton Oceanography Centre, University of Southampton, Waterfront Campus, Southampton, SO 14 3ZH, United Kingdom

2. Research Objectives

The upwelling area off NW-Africa is one of the most important upwelling systems of the global ocean influenced by high amounts of Sahara dust which is transporting nutrients into the ocean and the processes of the biological carbon pump system. Hence, they are controlling factors of the global atmospheric CO_2 budget. Despite the main driving force for climatic variability is located in the North-Atlantic, the upwelling area off NW-Africa is suitable to reconstruct the past climatic variability, via observation of present in-situ environmental datasets.
The research topics were carried out in correlation with the following projects:

2.1 MERSEA (Marine EnviRonment and Security for the European Area – Integrated Projekt)

The main task will concentrate on the MERSEA EU project, which is closely linked to the ANIMATE EU project, secluded in November 2004, and the DOLAN EU project, secluded in April 2004. The main aim of MERSEA will be the management of data, and their conditioning for scientific users.

The participating institutions during R/V POSEIDON cruise 319, MARUM, ICCM and SOC, are involved in work package 3. They will ensure the availability of real time and delayed-mode, and regional in-situ data and products in the form required by the MERSEA modelling, data assimilation and validation systems. The activities are partly research and development, innovation, and partly demonstration. The served research sites, continued from ANIMATE and DOLAN, are DOLAN/ESTOC (Canary Islands), PAP (Porcupine Abyssal Plain) and CIS (Central Irminger Sea). The main task during POS 319 cruise will be the work on the DOLAN site. The DOLAN station is located 25 nm west of ESTOC and comprises technical devices for transmission of scientific data sets via satellite into the internet and research institutes.

2.2 RAPID (Monitoring the Atlantic Meridional Overturning Circulation at 26.5°N)

Another goal of the POSEIDON cruise will be the work at the EB-2 site. It is located 60 nm south of Gran Canaria and a part of the RAPID program. Main task of the RAPID program is “to establish a pre-operational prototype system to continuously observe the strength and structure of the Atlantic meridional overturning circulation (MOC)”. The MOC is commonly defined as the zonally integrated meridional flow, as a function of latitude and depth. While parts of the MOC are wind-driven, the basin-scale Atlantic MOC is largely buoyancy-forced. Hence, observing the Atlantic MOC is the fundamental observational requirement of a program aiming to assess the role of the Atlantic thermohaline circulation (THC) in rapid climate change. The basic observational strategy relies on a combination of moored arrays (temperature, salinity, currents, and pressure), real time data transmission, hydrographic lines, satellite observations (sea level, winds), the opportunistic use of float data, cable measurements (Florida Strait transport), and modelling to synthesize the observations. The starting point lies in applying geostrophy: Geostrophic mass transport between any two points depends only on the pressure difference between these points; to estimate the MOC thus would require the continuous observation of density at eastern and western boundaries, plus the establishment of a reference level. Over the past year, we have performed design studies to test our strategy; in particular, we have successfully tested our proposed antenna in two high-resolution models.

In 2004 22 moorings were deployed: 9 across the eastern boundary, 4 across the Mid-Atlantic Ridge, and 9 across the Deep Western Boundary Current. The moorings consist of a combination of fixed point CTDs, current meters, bottom pressure recorders and profiling instruments. The array will be recovered and redeployed on an annual basis until 2008 (4 years of continuous observation 2004-2008).

3. Narrative of the Cruise

R/V Poseidon left the port of Las Palmas on December 10th with heading to DOLAN position.

On the way scientific work started with one rosette cast down to 2000 m water depth. At 8:00 pm R/V POSEIDON reached the DOLAN position. Till noon the DOLAN surface buoy (SBU) was recovered successfully and changed against a dummy buoyancy. Afterwards R/V POSEIDON steamed on to the ANIMATE ACI-4 position. During the afternoon this mooring array was recovered without problems. Then R/V POSEIDON left the ANIMATE ACI-4 position with heading to the EB2 location. The scientific work for that day finished with a calibration cast for the EB-2 sensors.

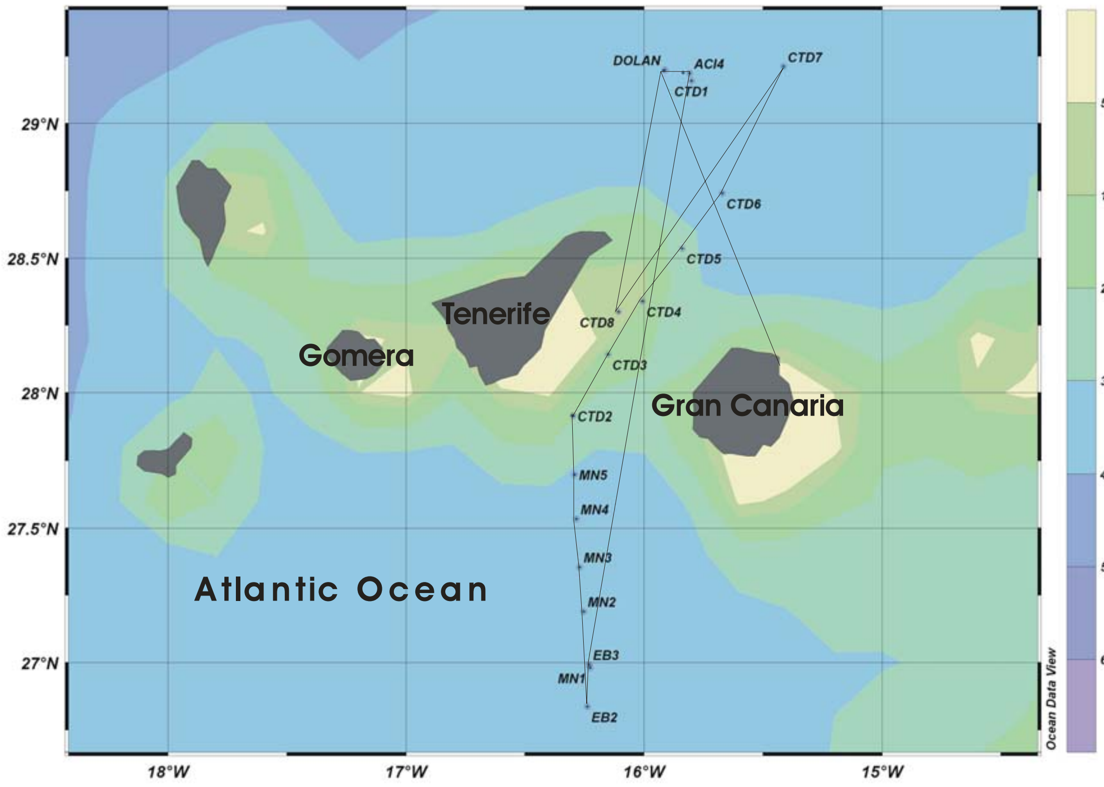


Figure 1: Cruise track R/V POSEIDON cruise 319.

At 10:45 pm on December 11th R/V POSEIDON reached the EB-2 position. It was assumed that the mooring was broken, some weeks after deployment. It was tried to contact the releaser to ensure that the mooring was still on its position, without any result. At noon on the same day the new EB-2 mooring was deployed successfully. In the evening an acoustic link was established to the releasers of the EB-3 mooring which ensured the mooring was still on its position. R/V POSEIDON left this area with heading to the area north of the Canaries. During the night six multinet casts, each down to 400 m water depth, were lowered.

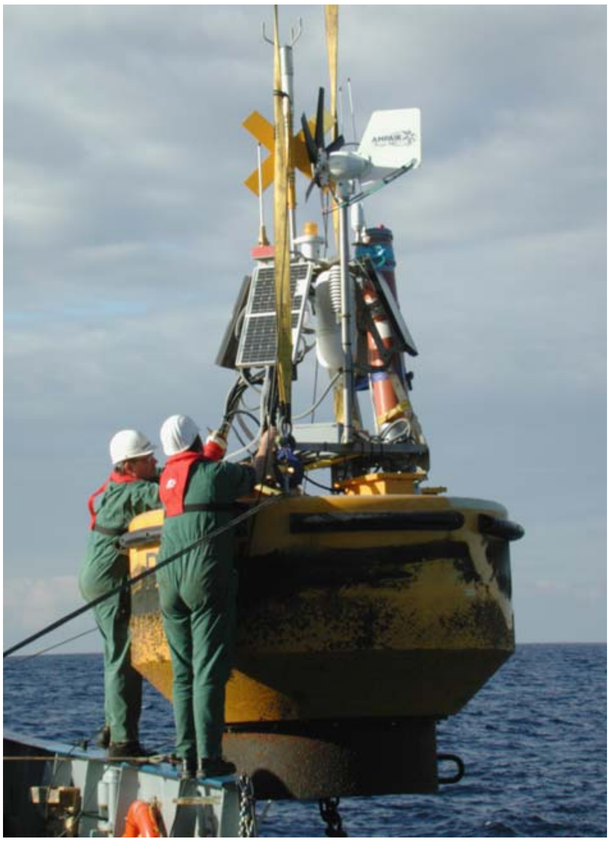
The next two days, five CTD/Rosette stations had been run on a transect between Tenerife and Gran Canaria., each down to 2000 m water depth. The scientific work on December 13th was continued with another rosette cast, located at ESTOC position for the routine monthly water sampling. It was run down to 3650 m water depth. In the afternoon the deployment of the MSD mooring followed. During the next day the calibration casts for the sensors of the DOLAN mooring took place. The first cast was used for calibration of the MicroCats and the reference samples. At the second cast the fluorometer had been calibrated. Due to bad weather conditions R/V POSEIDON spent the next hours in the shelter of the island of Tenerife. With respect to the advertisement of getting worse weather, the decision was made to steam onto the DOLAN position and attempt to deploy the SBU buoy. That was managed successfully during the afternoon on December 15th. At 17:00h the scientific work had been finished and R/V POSEIDON steamed back to Las Palmas harbour. All station work could be completed as planned.

4. Scientific Report

4.1 Equipment Development and Tests

4.1.1 DOLAN Surface Buoy (SBU)

The Surface Buoy Unit (SBU) operates since 1997 and was formerly part of the DOMEST project. The unit serves for the development of satellite based telemetry technologies.



On December 10th the DOLAN SBU, which is located at 29°10,40`N and 15°55,30`W at a water depth of 3630 m, was recovered. The last routine maintenance had been carried out during R/V POSEIDON cruise 310 in April 2004. The telemetry of pCO_2 readings from the SAMI sensor had shown that this sensor was no longer measuring correct values. Due to this fact a second SAMI sensor and a MicroCat CTD had been mounted on the buoy on an additional cruise in October 2004.

Figure 2: Recovery of the SBU.

During R/V POSEIDON cruise 319 the DOLAN SBU was recovered for maintenance and for a new configuration of the electronical SBU part, as well as integration of additional components into the SBU. Additionally the attached sensors were maintained or exchanged, which includes the SAMI, one MicroCat, an acoustic transducer, one nutrient analyser and one fluorometer.

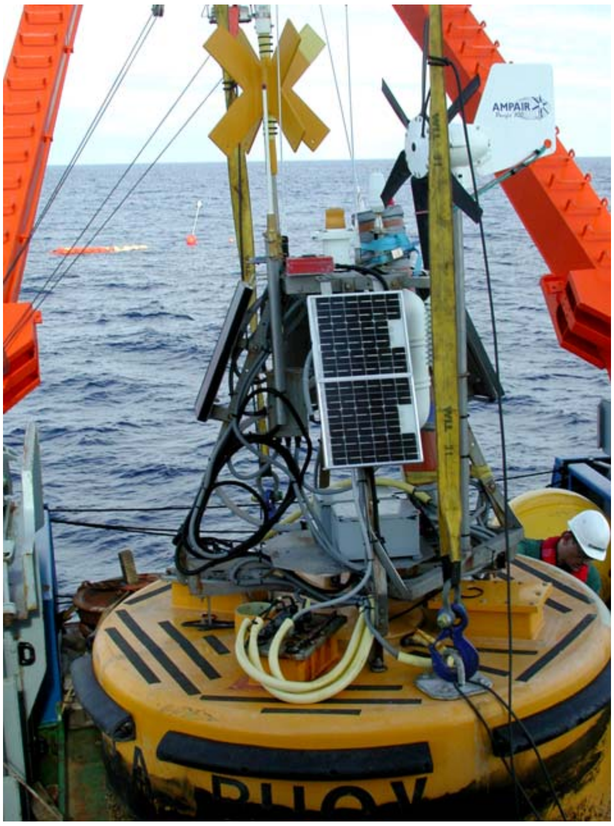


Figure 3: Recovered SBU.

Status of DOLAN before maintenance

Some of the systems on the DOLAN buoy stopped working after some weeks. The analysis of the problems showed that the 24V power supply was not working any longer. The systems on the 12V power supply were still working.

The reason for the malfunction was a water ingress in one of the telemetry boxes. This leads to a short circuit on the 24V power supply and burned one satellite transceiver. The fuse prevented the battery from damage but the 24V system was not operational any more.

Some of the sensors had been damaged and have been deinstalled for repair in Bremen while others could have been repaired on the cruise.

The analysis of the nutrient sensor data showed that the sensor did not work during the deployment. In a test it could be seen that the connection of the 100m cable to the telemetry stopped the schedule of the sensor.

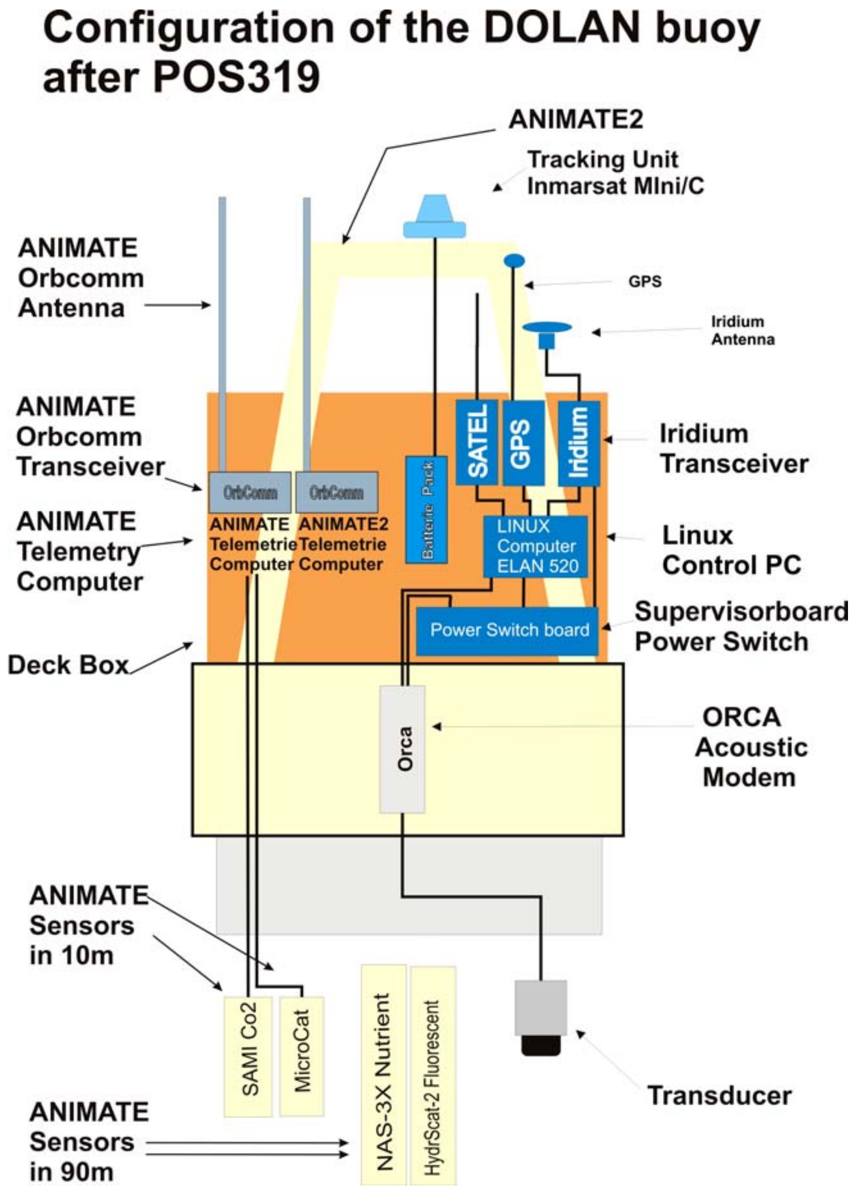


Figure 4: Configuration of the DOLAN Buoy.

A Change in the Electrical Architecture

DOLAN Power supply

Due to problems with the power supply during the last deployment phase, some modifications have been implemented. The power supply consists of a 12V system for low power applications and a 24V system for units with a higher power consumption.

The 12V system is charged by 40W 12V solar panels. The 24V system has also 40W of solar panels and one windgenerator (100W). That means that the DOLIX computer with the Iridium telemetry and the ORCA modem are connected to the 24V system.

The concept for the fuses has been updated due to the fact that the charging devices (wind and solar) do not regulate the voltage if no battery is present.

The ANIMATE telemetry is connected to the 12V power supply. The Inmarsat Mini-C tracking system has its own 15V primary battery.

The DOLIX computer system

The development of a new telemetry computer "DOLIX" has been continued during this cruise. The first test of the DOLIX on the cruise POS 310 showed a sophisticated power management system is necessary. The Pentium like PC104 computer consumes approx. 12W of power while the resources of solar and wind energy are limited. A special microcontroller-based computer has been developed and implemented in order to switch on only the devices needed at the moment. This supervisor computer will also control the correct function of the different units (including DOLIX) and switch them off in case of a malfunction.

ANIMATE Telemetry with SAMI and MICROCAT

The ANIMATE telemetry has been maintained and redeployed without a change in configuration.

ANIMATE II Telemetry with nutrientsensor and fluorometer

The ANIMATE II telemetry has not been activated, because it was not possible to get the sensor data via the 100m cable. The nutrient sensor has been stopped by the cable and the fluorometer data could not be transmitted with an acceptable rate of errors. The wind sensor and compass has been deinstalled for maintenance.

The main difference to the old system was the mounting of all electronic boards in an box on deck of the buoy. Only the heavy batteries and the charge regulators and fuses for the batteries are still in the body of the buoy. This will enable the maintenance of the electronics without removing all cables inside the buoy. All sensors are connected to this box.

Figure 5: Work at the SBU.

Figure 6: New buoy design.

The operational sensors are the following ones:

Online in the telemetry:

- SAMI CO_2 sensor
- MicroCat at 10 m water depth
- Inmarsat Mini-C with GPS for position reporting

Offline, storing data:

- Nutrient Analyser at 100 m water depth
- Fluorometer at 100 m water depth
- 6 Microcats from 20 m to 150 m water depth
- ADCP at 150 m water depth

During the last hours before the redeployment of the buoy an failure of the power switch board occurred. All tries to reconfigure the DOLIX system without the board during the deployment failed due to the lack of time.

Tasks for the next cruise

On the next cruise in March 2005 with R/V POSEIDON the power switch board has to be repaired and the wind sensor with the compass shall be connected to the DOLIX system. Some improvements in order to make the DOLIX / Power switch system tolerant against failures have to be implemented.

Also a converter (RS232 to RS422) to connect the nutrient sensor and the fluorometer on the 100 m cable has to be developed and tested.

The DOLAN SBU was redeployed on December 15th with several new sensors, which were installed before in the ANIMATE ACI-4 mooring array. That comprises six MicroCats and the ADCP. All new sensors were mounted on mooring bars to be able to attach them into the used chain or rope.

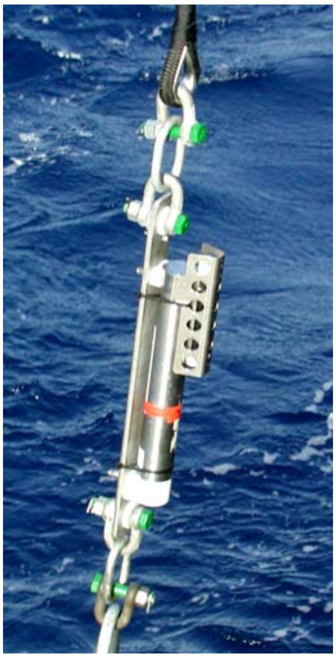


Figure 7: MicroCat

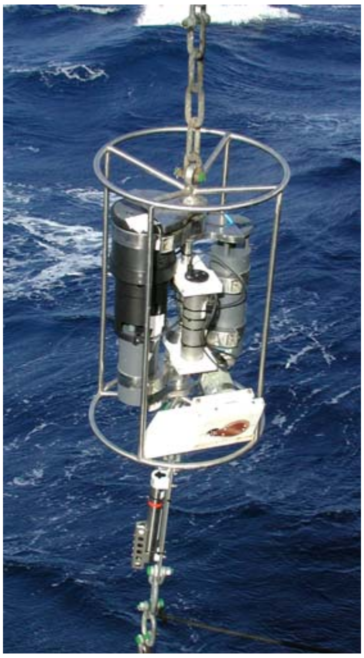


Figure 8: Nutrient analyser and fluorometer

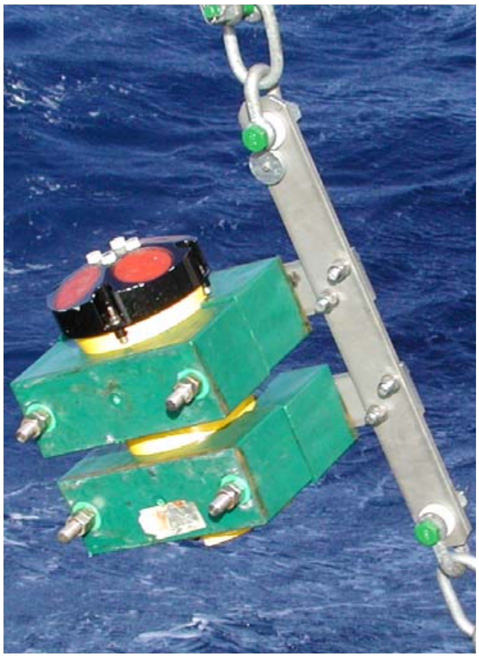


Figure 9: ADCP

Figure 10: Redeployment of the DOLAN SBU.

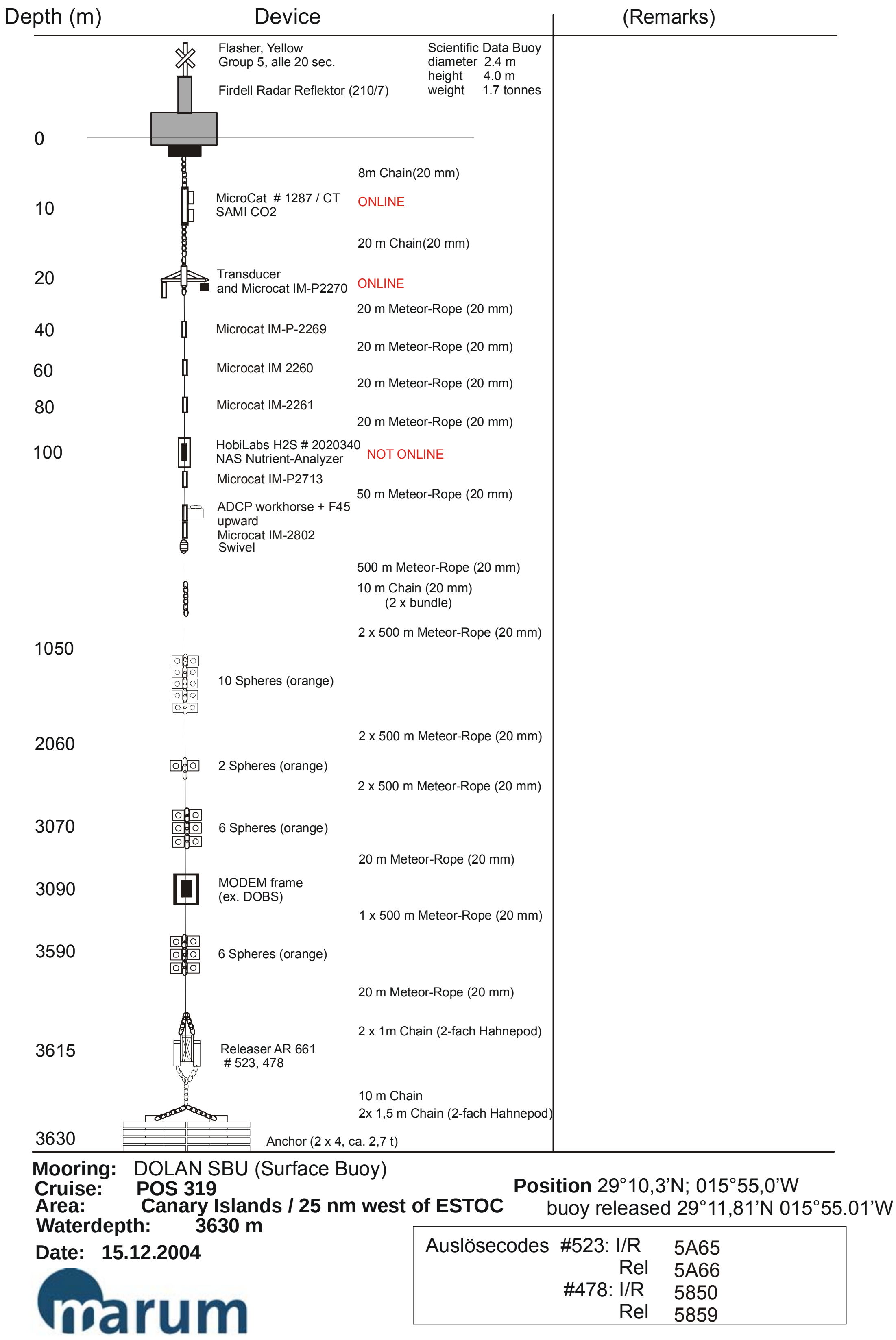


Figure 11: Drawing of the DOLAN-SBU.

4.1.2 ACI-4 (ANIMATE, Canary Islands)

This study site is located 60 nm north of Gran Canaria in about 3600 m water depth. The mooring was deployed during the R/V POSEIDON cruise 310, on April 23th 2004.

Till November 2004 this mooring site was involved in the ANIMATE EU project. With respect to its end, the ACI mooring was closed down during POSEIDON cruise 319. The attached devices were partly integrated in the DOLAN mooring, and are now part of the MERSEA EU project.

The research site included the ARGOS telemetry buoy, 8 MicroCats, a floatation sphere with integrated ADCP and the MSD sediment trap.

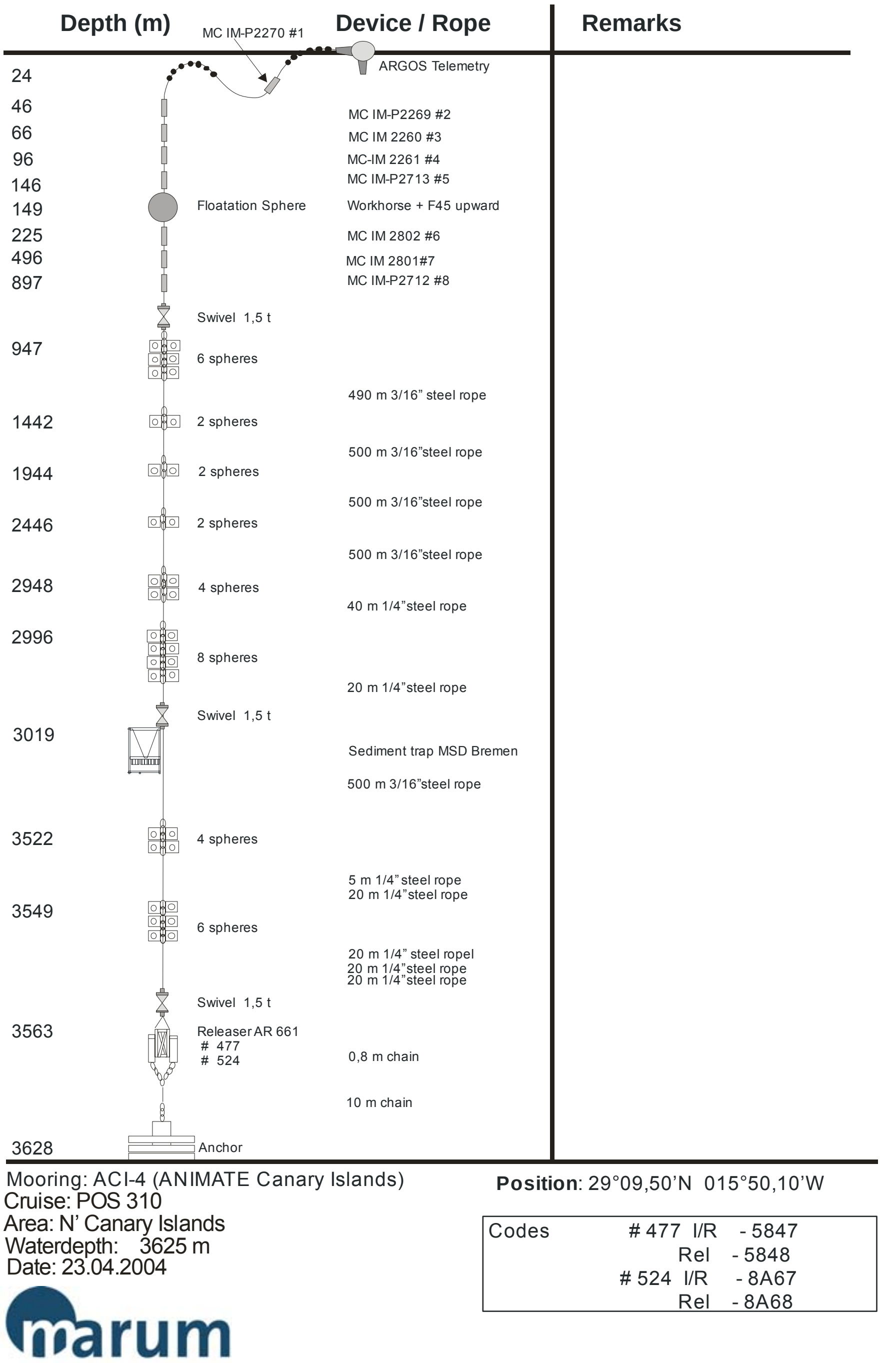


Figure 12: Design of the ANIMATE mooring ACI-4.

On December 10th the ACI-4 mooring was recovered. The ARGOS telemetry buoy was three weeks before ripped off by a ship's propeller. During the previous cruise POSEIDON 318/b the telemetry was picked up. Fig. 14 shows the drifting track of the ARGOS telemetry buoy, based on the position data coming from the ARGOS dispatcher.

Figure 13: Recovery of the ACI-4 mooring array.

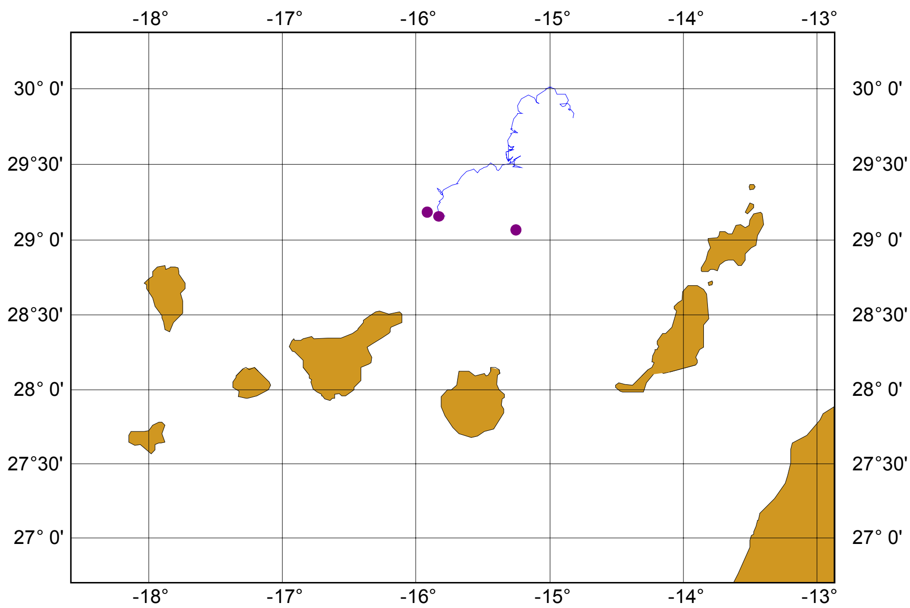


Figure 14: Drifting track of the ARGOS telemetry buoy.

4.1.3 EB-2 (RAPID)

This research site is located on 26.892°N and 16.234°W in a water depth of 3532 m. The mooring array was deployed on Febuary 28th. On 18th September EB-2 was trawled, the surface parts of the mooring being recovered from DISCOVERY on 27th September. During POSEIDON cruise 319 it was planned to recover, if possible, parts of the lost mooring array, but contact to the releasers could not be established in spite of several efforts. It can be assumed, that the mooring is no longer on its position.

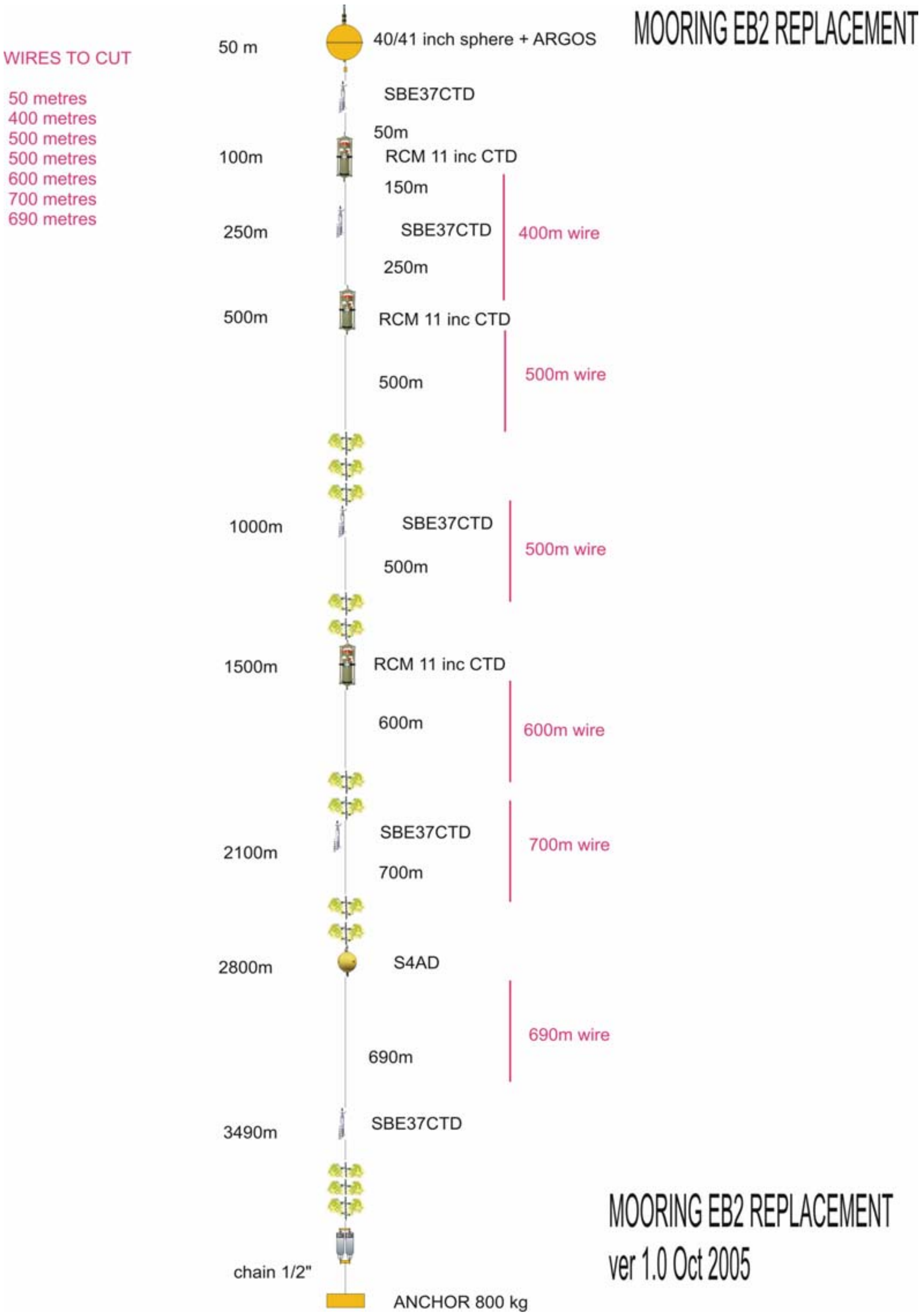


Figure 15: Layout of the new EB-2 morring array.

The new EB-2 was deployed on December 11th at 26°50,11'N 16°13,00'W in a water depth of 3506 m. The configuration is shown in Fig. 15 .

Figure 16: Deployment of the S4AD.

Figure 17: Preparing the RCM 11 for deployment.

4.2 Particle Collection with Sediment Traps

The particulate material collected will be analysed to determine total flux, particulate flux, particulate organic carbon, particulate nitrogen, biogenic opal, carbonate and stable isotopes of organic matter, and lithogenic material. The trapped material also will be investigated for species composition of the planktonic organisms (pteropods, foraminifera, coccolithophorides and diatoms). The objective of these studies is to identify signals of seasonal variations in those components, which play an important role in the sediment formation process. The result of these investigations will form a basis for the reconstruction of paleo-current systems and paleoproduction from the sediments.

4.2.1 ACI-4

On December 10th the mooring ACI-4 was recovered. This array included the MSD particle trap. The MSD trap consists of two sample devices, which delivered only 31 samples, due to the fact, that is was planned to recover this mooring array in Febuary 2005.

Figure 18: Recovered MSD particle trap.

4.2.2 DOLAN-MSD

This mooring array was deployed on December 13th at 29°12,12'N 12°50,12'W in a water depth of 3626 m. The next routine maintenance is planned in autumn 2005.

Table 1: Mooring data for recoveries and redeployments during R/V POSEIDON cruise 296.

Mooring	Position	Water depth (m)	Interval	Instr. (m)	Depth	Intervals (no x days)
Mooring recoveries						
DOLAN MSD 3	29°10,40`N 15°55,30`W	3630	16.04.2002 11.04.2003	MSD	3050	1 x 10, 39 x 9
Mooring deployments						
DOLAN MSD 4	29°12,12`N 15°50,12`W	3626	16.12.2004 11.10.2005	MSD	3050	41 x 7,5

Instruments used:
MSD = Multi sensor device, KUM, Kiel

4.3 Marine Chemistry

Along R/V POSEIDON cruise 319 the ICCM had to place a nitrate sensor in the MERSEA/ESTOC mooring, that for the first time will transmit the data in near real time. At the same time it was necessary to collect the biogeochemical monthly samples at the ESTOC station (**E**uropean **S**tation for **T**ime series in the **O**cean **C**anary islands), which belongs to a continuously monitoring, done since 1994. Calibration casts with CTD/Rosette were also made to accomplish the requirements of the sensors being recovered/deployed. Further stations were made to check the intermediate waters in the passage between Tenerife and Gran Canaria. The idea was to track the presence of the Antarctic Intermediate Water (AAIW). There is a great controversy whether the AAIW will be present in the north of the archipelago due to the circulation through the passages between the different islands.

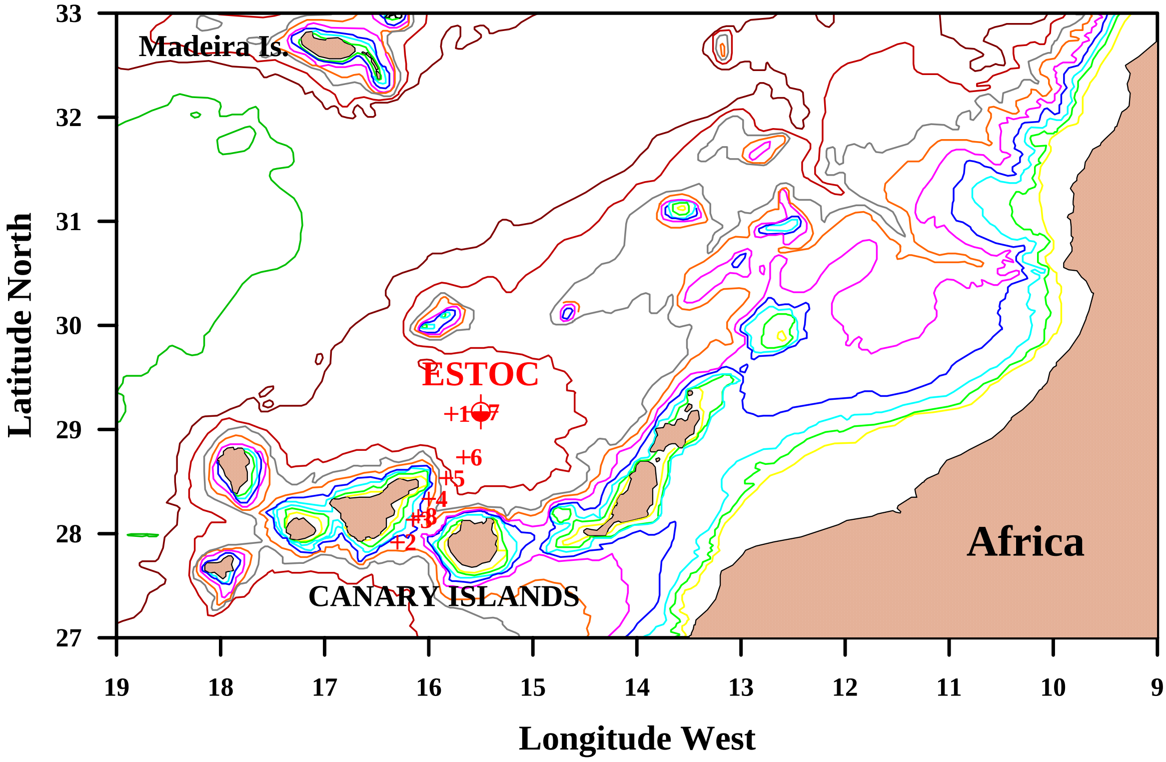


Figure 19: Position of the CTD stations (crosses) made along R/V POSEIDON cruise 319.

At the beginning of the cruise the DOLAN/ANIMATE mooring had to be recovered, hence a rosette/CTD cast to 1000m was made in order to have a calibration of the chemical sensors before their recovery (st. #1). After the DOLAN mooring with the chemical sensors from ANIMATE was recovered, a transect was started between the islands of Tenerife and Gran Canaria to search for the Antarctic Intermediate Water in that passage that ended up at ESTOC (st. #2-7). Finally st. #8 and 8bis were made to calibrate the microcats and fluorometer previous to the next deployment of the DOLAN/ANIMATE mooring.

A total of nine sampling rosette-CTD casts (see Table 2) have been done and a CTD/Rosette Seabird Plus unit with 24 bottles was used: one test station already mentioned (#1) to 1000m, five stations between Tenerife and Gran Canaria to 2000m (#2-6), the ESTOC station (Estación de Series Temporales Oceánicas de Canarias) to 3609m (#7) and two calibration stations taken only to 500 m of water depth due to the fluorometer depth restrictions, in order to calibrate eight microcats and a fluorometer.

Finally, the nitrate sensor was exchanged, collecting #2264 and deploying #2624. The NAS-3X nitrate sensor collected was prepared for getting nitrate data in near real time; however, there was a problem and the telemetry stopped the macro with the sensor from working, hence no data would be available for the mooring period using the telemetry. Because this problem couldn't be solved on board, the nitrate sensor was put into data recording mode without any link to the telemetry.

Physical (CTD, salinity) and biochemical (oxygen, nutrients, chlorophyll) parameters were measured in order to characterize the water masses present in the water column (Table 1). Some of the parameters (oxygen, chlorophyll filtration) were analysed on board after sampling, and others were taken frozen to the ICCM (nutrients and filters from chlorophyll).

Table 2: List of stations sampled along the cruise P319, Las Palmas-DOLAN-ANIMATE-DOLAN-Las Palmas (0=oxygen, I= isotopes, N=nutrients, S=salinity, C=chlorophyll "a", INCID = incidences).

Date	St. #, Cast #	water depth (m)	Lat N	Lon W	depth sample	PARAMETERS O	I	N	S	C	INCID
10.12.	1,001	3624	29º09.74'	15º47.94'		Test cast by DOLAN mooring, for chemical pack calibration before recovery					
					1000	√	√	√	√		
					1000						
					800	√	√	√			
					800						
					600	√		√			
					400	√	√	√			
					300	√		√			
					200	√	√	√		√	
					150	√	√	√		√	
					125	√	√	√		√	
					100	√	√	√		√	
					100						
					90	√		√	√	√	
					90						
					80	√		√		√	
					80						
					70	√		√		√	
					70						
					55	√	√	√		√	
					55						
					40	√		√		√	
					25	√	√	√	√	√	
					10	√	√	√		√	
					10						
12.12.	2,001	2521	27º55.00'	16º18.00'	2000	√			√	√	
					2000		√				
					1800	√		√			
					1500	√		√			
					1300	√		√			
					1200	√	√	√			
					1100	√		√			
					1000	√		√			
					800	√		√			
					800		√				
					600	√		√			
					400	√	√	√			
					300	√		√	√		
					200	√	√	√		√	
					150	√	√	√		√	
					125	√		√		√	
					125						

Table 2: continued

Date	St. #, Cast #	water depth (m)	Lat N	Lon W	depth sample	O	I	N	S	C	INCID
12.12.	2,001	2521	27º55.00’	16º18.00’	100	√	√	√		√	
					75	√		√		√	
					50	√	√	√		√	
					25						
					25	√	√	√	√	√	
					10	√		√		√	
					10		√				
12.12.	3,001	2274	28º08.00	16º09.00	2000	√	√	√	√		
					2000						
					1800	√		√			
					1500	√		√			
					1300	√		√			
					1200	√	√	√			
					1100	√		√			
					1000	√		√			
					800	√	√	√			
					800						
					600	√		√			
					400	√	√	√			
					300	√		√	√		
					200	√	√	√		√	
					150	√	√	√		√	
					125	√		√		√	
					125						
					100	√	√	√		√	
					75	√		√		√	
					50	√		√		√	
					25		√				
					25	√		√	√	√	
					10	√		√		√	
					10		√				
12:12.	4,001	2815	28º20.00’	16º00.00’	2000	√	√	√	√		
					2000						
					1800	√		√			
					1500	√		√			
					1300	√		√			
					1200	√	√	√			
					1100	√		√			
					1000	√		√			
					800	√	√	√			
					800						
					600	√		√			
					400	√	√	√			
					300	√		√	√		
					200	√	√	√		√	
					150	√	√	√		√	
					125	√		√		√	
					125						
					100	√	√	√		√	
					75	√		√		√	
					50	√		√		√	
					25		√				
					25	√		√	√	√	
					10	√	√	√		√	
					10						
12.12.	5,001	3426	28º32.00’	15º50.00’	2000	√	√	√	√		
					2000						
					1800	√		√			
					1500	√		√			
					1300	√		√			
					1200	√	√	√			
					1100	√		√			
					1000	√		√			
					800	√	√	√			
					800						
					600	√		√			
					400	√	√	√			
					300	√		√	√		
					200	√	√	√		√	
					150	√	√	√		√	
					125	√		√		√	

Table 2: continued

Date	St. #, Cast #	water depth (m)	Lat N	Lon W	depth sample	O	I	N	S	C	INCID
					125						
					100	√	√	√		√	
					75	√		√		√	
					50	√		√		√	
					25		√				
					25	√		√	√	√	
					10	√	√	√		√	
					10						
12.12.	6,001	3592	28°44.00’	15°40.00’	2000	√	√	√	√		
					2000						
					1800	√		√			
					1500	√		√			
					1300	√		√			
					1200	√	√	√			
					1100	√		√			
					1000	√		√			
					800	√	√	√			
					800						
					600	√		√			
					400	√	√	√			
					300	√		√	√		
					200	√	√	√		√	
					150	√	√	√		√	
					125	√		√		√	
					125						
					100	√	√	√		√	
					75	√		√		√	
					50	√		√		√	
					25		√				
					25	√		√	√	√	
					10	√	√	√		√	
					10						
13.12.	7,001 ESTOC	3609	29°10.32’	15°55.63’	3650	√	√	√	√		
					3500	√		√	√		
					3000	√		√	√		
					2800	√		√	√		
					2500	√		√	√		
					2000	√	√	√	√		
					1800	√		√	√		
					1500	√		√	√		
					1300	√	√	√	√		
					1200	√		√	√		
					1100	√		√	√		
					1000	√		√	√		
					800	√	√	√	√		
					600	√		√	√		
					400	√	√	√	√		
					300	√		√	√		
					200	√	√	√	√	√	
					150	√	√	√	√	√	
					125	√		√	√	√	
					100	√	√	√	√	√	
					75	√		√	√	√	
					50	√	√	√	√	√	
					25	√	√	√	√	√	
					10	√	√	√	√	√	
14.12.	8,001	2270	28°17.00’	16°06.00’	500	√		√	√		
	Microcats calibration ,8 units				200	√		√		√	Nutrient
					150	√		√		√	tubes taken
					125	√		√		√	for SOC and
					100	√		√		√	ICCM,
					90	√		√	√	√	2 tubes per
					80	√		√		√	depth.
					70	√		√		√	Fluoro-
					55	√		√		√	meter
					40	√		√	√	√	did not
					25	√		√		√	work.
					10	√		√		√	

Table 2: continued

Date	St. #, Cast #	water depth (m)	Lat N	Lon W	depth sample	O	I	N	S	C	INCID
14.12.	8bis,001	2312	28°17.00’	16°07.00’	500					√	
	Fluorometer calibration				200	√		√		√	
					150	√		√		√	This station
					125	√		√		√	was the 2nd
					100	√		√		√	with the
					90	√		√	√	√	fluoro-
					80	√		√		√	meter, this
					70	√		√		√	time
					55	√		√		√	It works.
					40	√		√	√	√	
					25	√		√		√	
					10	√		√		√	

4.3.1 Water Sampling and Analysis

The samples of all depth levels were collected immediately after the Niskin bottles were on board. The sampling sequence was carried out as follows:

Oxygen

Oxygen was taken in glass bottles of about 125 ml of volume which were previously cleaned and washed with HCl acid and was fixed at once; then it was kept for at least six hours according to WOCE regulations and finally it was analysed at the laboratory on board the ship. The samples were analysed using the method described in the WOCE Operations Manual, WHP Office Report No. 68/91; the final titration point was detected using a Metrohm 665 Dosimat Oxygen Auto-Titrator Analyser.

Nutrients

Nutrients were taken in polypropylene bottles which were previously cleaned and washed with HCl acid and were completely dry. Samples were immediately frozen at -20°C, analysing them as soon as possible after arrival at the laboratory. Freezing the samples is a common practice; it does not or only in a non-significant way affects the nitrate/nitrite and the phosphate values (by a slight decrease) and is not noticeable in the silicate values (Kremling and Wenck, 1986; McDonald and McLunghlin, 1982).
Salinity samples were taken in dark glass bottles which were previously cleaned and washed with HCl acid. Then, they were kept in boxes to protect them from light till analysis on land.
The nutrients determination was performed with a segmented continuous-flow autoanalyser, a Skalar® San Plus System (ICCM).

Nitrate and Nitrite

The automated procedure for the determination of nitrate and nitrite is based on the cadmium reduction method; the sample is passed through a column containing granulated copper-cadmium to reduce the nitrate to nitrite (Wood et al.,1967), using ammonium chloride as pH controller and complexer of the cadmium cations formed (Strickland and Parsons, 1972). The optimal column preparation conditions are described by several authors (Nydahl, 1976; Garside, 1993).

Phosphate

Orthophosphate concentration is understood as the concentration of reactive phosphate (Riley and Skirpow, 1975) and according to Koroleff (1983a) is a synonym of “dissolved inorganic phosphate”. The automated procedure for the determination of phosphate is based on the following reaction: ammonium molybdate and potassium antimony tartrate react in an acidic medium with diluted solution of phosphate to form an antimony-phospho-molybdate complex. This complex is reduced to an intensely blue-coloured complex, ascorbic acid. The complex is measured at 880nm. The basic methodology for this anion determination is given by Murphy and Riley (1962); the used methodology is the one adapted by Strickland and Parsons (1972).

Silicate

The determination of the soluble silicon compounds in natural waters is based on the formation of the yellow coloured silicomolybdic acid; the sample is acidified and mixed with an ammonium molybdate solution forming molybdosilicic acid. This acid is reduced with ascorbic acid to a blue dye, which is measured at 810nm. Oxalic acid is added to avoid phosphate interference. The used method is described in Koroleff (1983b).

Phytoplankton pigments

Pigments were measured using fluorimetric analysis, following the methodology described by Welschmeyer (1994). The determination was achieved using a fluorometer TURNER 10-AU-000.

Salinity

Samples were measured with a salinometer, model Autosal 8400a, whose measurement range was between 0.005-42 (psu), with an accuracy of ±0.003, according to the manufacturer. It was calibrated following the manufacturer´s information and standarizing it with IAPSO Standard Seawater. Salinity values were calculated as practical salinity according to Unesco (1978, 1984).

Chlorophyll

Chlorophyll: samples of one liter of water were taken. The chlorophyll samples were filtered immediately and the filters were frozen subsequently at -20°C. Their analysis takes place at the ICCM laboratory in land.

All samples were taken using the procedures established in the WOCE Operations Manual, WHP Office Report WHPO 91-1/WOCE Report No.68/91.

4.3.2 Preliminary Results

The diagrams T/S shown in Figure 1 (to the left) confirm that the surface values for temperature and salinity tend to be aligned with those which represent the NACW (North Atlantic Central Water) segment. The values correspond to the expected ones for this area on this time of the year.

Looking at the depths range which corresponds to the intermediate waters, it is observed that the values corresponding to the salinity relative maxima are always below 35.5 units of salinity; this salinity is considered as the limit to recognize the presence of Mediterranean Water (MW) for the zone sampled (see example in Llinás et al., 2003).

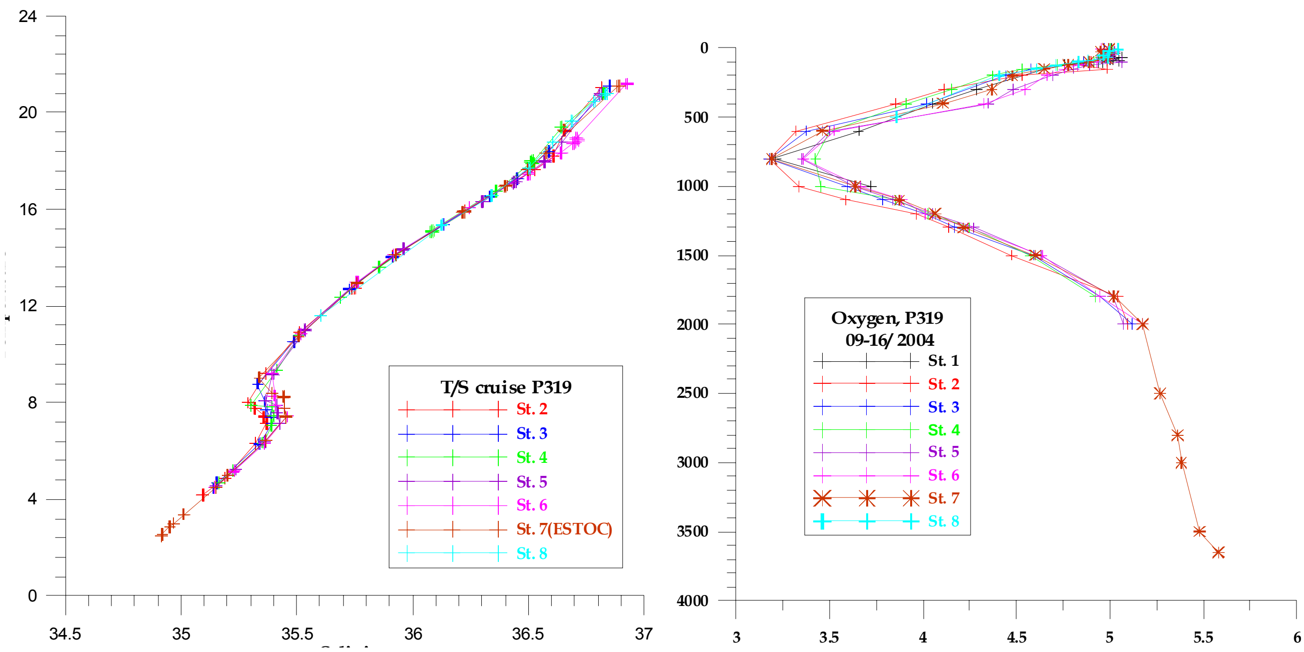


Figure 20: T/S (left) and oxygen (right) preliminary results from CTD/rosette stations made along R/V POSEIDON cruise 319.

However, if one look at the series of T / S diagrams from south to north (st. #2- #7), it is inferred that the relative maxima have a tendency towards higher salinities and temperatures, which clearly points out the influence of the Mediterranean Water. In parallel, the relative minimum shows a tendency in the same direction for the T/S diagram, indicating the obvious attenuation of the Antarctic Intermediate Water (AAIW), which it is also reflected in the oxygen concentration increases at 800 m depth (Figure 20, right).

The complexity of the mixing process in these water masses is also signalled by the variability of the temperature, salinity and oxygen values found between the relative maxima and minima for each diagram T/S or for the oxygen minimum. It is possible that is not only the complexity of the fronts among these water masses but also some effects derived from their channeling between Tenerife and Gran Canaria islands.

4.3.3 Stable Nitrogen and Carbon Isotopes of Marine Particles

4.3.3.1 Introduction

The origin of organic matter may be characterized by its chemical composition. Especially the stable nitrogen isotopes allow valuable insights into the production and degradation history of organic particles. Low values of the stable nitrogen isotope ratio $\delta^{15}N$ and high concentration of organic nitrogen and carbon are expected of material generated in an upwelling system. Higher $\delta^{15}N$ values are typical of organic matter produced in oligotrophic systems. In addition, degradation of organic matter causes an enrichment of $\delta^{15}N$. In this study, the stable nitrogen isotope ratio as well as the carbon isotope ratio of particulate (mainly suspended) material will be determined and compared to the organic chemistry of fast sinking material sampled by particle traps. To get a better compendium of the isotopic composition of the different water masses influencing the particle trap sample isotope compositions, sea surface samples were also taken for nitrogen and carbon isotope measurements.

4.3.3.2 Methods

Vertical profiles (Rosette)

Water from selected depths, reaching from 10 m to near the sea floor, was sampled on certain rosette stations for analysis of $\delta^{15}N$ and $\delta^{13}C$ of particulate material.

Sea surface samples

The water was sampled with the surface water pumping system, taking water five meters below the ship for analysis of $\delta^{15}N$ and $\delta^{13}C$ of particulate material (Tab. 4).

For the rosette samples as well as the sea surface samples, 5 l of seawater from each depth and site were filtrated onto precombusted GGF-filters. The filters were dried at 60°C to inhibite chemical and biological reactions, which could have an influence on the isotope ratios. $\delta^{15}N$ and $\delta^{13}C$ will be measured using a Finnigan mass spectrometer. For the analysis the filters will be divided into halves, for one decalcified and one non decalcified series of measurements.

4.3.3.3 First Results

Vertical profiles (rosette)

Assuming that the colour of the filters is an indicator of the particle concentration, first results can be seen based solely on the optical impression of the filters. As observable in the volumes at some stations it was impossible to filtrate 5 l of seawater at each depth, due to the fact that the filters get plugged after fewer litres. The particle concentration was highest in depths between 50 m and 200 m at each station.

Additional information will be expected by comparison of salinity and temperature data from the sea surface, and from each depth of CTD measurements (Tab. 3).

Table 3: Rosette sample sites used for isotope measurements.

GeoB-No.	date	Longitude (W)	Latitude (N)	sample depth (m)	water depth (m)	volume (l)	°C	S (PSU)
9101	10.12.2004	15°47	29°09	1000	3624	3,95	8,31	35,408
				800		2,4	8,99	35,347
				400		2,2	12,65	35,728
				200		2,45	15,7	36,176
				150		4	16,75	36,377
				125		5	17,44	36,472
				100		4,1	18,3	36,588
				55		3,95	21,02	36,839
				25			21,03	36,842
				10			21,03	36,842
9115	12.12.2004	16°18	27°55	2000	2521	4,6	4,2	35,097
				1200		5	7,4	35,359
				800		4,6	9,14	35,369
				400		5	12,76	35,729
				200		4,2	15,9	36,222
				150		4	17,54	36,523
				100		4,6	19,11	36,662
				50		4,8	21,03	36,817
				25		4,9	21,03	36,819
				10		5	21,02	36,818
9117	12.12.2004	16°00	28°20	2000	2811	5	4,66	35,165
				1200		5	7,45	35,4
				800		5	9,34	35,413
				400		5	12,33	35,689
				200		5	14,96	36,091
				150		5	16,88	36,518
				100		4,4	19,42	36,645
				50		5	20,79	36,82
				25		5	20,8	36,822
				10		5	20,8	36,821
9120	13.12.2004	15°30	29°10	2000	3606	5	4,51	35,011
				1200		5	7,75	35,451
				800		5	9,04	35,339
				400		5	12,89	35,762
				200		5	15,78	36,203
				150		4,8	16,93	36,398
				100		5	18,1	36,574
				50		2,5	21,11	36,893
				25		4,4	21,11	36,893
				10		5	21,11	36,893

Table 4: Sea surface samples taken during R/V POSEIDON cruise 319.

samples	date	time (UTC)	Longitude (W)	Latitude (N)	WD (m)	volume (l)	temp °C	SSS (PSU)
1	10.12.2004	12:51	29°11,132	15°50,130	3628	5	24°955	36°607
2	10.12.2004	19:23	29°06,753	15°49,274	3623	5	25°432	36°640
3	10.12.2004	22:13	28°41.076	15°55,433	3694	5	25°141	36,694
4	11.12.2004	00:12	28:23,9	15°58,306	2717	5	24,82	36°690
5	11.12.2004	03:05	28°00,990	16°02,449	1989	5	24,508	36,654
6	11.12.2004	06:43	27°27,142	16°08,296	2098	5	24,139	36,688
7	11.12.2004	07:45	27°18,309	16°09,771	3469	5	24,07	36°690
8	11.12.2004	09:02	27°07,424	16°11,777	3496	5	23,999	36,688
9	11.12.2004	10:38	26°54,335	16°13,873	3514	5	23,796	36,692
10	12.12.2004	13:55	28°20,057	16°17,872	2814	5	23,539	36,689

4.3.4 Plankton Sampling Using a Multiple Closing Net

4.3.4.1 Methods

Plankton was sampled with a multiple closing net (Fa. HYDROBIOS, with 0.25 m^2 sample area, 64 µm mesh size). It was used for vertical profiles at 6 sites during POSEIDON cruise 319. Each station comprised depth intervals from 400-200 m, 200-100 m, 100-50 m, 50-10 m and 10-0 m. All samples will be used for CHN and $\delta^{15}N$ and $\delta^{13}C$ measurements.

The water samples were carefully rinsed with filtrated seawater into KAUTEX bottles, fixed with mercury chloride for the inhibition of bacterial activity, and stored at 4°C.

Table 5: Multiple closing net sample sites.

GeoB-No.	depth (m)	date	Longitude (W)	Latitude (N)	water depth (m)
9109	0-10	11.12.	16° 13'54"	26° 58'48"	3498
	10-50				
	50-100				
	100-200				
	200-400				
9110	0-10	11.12.	16° 15'4"	27° 11'1"	3496
	10-50				
	50-100				
	100-200				
	200-400				
9111	0-10	11.12.	16° 15'56"	27° 20'59"	3499
	10-50				
	50-100				
	100-200				
	200-400				
9112	0-10	12.12.	16° 16'50"	27° 31'47"	3479
	10-50				
	50-100				
	100-200				
	200-400				
9113	0-10	12.12.	16° 17'54"	27° 41'54"	3260
	10-50				
	50-100				
	100-200				
	200-400				
9114	0-10	12.12.	16° 18'0"	27° 55'0"	2519
	10-50				
	50-100				
	100-200				
	200-400				

5. List of Stations

GeoB-No.	Date 2004	Description	LAT		LONG		WD [m]	Remarks
	10.12.	***Commence of scientific research program***						
9101	10.12.	CTD/Rosette	29° 9'30"	N	15° 48'0"	W	3624	
9102	10.12.	SAMI recovered	29° 12'14"	N	15° 55'10"	W	3629	Recovery DOLAN SBU
		SAMI recovered	29° 12'1"	N	15° 55'5"	W	3631	
		Nutrient Sensor recovered	29° 12'0"	N	15° 55'1"	W	3631	
		DOLAN Dummy deployed	29° 12'3"	N	15° 54'59"	W	3631	
		DOLAN SBU recovered	29° 12'1"	N	15° 54'58"	W	3631	
9103	10.12.	Flotation sphere a.D.	29° 10'12"	N	15° 49'22"	W	3625	Recovery ANIMATE
		MicroCat recovered	29° 10'16"	N	15° 42'14"	W	3625	
		8 spheres recovered	29° 10'16"	N	15° 42'14"	W	3625	
		MicroCat recovered	29° 10'16"	N	15° 42'14"	W	3625	
		MicroCat recovered	29° 10'16"	N	15° 42'14"	W	3625	
		MicroCat recovered	29° 10'12"	N	15° 49'22"	W	3625	
		MicroCat recovered	29° 10'16"	N	15° 42'14"	W	3625	
		6 spheres recovered	29° 10'16"	N	15° 42'14"	W	3625	
		2 spheres recovered	29° 10'16"	N	15° 42'14"	W	3625	
		2 spheres recovered	29° 10'16"	N	15° 42'14"	W	3625	
		2 spheres recovered	29° 10'54"	N	15° 48'42"	W	n.a.	
		MSD recovered	29° 11'0"	N	15° 48'30"	W	n.a.	upside down
		4 spheres recovered	29° 11'0"	N	15° 48'30"	W	n.a.	upside down
		8 spheres recovered	29° 11'0"	N	15° 48'30"	W	n.a.	upside down
		4 spheres recovered	29° 11'6"	N	15° 48'30"	W	n.a.	
		6 spheres recovered	29° 11'6"	N	15° 48'30"	W	n.a.	
		releaser recovered	29° 11'12"	N	15° 48'30"	W	n.a.	ACI 4 recovered
9104	10.12.	calibration cast EB 2 sensors	29° 11'24"	N	15° 48'6"	W	3625	sensors mounted on rosette frame
9105	11.12.	releaser test	26° 54'12"	N	16° 13'56"	W	3520	
9106	11.12.	EB-2 search	26° 53'47"	N	16° 13'57"	W	3511	
9107	11.12.	Sphere+ ARGOS deployed	26° 52'3"	N	16° 11'17"	W	3501	Deployment EB-2
		SBE 37 CTD deployed	26° 51'59"	N	16° 11'19"	W	3500	
		RCM/ CTD deployed	26° 51'57"	N	16° 11'23"	W	3501	
		SBE 37 CTD deployed	26° 51'47"	N	16° 11'25"	W	3501	
		RCM/ CTD deployed	26° 51'37"	N	16° 11'37"	W	3503	
		SBE 37 CTD deployed	26° 51'29"	N	16° 11'49"	W	3506	
		RCM/ CTD deployed	26° 51'22"	N	16° 11'2"	W	3510	
		SBE 37 CTD deployed	26° 51'8"	N	16° 12'25"	W	3506	
		S 4 AD deployed	26° 51'0"	N	16° 12'42"	W	3505	
		SBE 37 CTD deployed	26° 50'48"	N	16° 13'0"	W	3473	
		releaser deployed	26° 50'12"	N	16° 14'18"	W	3512	
		anchor weight deployed	26° 50'11"	N	16° 14'21"	W	3506	

GeoB-No.	Date 2004	Description	LAT		LONG		WD [m]	Remarks
		topbuoy submerged	26° 50'27"	N	16° 13'29"	W	3506	
9108	11.12.	hydrophon to water	26° 59'30"	N	16° 13'54"	W	3500	
9109	11.12.	Multinet	26° 58'48"	N	16° 13'54"	W	3498	
9110	11.12.	Multinet	27° 11'1"	N	16° 15'4"	W	3496	
9111	11.12.	Multinet	27° 20'59"	N	16° 15'56"	W	3499	
9112	12.12.	Multinet	27° 31'47"	N	16° 16'50"	W	3479	
9113	12.12.	Multinet	27° 41'54"	N	16° 17'54"	W	3260	
9114	12.12.	Multinet	27° 55'0"	N	16° 18'0"	W	2519	
9115	12.12.	CTD/Rosette	27° 55'0"	N	16° 18'0"	W	2519	
9116	12.12.	CTD/Rosette	28° 8'4"	N	16° 9'2"	W	2276	
9117	12.12.	CTD/Rosette	28° 20'4"	N	15° 59'59"	W	2816	
9118	12.12.	CTD/Rosette	28° 32'6"	N	15° 50'0"	W	3418	
9119	12.12.	CTD/Rosette	28° 43'54"	N	15° 40'5"	W	3587	
9120	13.12.	CTD/Rosette	29° 11'55"	N	15° 25'29"	W	3603	
9121	13.12.	anchor weight deployed	29° 10'55"	N	15° 50'12"	W	3546	
		releaser deployed	29° 11'0"	N	15° 50'12"	W	3546	
		6 spheres deployed	29° 11'4"	N	15° 50'13"	W	3546	
		MSD deployed	29° 11'13"	N	15° 50'13"	W	3546	
		10 spheres deployed	29° 11'18"	N	15° 50'13"	W	3546	Deployment MSD
		releaser deployed	29° 11'41"	N	15° 50'7"	W	3546	
		Releaser No. Recovered	29° 12'12"	N	15° 50'12"	W	3626	
9122	14.12.	CTD/Ro/MC	28° 17'46"	N	16° 6'16"	W	2276	
9123	14.12.	Arrival on Station	28° 17'48"	N	16° 6'14"	W	2413	
		CTD/Ro/MC	28° 17'51"	N	16° 6'17"	W	2413	
9124	15.12.	DOLAN SBU	29° 12'6"	N	15° 55'4"	W	3633	
		dummy buoyancy recovered	29° 12'2"	N	15° 55'5"	W	3633	
		ADCP deployed	29° 11'57"	N	15° 55'3"	W	3664	
		Hobilabs / MC deployed	29° 11'55"	N	15° 55'3"	W	3664	DOLAN-SBU deployment with ship´s crane
		MC deployed	29° 11'54"	N	15° 55'1"	W	3664	
		MC deployed	29° 11'54"	N	15° 55'0"	W	3664	
		MC deployed	29° 11'59"	N	15° 54'59"	W	3664	
		transducer / MC deployed	29° 11'52"	N	15° 54'59"	W	3664	
		SAMI / MC analyser deployed	29° 11'52"	N	15° 54'57"	W	3664	
		DOLAN- SBU deployed	29° 11'49"	N	15° 55'1"	W	3664	
	15.12.	**End of scientific research program**						

6. Acknowledgement

The scientific cruise participants would like to thank Captain Michael Schneider and his entire crew for the good co-operation during the R/V POSEIDON cruise 319, especially during the complicated mooring work with the DOLAN data buoy. The teamwork among the crew and scientists on one hand and the warm and friendly way of communication on the other hand lead to the success of this cruise, inspite of several days of bad weather conditions. Again, we gratefully enjoyed the stay onboard the R/V POSEIDON. On this note, we will look forward to the next cruise with the R/V POSEIDON.

7. References

BELLERBY R.G.J., TURNER D.R., MILLWARD G.E. and P.J. WORSFOLD (1995) Shipboard flow injection determination of sea water pH with spectrophotometric detection, *Anal. Chim. Acta*, ***309***, 259-270.

BUTLER J.H., ELKINS C.M., BRUSON C.M., EGAN K.B., THOMPSON T.M., CONWAY T.J. and B.D. HALL (1988) Trace gases in and over the West Pacific and East Indian Oceans during the El Niño-Southern Oscillation event of 1987, NOAA Data Report, ERL-ARL-**16**, 104 pp. Air Resources Laboratory, Silver Spring, Md.

CLAYTON T.D. and R.H. BYRNE (1993) Spectrophotometric seawater pH measurements: total hydrogen ion concentration scale calibration of m-cresol purple and at-sea results, *Deep Sea Res*., ***42***, 411-429.

DETERMANN S., REUTER R., WAGNER P. and R. WILLKOMM (1994) Fluorescent matter in the eastern Atlantic Ocean: Part 1, method of measurement and near-surface distribution, *Deep-Sea Research* **41**, 659-675.

DETERMANN S., REUTER R. and R. WILLKOMM. (1996) Fluorescent matter in the eastern Atlantic Ocean: Part 2, vertical profiles and relation of water masses, *Deep-Sea Research* **43**, 345-360.

DICKSON A.G. (1981) An exact definition of total alkalinity and a procedure for the estimation of alkalinity and total inorganic carbon from titration data, *Deep Sea Res*., ***28***, 609-623.

DICKSON A.G. and C. GOYET (Eds.) (1994) *DOE, Handbook of methods for the analysis of the various parameters of the carbon-dioxide system in sea water*, Version 2, ORNL/CDIAC-74.

DICKSON A.G. and F.J. MILLERO (1987) A comparison of the equilibrium constants for the dissociation of carbonic acid in seawater media, Deep Sea Res. **34**, 1733-1743.

GARSIDE C. (1993) Nitrate reductor efficiency as an error source in seawater analysis, *Mar. Chem*., **4**(1), 25-30.

KOROLEFF F. (1983) Determination of dissolved inorganic phosphate. In Methods of Seawater Analysis. K. Grasshoff, A. Ehrhardt and K. Kremling (eds), Verlag Chemie, 126-129.

KOROLEFF F. (1983b) Determination of dissolved inorganic silicate. In Methods of Seawater Analysis, K. Grasshoff, A. Ehrhardt and K. Kremling (eds), Verlag Chemie, 175-180.

KREMLING K. & A. WENCK (1986) On the storage of dissolved inorganic phosphate, nitrate and reactive silicate in Atlantic Ocean water samples, *Meeresforschung*, **31**, 69-74.

LEE K., MILLERO F.J. and R. WANNINKHOF (1997) The carbon dixodie system in the Atlantic Ocean, *J. Geophys. Res.*, ***102***, 15693-17707.

MCDONALD R.W. & F.A. MCLAUGHLIN (1982) The effect of starege by freeging of disolute inorganic phosphate, nitrate and reactive silicate for samples from coastal and internal water, *Water Research*, **16**, 95-104.

MILLERO F.J. (1995) Thermodynamics of the carbon dioxide system in the oceans, *Geochim. Cosmochim. Acta*, ***59***, 661-677.

MINTROP L.M., PÉREZ F.F., GONZÁLES-DÁVILA M., SANTANA-CASIANO J.M., and A. KÖRTZINGER (2000) Alkalinity determination by potentiometry – intercalibration using three different methods, *Ciencias Marinas*, ***26***, 23-37.

MURPHY J. & J.P. RILEY (1962) A modified single solution method for the determination of phosphate in natural waters, *Anal. Chim. Acta*, **27**, 31-36.

NYDAHL F. (1976) On the optimum conditions for the reduction of nitrate by cadmium, *Talanta*, 23, 349-357.

RILEY J.P. & J.P. SKIRPOW (1975) The Micronutrient Element, *Chemical Oceanography*, **2**, 245-297.

STRICKLAND J.D.H & PARSONs (1972) A practical handbook of seawater analysis, *Fisheries Research Board of Canada*, 167 pp.

UNESCO (1978) Technical Papers in Marine Science, **28**, 35pp.

UNESCO (1984) La escala de salinidades practicas de 1978 y la ecuacion internacional de estado del agua de mar de 1980, Documentos tecnicos de la Unesco sobre Ciencias del Mar, no. **36**.

WANNINKHOF R. and K. THONING (1993) Measurement of fugacity of CO_2 in surface water using continuous and discrete sampling methods, *Mar. Chem*., ***44***, 189-204.

WELSCHMEYER N.A. (1994) Fluorimetric Analysis of Chlorophyll a in presence of Chlorophyll b and Phaeopigments, *Limnol. Oceanog*. **39** (8), 1985-1992.

WOODS E.D., ARMSTRONG F.A.J. & F.A. RICHARDS (1967) Determination of nitrate in seawater by cadmiun-cooper reduction to nitrate, *J. Mar. Biol. Ass. UK.,* **47**, 31-43.

Publications of this series:

No. 1 **Wefer, G., E. Suess and cruise participants**
Bericht über die POLARSTERN-Fahrt ANT IV/2, Rio de Janeiro - Punta Arenas, 6.11. - 1.12.1985.
60 pages, Bremen, 1986.

No. 2 **Hoffmann, G.**
Holozänstratigraphie und Küstenlinienverlagerung an der andalusischen Mittelmeerküste.
173 pages, Bremen, 1988. (out of print)

No. 3 **Wefer, G. and cruise participants**
Bericht über die METEOR-Fahrt M 6/6, Libreville - Las Palmas, 18.2. - 23.3.1988.
97 pages, Bremen, 1988.

No. 4 **Wefer, G., G.F. Lutze, T.J. Müller, O. Pfannkuche, W. Schenke, G. Siedler, W. Zenk**
Kurzbericht über die METEOR-Expedition No. 6, Hamburg - Hamburg, 28.10.1987 - 19.5.1988.
29 pages, Bremen, 1988. (out of print)

No. 5 **Fischer, G.**
Stabile Kohlenstoff-Isotope in partikulärer organischer Substanz aus dem Südpolarmeer (Atlantischer Sektor).
161 pages, Bremen, 1989.

No. 6 **Berger, W.H. and G. Wefer**
Partikelfluß und Kohlenstoffkreislauf im Ozean.
Bericht und Kurzfassungen über den Workshop vom 3.-4. Juli 1989 in Bremen.
57 pages, Bremen, 1989.

No. 7 **Wefer, G. and cruise participants**
Bericht über die METEOR - Fahrt M 9/4, Dakar - Santa Cruz, 19.2. - 16.3.1989.
103 pages, Bremen, 1989.

No. 8 **Kölling, M.**
Modellierung geochemischer Prozesse im Sickerwasser und Grundwasser.
135 pages, Bremen, 1990.

No. 9 **Heinze, P.-M.**
Das Auftriebsgeschehen vor Peru im Spätquartär.
204 pages, Bremen, 1990. (out of print)

No. 10 **Willems, H., G. Wefer, M. Rinski, B. Donner, H.-J. Bellmann, L. Eißmann, A. Müller, B.W. Flemming, H.-C. Höfle, J. Merkt, H. Streif, G. Hertweck, H. Kuntze, J. Schwaar, W. Schäfer, M.-G. Schulz, F. Grube, B. Menke**
Beiträge zur Geologie und Paläontologie Norddeutschlands: Exkursionsführer.
202 pages, Bremen, 1990.

No. 11 **Wefer, G. and cruise participants**
Bericht über die METEOR-Fahrt M 12/1, Kapstadt - Funchal, 13.3.1990 - 14.4.1990.
66 pages, Bremen, 1990.

No. 12 **Dahmke, A., H.D. Schulz, A. Kölling, F. Kracht, A. Lücke**
Schwermetallspuren und geochemische Gleichgewichte zwischen Porenlösung und Sediment im Wesermündungsgebiet. BMFT-Projekt MFU 0562, Abschlußbericht.
121 pages, Bremen, 1991.

No. 13 **Rostek, F.**
Physikalische Strukturen von Tiefseesedimenten des Südatlantiks und ihre Erfassung in Echolotregistrierungen.
209 pages, Bremen, 1991.

No. 14 **Baumann, M.**
Die Ablagerung von Tschernobyl-Radiocäsium in der Norwegischen See und in der Nordsee.
133 pages, Bremen, 1991. (out of print)

No. 15 **Kölling, A.**
Frühdiagenetische Prozesse und Stoff-Flüsse in marinen und ästuarinen Sedimenten.
140 pages, Bremen, 1991.

No. 16 **SFB 261 (ed.)**
1. Kolloquium des Sonderforschungsbereichs 261 der Universität Bremen (14.Juni 1991):
Der Südatlantik im Spätquartär: Rekonstruktion von Stoffhaushalt und Stromsystemen.
Kurzfassungen der Vorträge und Poster.
66 pages, Bremen, 1991.

No. 17 **Pätzold, J. and cruise participants**
Bericht und erste Ergebnisse über die METEOR-Fahrt M 15/2, Rio de Janeiro - Vitoria, 18.1. - 7.2.1991.
46 pages, Bremen, 1993.

No. 18 **Wefer, G. and cruise participants**
Bericht und erste Ergebnisse über die METEOR-Fahrt M 16/1, Pointe Noire - Recife, 27.3. - 25.4.1991.
120 pages, Bremen, 1991.

No. 19 **Schulz, H.D. and cruise participants**
Bericht und erste Ergebnisse über die METEOR-Fahrt M 16/2, Recife - Belem, 28.4. - 20.5.1991.
149 pages, Bremen, 1991.

No. 20 **Berner, H.**
Mechanismen der Sedimentbildung in der Fram-Straße, im Arktischen Ozean und in der Norwegischen See.
167 pages, Bremen, 1991.

No. 21 **Schneider, R.**
Spätquartäre Produktivitätsänderungen im östlichen Angola-Becken: Reaktion auf Variationen im Passat-Monsun-Windsystem und in der Advektion des Benguela-Küstenstroms.
198 pages, Bremen, 1991. (out of print)

No. 22 **Hebbeln, D.**
Spätquartäre Stratigraphie und Paläozeanographie in der Fram-Straße.
174 pages, Bremen, 1991.

No. 23 **Lücke, A.**
Umsetzungsprozesse organischer Substanz während der Frühdiagenese in ästuarinen Sedimenten.
137 pages, Bremen, 1991.

No. 24 **Wefer, G. and cruise participants**
Bericht und erste Ergebnisse der METEOR-Fahrt M 20/1, Bremen - Abidjan, 18.11.- 22.12.1991.
74 pages, Bremen, 1992.

No. 25 **Schulz, H.D. and cruise participants**
Bericht und erste Ergebnisse der METEOR-Fahrt M 20/2, Abidjan - Dakar, 27.12.1991 - 3.2.1992.
173 pages, Bremen, 1992.

No. 26 **Gingele, F.**
Zur klimaabhängigen Bildung biogener und terrigener Sedimente und ihrer Veränderung durch die Frühdiagenese im zentralen und östlichen Südatlantik.
202 pages, Bremen, 1992.

No. 27 **Bickert, T.**
Rekonstruktion der spätquartären Bodenwasserzirkulation im östlichen Südatlantik über stabile Isotope benthischer Foraminiferen. 205 pages, Bremen, 1992. (out of print)

No. 28 **Schmidt, H.**
Der Benguela-Strom im Bereich des Walfisch-Rückens im Spätquartär.
172 pages, Bremen, 1992.

No. 29 **Meinecke, G.**
Spätquartäre Oberflächenwassertemperaturen im östlichen äquatorialen Atlantik.
181 pages, Bremen, 1992.

No. 30 **Bathmann, U., U. Bleil, A. Dahmke, P. Müller, A. Nehrkorn, E.-M. Nöthig, M. Olesch, J. Pätzold, H.D. Schulz, V. Smetacek, V. Spieß, G. Wefer, H. Willems**
Bericht des Graduierten Kollegs. Stoff-Flüsse in marinen Geosystemen.
Berichtszeitraum Oktober 1990 - Dezember 1992.
396 pages, Bremen, 1992.

No. 31 **Damm, E.**
Frühdiagenetische Verteilung von Schwermetallen in Schlicksedimenten der westlichen Ostsee.
115 pages, Bremen, 1992.

No. 32 **Antia, E.E.**
Sedimentology, Morphodynamics and Facies Association of a mesotidal Barrier Island Shoreface (Spiekeroog, Southern North Sea).
370 pages, Bremen, 1993.

No. 33 **Duinker, J. and G. Wefer (ed.)**
Bericht über den 1. JGOFS-Workshop. 1./2. Dezember 1992 in Bremen.
83 pages, Bremen, 1993.

No. 34 **Kasten, S.**
Die Verteilung von Schwermetallen in den Sedimenten eines stadtbremischen Hafenbeckens.
103 pages, Bremen, 1993.

No. 35 **Spieß, V.**
Digitale Sedimentographie. Neue Wege zu einer hochauflösenden Akustostratigraphie.
199 pages, Bremen, 1993.

No. 36 **Schinzel, U.**
Laborversuche zu frühdiagenetischen Reaktionen von Eisen (III) - Oxidhydraten in marinen Sedimenten.
189 pages, Bremen, 1993.

No. 37 **Sieger, R.**
CoTAM - ein Modell zur Modellierung des Schwermetalltransports in Grundwasserleitern.
56 pages, Bremen, 1993. (out of print)

No. 38 **Willems, H. (ed.)**
Geoscientific Investigations in the Tethyan Himalayas. 183 pages, Bremen, 1993.

No. 39 **Hamer, K.**
Entwicklung von Laborversuchen als Grundlage für die Modellierung des Transportverhaltens von Arsenat, Blei, Cadmium und Kupfer in wassergesättigten Säulen.
147 pages, Bremen, 1993.

No. 40 **Sieger, R.**
Modellierung des Stofftransports in porösen Medien unter Ankopplung kinetisch gesteuerter Sorptions- und Redoxprozesse sowie thermischer Gleichgewichte.
158 pages, Bremen, 1993.

No. 41 **Thießen, W.**
Magnetische Eigenschaften von Sedimenten des östlichen Südatlantiks und ihre paläozeanographische Relevanz.
170 pages, Bremen, 1993.

No. 42 **Spieß, V. and cruise participants**
Report and preliminary results of METEOR-Cruise M 23/1, Kapstadt - Rio de Janeiro, 4.-25.2.1993.
139 pages, Bremen, 1994.

No. 43 **Bleil, U. and cruise participants**
Report and preliminary results of METEOR-Cruise M 23/2, Rio de Janeiro - Recife, 27.2.-19.3.1993
133 pages, Bremen, 1994.

No. 44 **Wefer, G. and cruise participants**
Report and preliminary results of METEOR-Cruise M 23/3, Recife - Las Palmas, 21.3. - 12.4.1993
71 pages, Bremen, 1994.

No. 45 **Giese, M. and G. Wefer (ed.)**
Bericht über den 2. JGOFS-Workshop. 18../19. November 1993 in Bremen.
93 pages, Bremen, 1994.

No. 46 **Balzer, W. and cruise participants**
Report and preliminary results of METEOR-Cruise M 22/1, Hamburg - Recife, 22.9. - 21.10.1992.
24 pages, Bremen, 1994.

No. 47 **Stax, R.**
Zyklische Sedimentation von organischem Kohlenstoff in der Japan See: Anzeiger für Änderungen von Paläoozeanographie und Paläoklima im Spätkänozoikum.
150 pages, Bremen, 1994.

No. 48 **Skowronek, F.**
Frühdiagenetische Stoff-Flüsse gelöster Schwermetalle an der Oberfläche von Sedimenten des Weser Ästuares.
107 pages, Bremen, 1994.

No. 49 **Dersch-Hansmann, M.**
Zur Klimaentwicklung in Ostasien während der letzten 5 Millionen Jahre:
Terrigener Sedimenteintrag in die Japan See (ODP Ausfahrt 128).
149 pages, Bremen, 1994.

No. 50 **Zabel, M.**
Frühdiagenetische Stoff-Flüsse in Oberflächen-Sedimenten des äquatorialen und östlichen Südatlantik.
129 pages, Bremen, 1994.

No. 51 **Bleil, U. and cruise participants**
Report and preliminary results of SONNE-Cruise SO 86, Buenos Aires - Capetown, 22.4. - 31.5.93
116 pages, Bremen, 1994.

No. 52 **Symposium: The South Atlantic: Present and Past Circulation.**
Bremen, Germany, 15 - 19 August 1994. Abstracts.
167 pages, Bremen, 1994.

No. 53 **Kretzmann, U.B.**
^{57}Fe-Mössbauer-Spektroskopie an Sedimenten - Möglichkeiten und Grenzen.
183 pages, Bremen, 1994.

No. 54 **Bachmann, M.**
Die Karbonatrampe von Organyà im oberen Oberapt und unteren Unteralb (NE-Spanien, Prov. Lerida): Fazies, Zyklo- und Sequenzstratigraphie.
147 pages, Bremen, 1994. (out of print)

No. 55 **Kemle-von Mücke, S.**
Oberflächenwasserstruktur und -zirkulation des Südostatlantiks im Spätquartär.
151 pages, Bremen, 1994.

No. 56 **Petermann, H.**
Magnetotaktische Bakterien und ihre Magnetosome in Oberflächensedimenten des Südatlantiks.
134 pages, Bremen, 1994.

No. 57 **Mulitza, S.**
Spätquartäre Variationen der oberflächennahen Hydrographie im westlichen äquatorialen Atlantik.
97 pages, Bremen, 1994.

No. 58 **Segl, M. and cruise participants**
Report and preliminary results of METEOR-Cruise M 29/1, Buenos-Aires - Montevideo, 17.6. - 13.7.1994
94 pages, Bremen, 1994.

No. 59 **Bleil, U. and cruise participants**
Report and preliminary results of METEOR-Cruise M 29/2, Montevideo - Rio de Janiero 15.7. - 8.8.1994.
153 pages, Bremen, 1994.

No. 60 **Henrich, R. and cruise participants**
Report and preliminary results of METEOR-Cruise M 29/3, Rio de Janeiro - Las Palmas 11.8. - 5.9.1994. Bremen,
1994. (out of print)

No. 61 **Sagemann, J.**
Saisonale Variationen von Porenwasserprofilen, Nährstoff-Flüssen und Reaktionen in intertidalen Sedimenten des Weser-Ästuars.
110 pages, Bremen, 1994. (out of print)

No. 62 **Giese, M. and G. Wefer**
Bericht über den 3. JGOFS-Workshop. 5./6. Dezember 1994 in Bremen.
84 pages, Bremen, 1995.

No. 63 **Mann, U.**
Genese kretazischer Schwarzschiefer in Kolumbien: Globale vs. regionale/lokale Prozesse.
153 pages, Bremen, 1995. (out of print)

No. 64 **Willems, H., Wan X., Yin J., Dongdui L., Liu G., S. Dürr, K.-U. Gräfe**
The Mesozoic development of the N-Indian passive margin and of the Xigaze Forearc Basin in southern Tibet, China. – Excursion Guide to IGCP 362 Working-Group Meeting "Integrated Stratigraphy".
113 pages, Bremen, 1995. (out of print)

No. 65 **Hünken, U.**
Liefergebiets - Charakterisierung proterozoischer Goldseifen in Ghana anhand von Fluideinschluß-Untersuchungen.
270 pages, Bremen, 1995.

No. 66 **Nyandwi, N.**
The Nature of the Sediment Distribution Patterns in ther Spiekeroog Backbarrier Area, the East Frisian Islands.
162 pages, Bremen, 1995.

No. 67 **Isenbeck-Schröter, M.**
Transportverhalten von Schwermetallkationen und Oxoanionen in wassergesättigten Sanden. - Laborversuche in Säulen und ihre Modellierung -.
182 pages, Bremen, 1995.

No. 68 **Hebbeln, D. and cruise participants**
Report and preliminary results of SONNE-Cruise SO 102, Valparaiso - Valparaiso, 95
134 pages, Bremen, 1995.

No. 69 **Willems, H. (Sprecher), U.Bathmann, U. Bleil, T. v. Dobeneck, K. Herterich, B.B. Jorgensen, E.-M. Nöthig, M. Olesch, J. Pätzold, H.D. Schulz, V. Smetacek, V. Speiß. G. Wefer**
Bericht des Graduierten-Kollegs Stoff-Flüsse in marine Geosystemen.
Berichtszeitraum Januar 1993 - Dezember 1995.
45 & 468 pages, Bremen, 1995.

No. 70 **Giese, M. and G. Wefer**
Bericht über den 4. JGOFS-Workshop. 20./21. November 1995 in Bremen.
60 pages, Bremen, 1996. (out of print)

No. 71 **Meggers, H.**
Pliozän-quartäre Karbonatsedimentation und Paläozeanographie des Nordatlantiks und des Europäischen Nordmeeres - Hinweise aus planktischen Foraminiferengemeinschaften.
143 pages, Bremen, 1996. (out of print)

No. 72 **Teske, A.**
Phylogenetische und ökologische Untersuchungen an Bakterien des oxidativen und reduktiven marinen Schwefelkreislaufs mittels ribosomaler RNA.
220 pages, Bremen, 1996. (out of print)

No. 73 **Andersen, N.**
Biogeochemische Charakterisierung von Sinkstoffen und Sedimenten aus ostatlantischen Produktions-Systemen mit Hilfe von Biomarkern.
215 pages, Bremen, 1996.

No. 74 **Treppke, U.**
Saisonalität im Diatomeen- und Silikoflagellatenfluß im östlichen tropischen und subtropischen Atlantik.
200 pages, Bremen, 1996.

No. 75 **Schüring, J.**
Die Verwendung von Steinkohlebergematerialien im Deponiebau im Hinblick auf die Pyritverwitterung und die Eignung als geochemische Barriere.
110 pages, Bremen, 1996.

No. 76 **Pätzold, J. and cruise participants**
Report and preliminary results of VICTOR HENSEN cruise JOPS II, Leg 6,
Fortaleza - Recife, 10.3. - 26.3. 1995 and Leg 8, Vítoria - Vítoria, 10.4. - 23.4.1995.
87 pages, Bremen, 1996.

No. 77 **Bleil, U. and cruise participants**
Report and preliminary results of METEOR-Cruise M 34/1, Cape Town - Walvis Bay, 3.-26.1.1996.
129 pages, Bremen, 1996.

No. 78 **Schulz, H.D. and cruise participants**
Report and preliminary results of METEOR-Cruise M 34/2, Walvis Bay - Walvis Bay, 29.1.-18.2.96
133 pages, Bremen, 1996.

No. 79 **Wefer, G. and cruise participants**
Report and preliminary results of METEOR-Cruise M 34/3, Walvis Bay - Recife, 21.2.-17.3.1996.
168 pages, Bremen, 1996.

No. 80 **Fischer, G. and cruise participants**
Report and preliminary results of METEOR-Cruise M 34/4, Recife - Bridgetown, 19.3.-15.4.1996.
105 pages, Bremen, 1996.

No. 81 **Kulbrok, F.**
Biostratigraphie, Fazies und Sequenzstratigraphie einer Karbonatrampe in den Schichten der Oberkreide und des Alttertiärs Nordost-Ägyptens (Eastern Desert, N'Golf von Suez, Sinai).
153 pages, Bremen, 1996.

No. 82 **Kasten, S.**
Early Diagenetic Metal Enrichments in Marine Sediments as Documents of Nonsteady-State Depositional Conditions. Bremen, 1996.

No. 83 **Holmes, M.E.**
Reconstruction of Surface Ocean Nitrate Utilization in the Southeast Atlantic Ocean Based on Stable Nitrogen Isotopes.
113 pages, Bremen, 1996.

No. 84 **Rühlemann, C.**
Akkumulation von Carbonat und organischem Kohlenstoff im tropischen Atlantik: Spätquartäre Produktivitäts-Variationen und ihre Steuerungsmechanismen.
139 pages, Bremen, 1996.

No. 85 **Ratmeyer, V.**
Untersuchungen zum Eintrag und Transport lithogener und organischer partikulärer Substanz im östlichen subtropischen Nordatlantik.
154 pages, Bremen, 1996.

No. 86 **Cepek, M.**
Zeitliche und räumliche Variationen von Coccolithophoriden-Gemeinschaften im subtropischen Ost-Atlantik: Untersuchungen an Plankton, Sinkstoffen und Sedimenten.
156 pages, Bremen, 1996.

No. 87 **Otto, S.**
Die Bedeutung von gelöstem organischen Kohlenstoff (DOC) für den Kohlenstofffluß im Ozean.
150 pages, Bremen, 1996.

No. 88 **Hensen, C.**
Frühdiagenetische Prozesse und Quantifizierung benthischer Stoff-Flüsse in Oberflächensedimenten des Südatlantiks.
132 pages, Bremen, 1996.

No. 89 **Giese, M. and G. Wefer**
Bericht über den 5. JGOFS-Workshop. 27./28. November 1996 in Bremen.
73 pages, Bremen, 1997.

No. 90 **Wefer, G. and cruise participants**
Report and preliminary results of METEOR-Cruise M 37/1, Lisbon - Las Palmas, 4.-23.12.1996.
79 pages, Bremen, 1997.

No. 91 **Isenbeck-Schröter, M., E. Bedbur, M. Kofod, B. König, T. Schramm & G. Mattheß**
Occurrence of Pesticide Residues in Water - Assessment of the Current Situation in Selected EU Countries.
65 pages, Bremen 1997.

No. 92 **Kühn, M.**
Geochemische Folgereaktionen bei der hydrogeothermalen Energiegewinnung.
129 pages, Bremen 1997.

No. 93 **Determann, S. & K. Herterich**
JGOFS-A6 “Daten und Modelle”: Sammlung JGOFS-relevanter Modelle in Deutschland.
26 pages, Bremen, 1997.

No. 94 **Fischer, G. and cruise participants**
Report and preliminary results of METEOR-Cruise M 38/1, Las Palmas - Recife, 25.1.-1.3.1997, with Appendix: Core Descriptions from METEOR Cruise M 37/1. Bremen, 1997.

No. 95 **Bleil, U. and cruise participants**
Report and preliminary results of METEOR-Cruise M 38/2, Recife - Las Palmas, 4.3.-14.4.1997.
126 pages, Bremen, 1997.

No. 96 **Neuer, S. and cruise participants**
Report and preliminary results of VICTOR HENSEN-Cruise 96/1. Bremen, 1997.

No. 97 **Villinger, H. and cruise participants**
Fahrtbericht SO 111, 20.8. - 16.9.1996. 115 pages, Bremen, 1997.

No. 98 **Lüning, S.**
Late Cretaceous - Early Tertiary sequence stratigraphy, paleoecology and geodynamics of Eastern Sinai, Egypt.
218 pages, Bremen, 1997.

No. 99 **Haese, R.R.**
Beschreibung und Quantifizierung frühdiagenetischer Reaktionen des Eisens in Sedimenten des Südatlantiks.
118 pages, Bremen, 1997.

No. 100 **Lührte, R. von**
Verwertung von Bremer Baggergut als Material zur Oberflächenabdichtung von Deponien - Geochemisches Langzeitverhalten und Schwermetall-Mobilität (Cd, Cu, Ni, Pb, Zn).
Bremen, 1997.

No. 101 **Ebert, M.**
Der Einfluß des Redoxmilieus auf die Mobilität von Chrom im durchströmten Aquifer.
135 pages, Bremen, 1997.

No. 102 **Krögel, F.**
Einfluß von Viskosität und Dichte des Seewassers auf Transport und Ablagerung von Wattsedimenten (Langeooger Rückseitenwatt, südliche Nordsee).
168 pages, Bremen, 1997.

No. 103 **Kerntopf, B.**
Dinoflagellate Distribution Patterns and Preservation in the Equatorial Atlantic and Offshore North-West Africa.
137 pages, Bremen, 1997.

No. 104 **Breitzke, M.**
Elastische Wellenausbreitung in marinen Sedimenten - Neue Entwicklungen der Ultraschall Sedimentphysik und Sedimentechographie.
298 pages, Bremen, 1997.

No. 105 **Marchant, M.**
Rezente und spätquartäre Sedimentation planktischer Foraminiferen im Peru-Chile Strom.
115 pages, Bremen, 1997.

No. 106 **Habicht, K.S.**
Sulfur isotope fractionation in marine sediments and bacterial cultures.
125 pages, Bremen, 1997.

No. 107 **Hamer, K., R.v. Lührte, G. Becker, T. Felis, S. Keffel, B. Strotmann, C. Waschkowitz, M. Kölling, M. Isenbeck-Schröter, H.D. Schulz**
Endbericht zum Forschungsvorhaben 060 des Landes Bremen: Baggergut der Hafengruppe Bremen-Stadt: Modelluntersuchungen zur Schwermetallmobilität und Möglichkeiten der Verwertung von Hafenschlick aus Bremischen Häfen.
98 pages, Bremen, 1997.

No. 108 **Greeff, O.W.**
Entwicklung und Erprobung eines benthischen Landersystemes zur *in situ*-Bestimmung von Sulfatreduktionsraten mariner Sedimente.
121 pages, Bremen, 1997.

No. 109 **Pätzold, M. und G. Wefer**
Bericht über den 6. JGOFS-Workshop am 4./5.12.1997 in Bremen. Im Anhang:
Publikationen zum deutschen Beitrag zur Joint Global Ocean Flux Study (JGOFS), Stand 1/1998.
122 pages, Bremen, 1998.

No. 110 **Landenberger, H.**
CoTReM, ein Multi-Komponenten Transport- und Reaktions-Modell. 142 pages, Bremen, 1998.

No. 111 **Villinger, H. und Fahrtteilnehmer**
Fahrtbericht SO 124, 4.10. - 16.10.199.
90 pages, Bremen, 1997.

No. 112 **Gietl, R.**
Biostratigraphie und Sedimentationsmuster einer nordostägyptischen Karbonatrampe unter Berücksichtigung der Alveolinen-Faunen.
142 pages, Bremen, 1998.

No. 113 **Ziebis, W.**
The Impact of the Thalassinidean Shrimp *Callianassa truncata* on the Geochemistry of permeable, coastal Sediments.
158 pages, Bremen 1998.

No. 114 **Schulz, H.D. and cruise participants**
Report and preliminary results of METEOR-Cruise M 41/1, Málaga - Libreville, 13.2.-15.3.1998.
Bremen, 1998.

No. 115 **Völker, D.J.**
Untersuchungen an strömungsbeeinflußten Sedimentationsmustern im Südozean. Interpretation sedimentechographischer Daten und numerische Modellierung.
152 pages, Bremen, 1998.

No. 116 **Schlünz, B.**
Riverine Organic Carbon Input into the Ocean in Relation to Late Quaternary Climate Change.
136 pages, Bremen, 1998.

No. 117 **Kuhnert, H.**
Aufzeichnug des Klimas vor Westaustralien in stabilen Isotopen in Korallenskeletten.
109 pages, Bremen, 1998.

No. 118 **Kirst, G.**
Rekonstruktion von Oberflächenwassertemperaturen im östlichen Südatlantik anhand von Alkenonen.
130 pages, Bremen, 1998.

No. 119 **Dürkoop, A.**
Der Brasil-Strom im Spätquartär: Rekonstruktion der oberflächennahen Hydrographie während der letzten 400 000 Jahre.
121 pages, Bremen, 1998.

No. 120 **Lamy, F.**
Spätquartäre Variationen des terrigenen Sedimenteintrags entlang des chilenischen Kontinentalhangs als Abbild von Klimavariabilität im Milanković- und Sub-Milanković-Zeitbereich.
141 pages, Bremen, 1998.

No. 121 **Neuer, S. and cruise participants**
Report and preliminary results of POSEIDON-Cruise Pos 237/2, Vigo – Las Palmas, 18.3.-31.3.1998.
39 pages, Bremen, 1998

No. 122 **Romero, O.E.**
Marine planktonic diatoms from the tropical and equatorial Atlantic: temporal flux patterns and the sediment record.
205 pages, Bremen, 1998.

No. 123 **Spiess, V. und Fahrtteilnehmer**
Report and preliminary results of RV SONNE Cruise 125, Cochin – Chittagong, 17.10.-17.11.1997.
128 pages, Bremen, 1998.

No. 124 **Arz, H.W.**
Dokumentation von kurzfristigen Klimaschwankungen des Spätquartärs in Sedimenten des westlichen äquatorialen Atlantiks.
96 pages, Bremen, 1998.

No. 125 **Wolff, T.**
Mixed layer characteristics in the equatorial Atlantic during the late Quaternary as deduced from planktonic foraminifera.
132 pages, Bremen, 1998.

No. 126 **Dittert, N.**
Late Quaternary Planktic Foraminifera Assemblages in the South Atlantic Ocean: Quantitative Determination and Preservational Aspects.
165 pages, Bremen, 1998.

No. 127 **Höll, C.**
Kalkige und organisch-wandige Dinoflagellaten-Zysten in Spätquartären Sedimenten des tropischen Atlantiks und ihre palökologische Auswertbarkeit.
121 pages, Bremen, 1998.

No. 128 **Hencke, J.**
Redoxreaktionen im Grundwasser: Etablierung und Verlagerung von Reaktionsfronten und ihre Bedeutung für die Spurenelement-Mobilität.
122 pages, Bremen 1998.

No. 129 **Pätzold, J. and cruise participants**
Report and preliminary results of METEOR-Cruise M 41/3, Vítoria, Brasil – Salvador de Bahia, Brasil, 18.4. - 15.5.1998. Bremen, 1999.

No. 130 **Fischer, G. and cruise participants**
Report and preliminary results of METEOR-Cruise M 41/4, Salvador de Bahia, Brasil – Las Palmas, Spain, 18.5. – 13.6.1998. Bremen, 1999.

No. 131 **Schlünz, B. und G. Wefer**
Bericht über den 7. JGOFS-Workshop am 3. und 4.12.1998 in Bremen. Im Anhang: Publikationen zum deutschen Beitrag zur Joint Global Ocean Flux Study (JGOFS), Stand 1/ 1999.
100 pages, Bremen, 1999.

No. 132 **Wefer, G. and cruise participants**
Report and preliminary results of METEOR-Cruise M 42/4, Las Palmas - Las Palmas - Viena do Castelo; 26.09.1998 - 26.10.1998.
104 pages, Bremen, 1999.

No. 133 **Felis, T.**
Climate and ocean variability reconstructed from stable isotope records of modern subtropical corals (Northern Red Sea).
111 pages, Bremen, 1999.

No. 134 **Draschba, S.**
North Atlantic climate variability recorded in reef corals from Bermuda.
108 pages, Bremen, 1999.

No. 135 **Schmieder, F.**
Magnetic Cyclostratigraphy of South Atlantic Sediments.
82 pages, Bremen, 1999.

No. 136 **Rieß, W.**
In situ measurements of respiration and mineralisation processes – Interaction between fauna and geochemical fluxes at active interfaces.
68 pages, Bremen, 1999.

No. 137 **Devey, C.W. and cruise participants**
Report and shipboard results from METEOR-cruise M 41/2, Libreville – Vitoria, 18.3. – 15.4.98.
59 pages, Bremen, 1999.

No. 138 **Wenzhöfer, F.**
Biogeochemical processes at the sediment water interface and quantification of metabolically driven calcite dissolution in deep sea sediments.
103 pages, Bremen, 1999.

No. 139 **Klump, J.**
Biogenic barite as a proxy of paleoproductivity variations in the Southern Peru-Chile Current.
107 pages, Bremen, 1999.

No. 140 **Huber, R.**
Carbonate sedimentation in the northern Northatlantic since the late pliocene.
103 pages, Bremen, 1999.

No. 141 **Schulz, H.**
Nitrate-storing sulfur bacteria in sediments of coastal upwelling.
94 pages, Bremen, 1999.

No. 142 **Mai, S.**
Die Sedimentverteilung im Wattenmeer: ein Simulationsmodell.
114 pages, Bremen, 1999.

No. 143 **Neuer, S. and cruise participants**
Report and preliminary results of Poseidon Cruise 248, Las Palmas - Las Palmas, 15.2.-26.2.1999.
45 pages, Bremen, 1999.

No. 144 **Weber, A.**
Schwefelkreislauf in marinen Sedimenten und Messung von *in situ* Sulfatreduktionsraten.
122 pages, Bremen, 1999.

No. 145 **Hadeler, A.**
Sorptionsreaktionen im Grundwasser: Unterschiedliche Aspekte bei der Modellierung des Transportverhaltens von Zink.
122 pages, 1999.

No. 146 **Dierßen, H.**
Zum Kreislauf ausgewählter Spurenmetalle im Südatlantik: Vertikaltransport und Wechselwirkung zwischen Partikeln und Lösung.
167 pages, Bremen, 1999.

No. 147 **Zühlsdorff, L.**
High resolution multi-frequency seismic surveys at the Eastern Juan de Fuca Ridge Flank and the Cascadia Margin – Evidence for thermally and tectonically driven fluid upflow in marine sediments.
118 pages, Bremen 1999.

No. 148 **Kinkel, H.**
Living and late Quaternary Coccolithophores in the equatorial Atlantic Ocean: response of distribution and productivity patterns to changing surface water circulation.
183 pages, Bremen, 2000.

No. 149 **Pätzold, J. and cruise participants**
Report and preliminary results of METEOR Cruise M 44/3, Aqaba (Jordan) - Safaga (Egypt) – Dubá (Saudi Arabia) – Suez (Egypt) - Haifa (Israel), 12.3.-26.3.-2.4.-4.4.1999. 1
35 pages, Bremen, 2000.

No. 150 **Schlünz, B. and G. Wefer**
Bericht über den 8. JGOFS-Workshop am 2. und 3.12.1999 in Bremen. Im Anhang: Publikationen zum deutschen Beitrag zur Joint Global Ocean Flux Study (JGOFS), Stand 1/ 2000.
95 pages, Bremen, 2000.

No. 151 **Schnack, K.**
Biostratigraphie und fazielle Entwicklung in der Oberkreide und im Alttertiär im Bereich der Kharga Schwelle, Westliche Wüste, SW-Ägypten.
142 pages, Bremen, 2000.

No. 152 **Karwath, B.**
Ecological studies on living and fossil calcareous dinoflagellates of the equatorial and tropical Atlantic Ocean.
175 pages, Bremen, 2000.

No. 153 **Moustafa, Y.**
Paleoclimatic reconstructions of the Northern Red Sea during the Holocene inferred from stable isotope records of modern and fossil corals and molluscs.
102 pages, Bremen, 2000.

No. 154 **Villinger, H. and cruise participants**
Report and preliminary results of SONNE-cruise 145-1 Balboa – Talcahuana, 21.12.1999 – 28.01.2000.
147 pages, Bremen, 2000.

No. 155 **Rusch, A.**
Dynamik der Feinfraktion im Oberflächenhorizont permeabler Schelfsedimente.
102 pages, Bremen, 2000.

No. 156 **Moos, C.**
Reconstruction of upwelling intensity and paleo-nutrient gradients in the northwest Arabian Sea derived from stable carbon and oxygen isotopes of planktic foraminifera.
103 pages, Bremen, 2000.

No. 157 **Xu, W.**
Mass physical sediment properties and trends in a Wadden Sea tidal basin.
127 pages, Bremen, 2000.

No. 158 **Meinecke, G. and cruise participants**
Report and preliminary results of METEOR Cruise M 45/1, Malaga (Spain) - Lissabon (Portugal), 19.05. - 08.06.1999.
39 pages, Bremen, 2000.

No. 159 **Vink, A.**
Reconstruction of recent and late Quaternary surface water masses of the western subtropical Atlantic Ocean based on calcareous and organic-walled dinoflagellate cysts.
160 pages, Bremen, 2000.

No. 160 **Willems, H. (Sprecher), U. Bleil, R. Henrich, K. Herterich, B.B. Jørgensen, H.-J. Kuß, M. Olesch, H.D. Schulz,V. Spieß, G. Wefer**
Abschlußbericht des Graduierten-Kollegs Stoff-Flüsse in marine Geosystemen.
Zusammenfassung und Berichtszeitraum Januar 1996 - Dezember 2000.
340 pages, Bremen, 2000.

No. 161 **Sprengel, C.**
Untersuchungen zur Sedimentation und Ökologie von Coccolithophoriden im Bereich der Kanarischen Inseln: Saisonale Flussmuster und Karbonatexport.
165 pages, Bremen, 2000.

No. 162 **Donner, B. and G. Wefer**
Bericht über den JGOFS-Workshop am 18.-21.9.2000 in Bremen:
Biogeochemical Cycles: German Contributions to the International Joint Global Ocean Flux Study.
87 pages, Bremen, 2000.

No. 163 **Neuer, S. and cruise participants**
Report and preliminary results of Meteor Cruise M 45/5, Bremen – Las Palmas, October 1 – November 3, 1999.
93 pages, Bremen, 2000.

No. 164 **Devey, C. and cruise participants**
Report and preliminary results of Sonne Cruise SO 145/2, Talcahuano (Chile) - Arica (Chile), February 4 – February 29, 2000.
63 pages, Bremen, 2000.

No. 165 **Freudenthal, T.**
Reconstruction of productivity gradients in the Canary Islands region off Morocco by means of sinking particles and sediments.
147 pages, Bremen, 2000.

No. 166 **Adler, M.**
Modeling of one-dimensional transport in porous media with respect to simultaneous geochemical reactions in CoTReM.
147 pages, Bremen, 2000.

No. 167 **Santamarina Cuneo, P.**
Fluxes of suspended particulate matter through a tidal inlet of the East Frisian Wadden Sea (southern North Sea).
91 pages, Bremen, 2000.

No. 168 **Benthien, A.**
Effects of CO2 and nutrient concentration on the stable carbon isotope composition of C37:2 alkenones in sediments of the South Atlantic Ocean.
104 pages, Bremen, 2001.

No. 169 **Lavik, G.**
Nitrogen isotopes of sinking matter and sediments in the South Atlantic.
140 pages, Bremen, 2001.

No. 170 **Budziak, D.**
Late Quaternary monsoonal climate and related variations in paleoproductivity and alkenone-derived sea-surface temperatures in the western Arabian Sea.
114 pages, Bremen, 2001.

No. 171 **Gerhardt, S.**
Late Quaternary water mass variability derived from the pteropod preservation state in sediments of the western South Atlantic Ocean and the Caribbean Sea.
109 pages, Bremen, 2001.

No. 172 **Bleil, U. and cruise participants**
Report and preliminary results of Meteor Cruise M 46/3, Montevideo (Uruguay) – Mar del Plata (Argentina), January 4 – February 7, 2000. Bremen, 2001.

No. 173 **Wefer, G. and cruise participants**
Report and preliminary results of Meteor Cruise M 46/4, Mar del Plata (Argentina) – Salvador da Bahia (Brazil), February 10 – March 13, 2000. With partial results of METEOR cruise M 46/2.
136 pages, Bremen, 2001.

No. 174 **Schulz, H.D. and cruise participants**
Report and preliminary results of Meteor Cruise M 46/2, Recife (Brazil) – Montevideo (Uruguay), December 2 – December 29, 1999.
107 pages, Bremen, 2001.

No. 175 **Schmidt, A.**
Magnetic mineral fluxes in the Quaternary South Atlantic: Implications for the paleoenvironment.
97 pages, Bremen, 2001.

No. 176 **Bruhns, P.**
Crystal chemical characterization of heavy metal incorporation in brick burning processes.
93 pages, Bremen, 2001.

No. 177 **Karius, V.**
Baggergut der Hafengruppe Bremen-Stadt in der Ziegelherstellung.
131 pages, Bremen, 2001.

No. 178 **Adegbie, A. T.**
Reconstruction of paleoenvironmental conditions in Equatorial Atlantic and the Gulf of Guinea Basins for the last 245,000 years.
113 pages, Bremen, 2001.

No. 179 **Spieß, V. and cruise participants**
Report and preliminary results of R/V Sonne Cruise SO 149, Victoria - Victoria, 16.8. - 16.9.2000.
100 pages, Bremen, 2001.

No. 180 **Kim, J.-H.**
Reconstruction of past sea-surface temperatures in the eastern South Atlantic and the eastern South Pacific across Termination I based on the Alkenone Method.
114 pages, Bremen, 2001.

No. 181 **von Lom-Keil, H.**
Sedimentary waves on the Namibian continental margin and in the Argentine Basin – Bottom flow reconstructions based on high resolution echosounder data.
126 pages, Bremen, 2001.

No. 182 **Hebbeln, D. and cruise participants**
PUCK: Report and preliminary results of R/V Sonne Cruise SO 156, Valparaiso (Chile) - Talcahuano (Chile), March 29 - May 14, 2001.
195 pages, Bremen, 2001.

No. 183 **Wendler, J.**
Reconstruction of astronomically-forced cyclic and abrupt paleoecological changes in the Upper Cretaceous Boreal Realm based on calcareous dinoflagellate cysts.
149 pages, Bremen, 2001.

No. 184 **Volbers, A.**
Planktic foraminifera as paleoceanographic indicators: production, preservation, and reconstruction of upwelling intensity. Implications from late Quaternary South Atlantic sediments.
122 pages, Bremen, 2001.

No. 185 **Bleil, U. and cruise participants**
Report and preliminary results of R/V METEOR Cruise M 49/3, Montevideo (Uruguay) - Salvador (Brasil), March 9 - April 1, 2001.
99 pages, Bremen, 2001.

No. 186 **Scheibner, C.**
Architecture of a carbonate platform-to-basin transition on a structural high (Campanian-early Eocene, Eastern Desert, Egypt) – classical and modelling approaches combined.
173 pages, Bremen, 2001.

No. 187 **Schneider, S.**
Quartäre Schwankungen in Strömungsintensität und Produktivität als Abbild der Wassermassen-Variabilität im äquatorialen Atlantik (ODP Sites 959 und 663): Ergebnisse aus Siltkorn-Analysen.
134 pages, Bremen, 2001.

No. 188 **Uliana, E.**
Late Quaternary biogenic opal sedimentation in diatom assemblages in Kongo Fan sediments.
96 pages, Bremen, 2002.

No. 189 **Esper, O.**
Reconstruction of Recent and Late Quaternary oceanographic conditions in the eastern South Atlantic Ocean based on calcareous- and organic-walled dinoflagellate cysts.
130 pages, Bremen, 2001.

No. 190 **Wendler, I.**
Production and preservation of calcareous dinoflagellate cysts in the modern Arabian Sea.
117 pages, Bremen, 2002.

No. 191 **Bauer, J.**
Late Cenomanian – Santonian carbonate platform evolution of Sinai (Egypt): stratigraphy, facies, and sequence architecture.
178 pages, Bremen, 2002.

No. 192 **Hildebrand-Habel, T.**
Die Entwicklung kalkiger Dinoflagellaten im Südatlantik seit der höheren Oberkreide. 152 pages, Bremen, 2002.

No. 193 **Hecht, H.**
Sauerstoff-Optopoden zur Quantifizierung von Pyritverwitterungsprozessen im Labor- und Langzeit-in-situ-Einsatz. Entwicklung - Anwendung – Modellierung.
130 pages, Bremen, 2002.

No. 194 **Fischer, G. and cruise participants**
Report and Preliminary Results of RV METEOR-Cruise M49/4, Salvador da Bahia – Halifax, 4.4.-5.5.2001.
84 pages, Bremen, 2002.

No. 195 **Gröger, M.**
Deep-water circulation in the western equatorial Atlantic: inferences from carbonate preservation studies and silt grain-size analysis.
95 pages, Bremen, 2002.

No. 196 **Meinecke,G. and cruise participants**
Report of RV POSEIDON Cruise POS 271, Las Palmas - Las Palmas, 19.3.-29.3.2001.
19 pages, Bremen, 2002.

No. 197 **Meggers, H. and cruise participants**
Report of RV POSEIDON Cruise POS 272, Las Palmas - Las Palmas, 1.4.-14.4.2001.
19 pages, Bremen, 2002.

No. 198 **Gräfe, K.-U.**
Stratigraphische Korrelation und Steuerungsfaktoren Sedimentärer Zyklen in ausgewählten Borealen und Tethyalen Becken des Cenoman/Turon (Oberkreide) Europas und Nordwestafrikas.
197 pages, Bremen, 2002.

No. 199 **Jahn, B.**
Mid to Late Pleistocene Variations of Marine Productivity in and Terrigenous Input to the Southeast Atlantic.
97 pages, Bremen, 2002.

No. 200 **Al-Rousan, S.**
Ocean and climate history recorded in stable isotopes of coral and foraminifers from the northern Gulf of Aqaba.
116 pages, Bremen, 2002.

No. 201 **Azouzi, B.**
Regionalisierung hydraulischer und hydrogeochemischer Daten mit geostatistischen Methoden.
108 pages, Bremen, 2002.

No. 202 **Spieß, V. and cruise participants**
Report and preliminary results of METEOR Cruise M 47/3, Libreville (Gabun) - Walvis Bay (Namibia),
01.06 - 03.07.2000. 70 pages, Bremen 2002.

No. 203 **Spieß, V. and cruise participants**
Report and preliminary results of METEOR Cruise M 49/2, Montevideo (Uruguay) - Montevideo, 13.02 - 07.03.2001. 84 pages, Bremen 2002.

No. 204 **Mollenhauer, G.**
Organic carbon accumulation in the South Atlantic Ocean: Sedimentary processes and glacial/interglacial Budgets.
139 pages, Bremen 2002.

No. 205 **Spieß, V. and cruise participants**
Report and preliminary results of METEOR Cruise M49/1, Cape Town (South Africa) - Montevideo (Uruguay), 04.01.2000 - 10.02.2000.
57 pages, Bremen, 2003.

No. 206 **Meier, K.J.S.**
Calcareous dinoflagellates from the Mediterranean Sea: taxonomy, ecology and palaeoenvironmental application.
126 pages, Bremen, 2003.

No. 207 **Rakic, S.**
Untersuchungen zur Polymorphie und Kristallchemie von Silikaten der Zusammensetzung Me2Si2O5 (Me:Na, K).
139 pages, Bremen, 2003.

No. 208 **Pfeifer, K.**
Auswirkungen frühdiagenetischer Prozesse auf Calcit- und Barytgehalte in marinen Oberflächen-sedimenten. 110 pages, Bremen, 2003.

No. 209 **Heuer, V.**
Spurenelemente in Sedimenten des Südatlantik. Primärer Eintrag und frühdiagenetische Überprägung.
136 pages, Bremen, 2003.

No. 210 **Streng, M.**
Phylogenetic Aspects and Taxonomy of Calcareous Dinoflagellates.
157 pages, Bremen 2003.

No. 211 **Boeckel, B.**
Present and past coccolith assemblages in the South Atlantic: implications for species ecology, carbonate contribution and palaeoceanographic applicability.
157 pages, Bremen, 2003.

No. 212 **Precht, E.**
Advective interfacial exchange in permeable sediments driven by surface gravity waves and its ecological
consequences. 131 pages, Bremen, 2003.

No. 213 **Frenz, M.**
Grain-size composition of Quaternary South Atlantic sediments and its paleoceanographic significance.
123 pages, Bremen, 2003.

No. 214 **Meggers, H. and cruise participants**
Report and preliminary results of METEOR Cruise M 53/1, Limassol - Las Palmas – Mindelo, 30.03.2002 - 03.05.2002.
81 pages, Bremen, 2003.

No. 215 **Schulz, H.D. and cruise participants**
Report and preliminary results of METEOR Cruise M 58/1, Dakar – Las Palmas, 15.04..2003 - 12.05.2003. Bremen, 2003.

No. 216 **Schneider, R. and cruise participants**
Report and preliminary results of METEOR Cruise M 57/1, Cape Town – Walvis Bay, 20.01. – 08.02.2003.
123 pages, Bremen, 2003.

No. 217 **Kallmeyer, J.**
Sulfate reduction in the deep Biosphere.
157 pages, Bremen, 2003.

No. 218 **Røy, H.**
Dynamic Structure and Function of the Diffusive Boundary Layer at the Seafloor.
149 pages, Bremen, 2003.

No. 219 **Pätzold, J., C. Hübscher and cruise participants**
Report and preliminary results of METEOR Cruise M 52/2&3, Istanbul – Limassol – Limassol, 04.02. – 27.03.2002. Bremen, 2003.

No. 220 **Zabel, M. and cruise participants**
Report and preliminary results of METEOR Cruise M 57/2, Walvis Bay – Walvis Bay, 11.02. – 12.03.2003.
136 pages, Bremen 2003.

No. 221 **Salem, M.**
Geophysical investigations of submarine prolongations of alluvial fans on the western side of the Gulf of Aqaba-Red Sea.
100 pages, Bremen, 2003.

No. 222 **Tilch, E.**
Oszillation von Wattflächen und deren fossiles Erhaltungspotential (Spiekerooger Rückseitenwatt, südliche Nordsee).
137 pages, Bremen, 2003.

No. 223 **Frisch, U. and F. Kockel**
Der Bremen-Knoten im Strukturnetz Nordwest-Deutschlands. Stratigraphie, Paläogeographie, Strukturgeologie.
379 pages, Bremen, 2004.

No. 224 **Kolonic, S.**
Mechanisms and biogeochemical implications of Cenomanian/Turonian black shale formation in North Africa: An integrated geochemical, millennial-scale study from the Tarfaya-LaAyoune Basin in SW Morocco.
174 pages, Bremen, 2004. Report online available only.

No. 225 **Panteleit, B.**
Geochemische Prozesse in der Salz- Süßwasser Übergangszone. 106 pages, Bremen, 2004.

No. 226 **Seiter, K.**
Regionalisierung und Quantifizierung benthischer Mineralisationsprozesse.
135 pages, Bremen, 2004.

No. 227 **Bleil, U. and cruise participants**
Report and preliminary results of METEOR Cruise M 58/2, Las Palmas – Las Palmas (Canary Islands, Spain), 15.05. – 08.06.2003.
123 pages, Bremen, 2004.

No. 228 **Kopf, A. and cruise participants**
Report and preliminary results of SONNE Cruise SO175, Miami - Bremerhaven, 12.11 - 30.12.2003.
218 pages, Bremen, 2004.

No. 229 **Fabian, M.**
Near Surface Tilt and Pore Pressure Changes Induced by Pumping in Multi-Layered Poroelastic Half-Spaces.
121 pages, Bremen, 2004.

No. 230 **Segl, M. and cruise participants**
Report and preliminary results of POSEIDON Cruise 304, Galway – Lisbon, 05.10 - 22.10.2004.
27 pages, Bremen, 2004.

No. 231 **Meinecke, G. and cruise participants**
Report and preliminary results of POSEIDON Cruise POS 296, Las Palmas – Las Palmas, 04.04 - 14.04.2003.
42 pages, Bremen, 2005.

No. 232 **Meinecke, G. and cruise participants**
Report and preliminary results of POSEIDON Cruise POS 310, Las Palmas – Las Palmas, 12.04 - 26.04.2004.
49 pages, Bremen, 2005.

No. 233 **Meinecke, G. and cruise participants**
Report and preliminary results of METEOR Cruise M 58/3, Las Palmas – Ponta Delgada, 11.06 - 24.06.2003.
50 pages, Bremen, 2005.

No. 234 **Feseker, T.**
Numerical Studies on Groundwater Flow in Coastal Aquifers,
219 pages., Bremen 2004

No. 235 **Sahling, H. And cruise participants**
Report and preliminary results of POSEIDON Cruise POS 317/4, Istanbul-Istanbul, 16.10-04.11.2004.
92 pages, Bremen, 2004.

No. 236 **Meinecke, G. and cruise participants**
Report and preliminary results of POSEIDON Cruise 305, Las Palmas – Lisbon, 28.10.-06.11.2003.
43 pages, Bremen, 2005.