

SPP-reader

The bi-annual newsletter of the DFG Priority Program SPP 1144
Issue 4, December 2005

The SPP 1144 web site is at:
www.deridge.de

Fourth Edition

The SPP 1144: "From Mantle to Ocean: Energy-, Material- and Life Cycles at Spreading Axes" started on the first of October 2003, and with it this newsletter. In general, there will be two editions per year. We hope that you will find this newsletter useful. Please send any feedback you may have to Katja Freitag (kfreitag@ifm-geomar.de). This is also the address to use if you have a contribution which you would like included in the next issue.

Our bi-annual newsletter aims to bring you all the latest developments and news related to the SPP and other international activities at mid-ocean ridges.

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We would like to take this opportunity to wish all SPP participants and their families a Merry Christmas and a Happy New Year!!!

Funded proposals for the 2nd Phase (10/05 – 10/07) of SPP 1144

The following projects were funded in the second phase of SPP 1144:

Geobiological coupling between hydrothermal vent fluids and symbiotic primary producers at spreading axes.	N. Dubilier - Max Planck Institute of Marine Microbiology, Bremen
Numerical modeling of mantle flow, melt migration, and MORB compositions.	M. Hort, Geophysik, Uni Hamburg
Low pressure differentiation of basalts at the Mid-Atlantic Ridge near Ascension - Constraints from experiments at controlled volatile and oxygen fugacities.	F. Holtz and J. Koepke, Institute für Mineralogie, Universität Hannover
Hydrothermal fluids at the Mid-Atlantic Ridge (15°N and 4-11°S) as media for the transport of energy and mass from the crust into the hydro- and biosphere.	A. Koschinsky, International University Bremen and D. Garbe-Schönberg, Universität Kiel
High- and low-temperature alteration of ultramafic oceanic crust: Mineralogy, geochemistry and isotope characteristics of hydrothermal systems at the Mid Atlantic Ridge between 14° and 15°N.	K.S. Lackschewitz, C.W. Devey and A. Eisenhauer, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel
Gas chemistry and carbon cycling at hydrothermal systems along the Mid-Atlantic Ridge: time- and space-referenced biogeochemical and isotopic investigations.	R. Seifert, Institut für Biogeochemie und Meereschemie, Hamburg
Logatchev longterm hydrothermal field environmental monitoring.	H. Villinger, M. Fabian and C. Waldmann, Fachbereich Geowissenschaften, Universität Bremen
Geophysical studies near the Ascension Transform: evolution of ridge segmentation and crustal structure - Auswertung.	T. J. Reston, J. Bialas and I. Grevemeyer, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel
The third dimension of the ultramafic-hosted Logatchev-1 hydrothermal field: sulfide formation, evolution, and fluid flow in the subseafloor.	S. Petersen, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel
In-situ determination of the spatial and temporal variation of elements and energy in hydrothermal fluids and associated microbial activity.	F. Wenzhöfer, MPI-Bremen
Opaque phase petrology and geochemical modeling as a guide to abiotic organic synthesis in the Mid-Atlantic Ridge 15°N area.	W. Bach, Universität Bremen
Metagenomic studies of the diversity and function of chemosynthetic microbial communities at oceanic spreading zones.	A. Meyerdierks, MPI-Bremen
Sulphur isotopic investigation of dissolved and solid sulphur phases in fluids, mineral precipitates, sediments and rock samples from the Mid-Atlantic Ridge.	H. Strauss, Universität Münster
Passive electromagnetic and seismological measurements to study the deep melt structure beneath the mid-Atlantic ridge (MAR).	T. Dahm, Institut für Geophysik, Universität Hamburg and M. Jegen, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel
The geology and structure of the Mid-Atlantic Ridge near Ascension Island.	C. W. Devey, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel
Coordination of the Priority Program 1144 "From the mantle to the ocean".	C. W. Devey, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel
Methane transport to the ocean from the Mid-Atlantic Ridge, 7°S to 11°S.	R. Keir and G. Rehder, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel
High resolution volcanology and geochemistry of mid ocean ridge segments flanking the 9°40'S melt anomaly and the Ascension hot spot.	C. Münker, Universität Münster and H. Paulick, Universität Bonn
The role of high- and low-temperature alteration of oceanic crust on the marine calcium budget.	A. Eisenhauer, F. Hauff and K. S. Lackschewitz, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel
Temporal evolution of hydrothermal systems at the Mid-Atlantic Ridge.	J. Scholten and P. Stoffers, Universität Kiel, A. Eisenhauer, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel
U-Th-Ra disequilibria in basalts from the Mid-Atlantic Ridge 6-11°S: Constraints on melting, mixing and time-scales of magmatic processes.	Karsten Haase, Universität Kiel and Folkmar Hauff, IFM-GEOMAR Leibniz-Institut für Meereswissenschaft, Kiel

Abstracts of these projects are available on the SPP 1144 website.

Summary of Meteor cruises M64/1 and M64/2

M64/1

On 2 April 2005 FS METEOR left the port of Mindelo (Cape Verdes) and steamed southwards towards 5°S on the Mid-Atlantic Ridge. On the evening of 7 April we arrived at our first working site, the Turtle Pits hydrothermal field which was discovered only weeks before by a British-American cruise, the location of which was kindly forwarded to us by C. German and T. Shank (WHOI). We sampled the area using the MARUM QUEST ROV which performed six dives in this hydrothermal field as well as one dive at the Red Lion field where one active smoker had been reported by our British-American colleagues. During the night, lava and hydrothermal rocks were recovered using the TV grab and a wax corer. CTD/rosette and MAPR stations were carried out to determine the location of the hydrothermal plume. Both the Turtle Pits and the Red Lion fields each consist of four active chimneys on young basaltic lavas. During the ROV dives the structures were photographed, measured, and samples of fluids and rocks were taken.

After completing our investigations in the 5°S area we started a detailed bathymetric survey and sampling program of a large volcanic field on the MAR close to 8°50'S. Lavas of the volcanic field were sampled using the wax corer and two ROV dives. These samples were used to study the volcanology and geology of the area. Surprisingly, much of the volcanic field was covered by sediments although the sidescan maps showed a very high reflectivity. CTD and MAPR stations in the area of the volcanic field did not show any hydrothermal signals and we concluded that the southern part of segment A2 is probably both volcanically and hydrothermally inactive.

After three days of work on segment A2 we continued hydrothermal exploration on segment A3 using wax corers with MAPRs and CTD/rosettes. Two dives were performed on the shallowest portion of segment A3 proximal to the near-axis seamounts in order to study the volcanology and sample lavas. Five CTD stations enabled us to locate a potential hydrothermal vent in the area between 9°32.5'S and 9°33.0'S and during a follow-up ROV dive, we found the

active low-temperature Liliput hydrothermal field in the volcanically active zone at 1500 m water depth. The name "Liliput" was selected due to the extreme abundance of small mussels. Biological, geological and fluid samples were taken. During the night, two TV grab stations recovered more hydrothermal sediment, lava and biological specimen from this field. Early in the morning on 3 May METEOR arrived in Fortaleza after a very successful cruise.

M64/2

The R/V METEOR cruise M64/2 was the second German expedition to the hydrothermally active Logatchev field at 14°45'N and took place from 6 May till 6 June 2005, starting in Fortaleza/Brasil and ending in Dakar/Senegal.

Further mapping and sampling as well as the first deployment of long-term monitoring stations were accomplished in the Logatchev Hydrothermal Field-1 (LHF-1) at 14°45'N on the Mid-Atlantic Ridge. The main working tools during our cruise were the deep-sea ROV "QUEST", a TV-grab, a TV-sled and a hydrocast. At 14°45.047 N and 44°58'671 W we discovered a 5 m high active black smoker (site "A" after Gebruk et al., 1997) which was named "Barad-Dûr" after the black tower of Mordor in the bestseller "Lord of the Rings". Based on a video and photographic survey we were able to create a photomosaic of this tower as well as of the smoker complex at the IRINA II site. During a ROV survey northwest of the active QUEST site we found a new diffusely venting site at 14°45.31 N and 44°58.87 W.

Along CTD surveys above LHF-1 a clearly defined methane-enriched plume (up to 0.3 µmol/L CH₄) was identified between 2700 m and 2900 m water depth. Strong evidence was found for additional hydrothermal activity approximately 2 nautical miles northwest of LHF-1. High hydrogen concentrations (> 50 nmol/L) together with a layer of increased light transmission at 3030 to 3080 m water depth indicate the presence of venting in this area.

During 9 ROV dives we sampled a large variety of sulfides and Fe-oxid-hydroxide crusts. In addition, 7 TV grab stations with serpentinized pyroxenites, Mn-crusts, silicified crusts and atacamites completed the

overall surface sampling exercise in the area of LHF-1. This was a direct continuation of the work that began in 2004 during cruise M60/3. A total of 15 vent fluid samples were obtained with the ROV fluid sampling system. The sampled vent fluids are highly reduced and acidic indicating a low proportion of intermixed seawater. Lowest values obtained for fluid samples were a pH of 3.9 and -370 mV for Eh. The highest in-situ temperature measured during this cruise was 350°C at Site "B".

During this cruise, we also continued our ongoing studies of geobiological coupling at MAR vents by identifying and characterizing gradients in vent fluids in mussel beds, and collecting mussels along these gradients for analysis of the biomass and activity of the bacterial symbionts. In-situ microsensor

measurements of O₂, pH, H₂S, T and, for the first time, H₂ were used to investigate the link between the geochemical energy supply from hydrothermal fluids and hydrothermal vent communities. These high-resolution microprofiles allow us to determine the variability of hydrothermal fluid emission in space and time and its influence on vent communities.

An ocean bottom tiltmeter (OBT) and an ocean pressure meter (OBP) were deployed in LHF-1 to monitor tidal loading, micro seismicity and recent tectonic processes over a time period of ≥ 1 year. In addition, we have placed a set of temperature loggers in mussel fields of the QUEST and IRINA II sites that monitor temperature variations in the biological community as a possible indicator for changes in their living environment.

(M64/2 cruise report is available on the SPP 1144 website)

Upcoming events

Meteor-cruise M68/1

Cruise M68/1 starts on 27 April 2006 in Barbados and ends in Recife, Brazil, on 2 June (PI: A. Koschinsky, International University Bremen). Previous cruises (M62/4, M62/5, M64/1, CD169) provided the necessary volcanological, tectonic and water column information to begin to assess the regional distribution of hydrothermal systems and their volcano-tectonic settings. These cruises yielded the first samples of hydrothermal systems (at 5°S and 9°33'S) south of the large equatorial fracture zones as well as picking up signals (at 8°10'S, 8°18'S) of other possible systems along the ridge. One vent site at 5°S is of special interest because it shows unusual fluid and mineral compositions and appears to be in an early post-eruptive state. Cruise M68/1 builds on the work of these previous cruises in order to (a) provide a quantitative estimate of the regional distribution of hydrothermal activity between 4°S and 10°S, (b) establish the volcano-tectonic setting of this activity, (c) determine the nature of the ecosystems associated with the activity, and (d) evaluate the role of the large equatorial fracture zones as possible biogeographic filters between the northern and the southern MAR.

Hydrothermal prospecting and plume mapping will be carried out with the autonomous underwater vehicle (AUV) 'ABE' from WHOI (cooperation partners C.

German, T. Shank). Target areas for ABE deployment will be identified from CTD casts and hydrothermal tracer anomalies. During the ROV Quest dives, chemical, biological and geological samples will be obtained. These will include measurements of the physico-geochemical near-field surroundings. Combined measurements of gases, metals, and turbidity together with physical properties (T, S) will provide an estimate of the fluxes from the hydrothermal vents located between 5°S to 10°S. In the 5°S area, temporal and spatial changes in vent activity and chemistry will be investigated in this young, hot, boiling system.

Merian-cruise 2006 "Rockdrill II"

The HYDROMAR IV cruise with RV Maria S. Merian will start on 11 November 2006 in Fort de France, and ends in Fortaleza on 2 December 2006 (PI: T. Kuhn, IFM-GEOMAR, Kiel). This project proposes to drill shallow boreholes (15 m) into the ultramafic-hosted active vent sites of the Logatchev-1 hydrothermal field located at 14°45'N on the slow-spreading MAR. The newly built Rockdrill 2 of the British Geological Survey in Edinburgh (UK) will be used as the drilling device. The subsurface samples drilled during the proposed cruise will complement surface samples gathered during the HYDROMAR I III cruises and deep samples gathered during ODP Leg 209 (2003).

The major scientific objectives include the investigation of the depth zonations of the mineralization and

alteration, their age relationships and the establishment of the variability of the subsurface biosphere. The results of these investigations will improve our understanding of the fluid chemistry and the faunal distribution found and sampled at the seabed.

Merian-cruise “Time-series measurements at LHF”

The HYDROMAR III cruise with RV Maria S. Merian to Logatchev (MAR, 14°45' N) was initially planned for January 2006, but has now been postponed till early October – early November 2006 (PI: C. Borowski, MPI-Bremen). While exact dates are not yet available, the cruise will most likely start in Las Palmas and end in Fort de France. As the Quest ROV is not available, we are currently negotiating for an alternative ROV system that will be chartered by the SPP.

The main objective of this cruise is to continue time series investigations of temporal variability patterns of the physico-chemical environment that began in

2005 on the RV Meteor cruise M64/2. The recovery of monitoring devices for temperature, pressure and seismicity and also biological experiments deployed during M64/2 will provide the first continuous long-term data sets from the Logatchev field. The data sets will cover a period of 16 months.

Further investigations include organic and anorganic fluid geochemistry and sulfur isotopes, biogenicity of iron oxidation, microbial diversity and activity, metagenomics, in-situ sensor measurements and in-situ experiments to study activity patterns of hydrothermal symbiosis. For some of these investigations, long-term in-situ experiments and monitoring devices will be deployed. The new SIMRAD multi-beam echo sounder installed on RV Maria S. Merian will be used for high resolution swath bathymetry mapping, which will provide a better understanding of the MAR median valley topography around the Logatchev field and may help us locate other hydrothermal structures.

Main objectives of planned Meteor and Merian cruises 2007

Three proposals were submitted to the Senatskommission für Ozeanographie for scheduling in 2007. All three proposals received in principle positive reviews, however the reviewers were not prepared to make a final decision without a “Mid-term synthesis” of the results of the cruises so far. Pending the successful compilation of this synthesis and its acceptance by the reviewers, the following comments on cruises in 2007 are purely for information on what has been proposed only and do not imply that the cruises will take place.

In 2005, Grevemeyer et al. submitted a proposal to the Senatskommission for a follow-up cruise entitled “*Geophysical study of the magmatic/tectonic regime of the Logatchev Hydrothermal field along the Mid-Atlantic Ridge at 15°N*”. The cruise was proposed for 2007.

The aim of the proposed studies is to investigate the magmatic system of the Mid-Atlantic Ridge at 15°N and gain fundamental insight into the relationship between the melting system, magma chambers and the location of active hydrothermalism.

A focus of the work is to study the spatial position of the Logatchev hydrothermal field in relation to the system of upwelling melts under the Mid-Atlantic Ridge as well as to investigate the interactions between active magmatism and tectonic extension. In order to do this, various geophysical techniques (seismic profiles, ocean bottom seismometers (OBS), magnetotelluric techniques (MT), broadband seismic compliance measurements and active electromagnetic measurements (CSEM)) would be used to enable us to obtain data from different levels of the system and use these to come up with quantitative conclusions regarding the depth and cause of the thermal anomaly at the Logatchev hydrothermal field.

The goal of the proposed 2007 *HYDROMAR V Meteor cruise* (PI Thomas Kuhn, IFM-GEOMAR, Kiel) is to continue the time series investigations of geophysical, fluid chemical, and biological parameters in the Logatchev hydrothermal field, MAR at 14°45'N. Time series investigations in this area started with the HYDROMAR I cruise (Kuhn et al., 2004) which formed part of the SPP 1144 program, and are being continued with the HYDROMAR II (Lackschewitz et al., 2005) and HYDROMAR III (Borowski et al., 2006) projects.

The HYDROMAR V cruise would form an integral

and critical part of these investigations of the time-dependent changes in the Logatchev hydrothermal field system. The main focus of our cruise would be to revisit the locations that were studied in detail during the 2004-2006 cruises and which have comprehensive scientific results available. Our investigations would be used to compare how individual vents have changed geochemically over time and determine the possible influence this has had on the macrofaunal and microbial communities.

The fourth cruise to the southern SPP area (*MARSÜD IV*; PI Devey, IFM-GEOMAR, Kiel) is also in review at the Senatskommission. The proposed cruise marks a clear focussing of the SPP on its prime regions of interest within the South Atlantic working area and the initiation of the integration studies to begin to form a homogenous overview. Thus the work will be concentrated into four key areas:

- *Vents around 4°48'S*: Found in 2004 and sampled for the first time during cruise M64/1, these vents provide a wide variety of fluid types, habitats and geological settings to investigate the linkages between magmatism,

fluid circulation and ecosystems in the deep sea.

- *Deep crust exposed at 5°S*: There is mounting evidence that the deep crust also plays an important role in hydrothermal circulation and that water in the deep crust can strongly influence magmatic processes. Earlier studies during M47/2 have shown the presence of good lower crustal exposures on an inside corner high just south of the 4°48'S vent fields.

- *Lilliput Vent Fields at 9°32'S*: These vents were first seen during M64/1. They provide an ideal compliment, in much shallower water, to the 4°48'S vents, enabling the influence of water depth on hydrothermal and biological processes to be investigated in a systematic way for the first time.

- *Segment A4*: Up to present severely undersampled due to its geographical isolation, studying this segment is imperative for one of the overarching goals of the SPP, namely to provide a regional view of hydrothermal activity on the ridge.

The latest technology (ROV, AUV) combined with a multi-disciplinary scientific team will be used to investigate all these areas.

News from the SPP 1144 data management

Pangaea data management continued this year by preparing and transferring data from the Meteor M60/3 cruise. Preparation of M62/5 and M64/2 cruise data are in progress. The basic requirement to import the majority of cruise and scientific data is accurate geographic location, i.e. final site/station lists and the navigational data of the OFOS and ROV dives. Collecting and inputting location data is also still in progress.

In order to continue the process of expanding the Pangaea database, all SPP1144 participants from these cruises are requested to provide revised cruise data and final scientific data for the project archive. Please also provide all information (metadata) describing your data. The list of required metadata includes:

General data: Cruise label, basis (ship), Responsible scientist (PI) for the provided data

Complete core/sample/measurement ("event")

metadata: Site information - complete core label, latitude/longitude, elevation/depth, gear, date/time.

Data: Definition of investigated parameters (fossil species, phys. properties, chem. elements, etc.), exact

parameter units (SI units, generally accepted/used units), depth (in sediment/in water), distance from a base point, age, complete list of abbreviations used in the data table. The data should be arranged in simple tables: 1. column: site/sample label, 2. to n column: depth/age/date-time, following columns: parameters. *Exact description of the analytical or calculation methods*: laboratory device[s], analytical process, age model, reference[s] for the used method. *Source of data* (reference[s] of published data, cruise report)

REMEMBER, a good database requires input of good data as well as accurate and complete metadata!

Depending on the data volume, data files can be sent as email attachments or by regular mail on disk or CD-ROM. Data must be in an established file format (e.g. Excel, ASCII-Text, GIF, JPG, PDF).

Please contact the support page of the project data website for more information and examples <http://www.pangaea.de/Projects/SPP1144/supp.html>. Any other questions can be directed to H.-J. Wallrabe-Adams (hwallrabe@pangaea.de or tel +49 (0)421 218 65592).

3rd SPP1144-Workshop, Etelsen, 04.- 06.7.06

This is the first announcement for the 3rd SPP1144 workshop that will take place in July 2006. The workshop will be used to present the results of the Meteor cruise M68/1 and the results of the funded SPP1144 DFG-projects. Furthermore, it will give us the opportunity to coordinate the evaluation of data from the Mid-Atlantic ridge segments and hydrothermal vent fields in the

selected areas at 15°N and between 7 and 11°S as well as discuss how best to go about publishing these.

The workshop will bring together scientists and graduate students from all disciplines interested in both field areas. Based on our positive experience last year, the workshop will be held in Etelsen (near Bremen) from 04.-06.7.06. An official invitation together with a registration form will be sent out by the DFG during spring 2006.

News from the InterRidge Office

This has been a successful second year for the InterRidge office hosted in Germany.

Office activities: A fundamental part of InterRidge office activities is to provide up-to-date ridge-related information through the annual IR News, IR info emails and the InterRidge website (www.interridge.org). A lot of effort goes into maintaining the IR membership database so if you have recently moved (or are interested in being in this database) please send Katja Freitag your details. The resources of the InterRidge office are not sufficient to maintain extensive scientific databases. The InterRidge office will therefore concentrate on maintaining the database of ridge researchers and cruises, and will create portal pages with information about relevant databases around the world. A first step towards this was done when the InterRidge biology database was amalgamated with the ChEss database "ChEssBase" in September.

Education Outreach activities: InterRidge has a major role to play in educating the public and policy-makers about the global significance of ridges and so pledged to spearhead an education outreach program in its second decade plan. The goal is to ensure that InterRidge's message of responsible exploration and discovery of the world's deep ocean actively engages students, policy-makers, and other members of the general public. InterRidge has designed and undertaken two main E&O initiatives to help achieve its goals: a Deep Ocean Video Series, and Science Writer-At-Sea program. It is currently seeking funding for each and welcomes potential partners. A pilot test of the writer at sea program successfully took place this summer on a cruise co-led by Rolf Pedersen (Norway). For more information on InterRidge's E&O plans or if you would like to participate

in our initiatives, please go to the InterRidge website or contact Kristen Kusek (kristenkusek@aol.com).

Recent events: In April 2005, a MoMAR-InterRidge-Ridge 2000 International MoMAR Implementation Workshop took place in Lisbon, Portugal and was attended by approximately 80 scientists from 12 countries. The workshop objectives were to continue the planning process for long-term monitoring while also taking into account the additional goals of a Ridge 2000 Integrated Study Site, to design experiments to conduct both in the short-term (~3 years) and in the long-term when a cable or buoy to provide power and data transmission might be in place, and to develop implementation plans to move these studies forward. The aim was to make the move beyond planning the observatory (i.e. compiling the wish-list of useful experiments, parameters etc.) which had been achieved by the previous workshop toward defining the implementation plan to allow us to collect these data. In addition, the meeting looked at how scientific research, an integral and essential part of any protection strategy, can best be coordinated to yield maximum results for minimal environmental impact. Hydrothermal sites on spreading axes are also increasingly become the focus of interest from environmental protection groups.

From 11-12 April, the InterRidge Steering Committee Meeting, took place at IFM-GEOMAR in Kiel. This was well attended with 13 of the 16 then current members present. Apart from introducing new steering committee members and presenting updates of the national ridge programs and activities, a lot of discussion regarding the code of conduct for research at hydrothermal vent sites, which InterRidge is developing, took place. The meeting outlines InterRidge activities for the upcoming year, and always presents an opportunity to establish networks amongst the different nations.

In May, InterRidge and Ridge 2000 organized a field school and field trip to the Troodos Ophiolite in Cyprus. Both events lasted a week and were led by Joe Cann, Leeds University, UK. Participation was good, with 38 students attending the field school and 19 scientists on the field trip.

In September 2005 the 3rd International Symposium on Seep and Hydrothermal Vent Biology took place at Scripps in California, USA. More than 170 scientists

from 18 countries used this meeting as a place to exchange science and ideas.

Upcoming events: From 20-22 September 2006 InterRidge is hosting a Polar Ridges workshop and meeting in Sestri Levante, Italy. For more information on this, and to pre-register (deadline is March 2006) see the InterRidge website (www.interridge.org/SCIENCE/IRmeetings/2006PolarRidges.html).

SPP 1144 members in the news

Weser-Kurier - 18. November 2005 (Platzierung: S. 14, Rubrik: Bremen)

SPARKASSENPREIS 2005

Together "Sparkasse Bremen" and "Unifreunde Bremen e. V." award innovative cooperation projects between the two Bremen universities with the annual "Sparkassenpreis".

This year's laureates are Dr. Andrea Koschinsky, IUB Professor of Geosciences, and Dr. Volker Ratmeyer, MARUM, University of Bremen. Endowed with 5.000 Euros the award was presented on 16 November 2005 in the "Haus der Wissenschaft". They won the prize for cooperating on the IUB project "Hydrothermal fluids at the Mid-Atlantic Ridge as media for the transport of energy and mass from the crust into the hydro- and biosphere", the results of which have gained a high level of international recognition.

(Extracted and modified from IUB'S President's News, November 2005 issue)



Die Preisträger Volker Ratmeyer (rechts vorn), Dietmar Koch (in grauem Jackett) und Professorin Andrea Koschinsky-Fritsche (Mitte) bei der Verleihung im Haus der Wissenschaft – umringt von Gratulanten.
FOTO: FRANK THOMAS KOCH

Mit Tiefseeroboter gebuddelt und neue Keramik erfunden

Unifreunde vergaben Preise für außergewöhnliche Forschungen

Von unserem Redakteur
Horst Frey

BREMEN. Es gibt in den Tiefen der Ozeane interessante heiße Quellen. Die untersuchten Professorin Andrea Koschinsky-Fritsche von der International University Bremen (IUB) und Volker Ratmeyer vom Zentrum für Marine Umweltwissenschaften der Uni Bremen mit einem Tiefseeroboter. Die Wissenschaftler haben jetzt den Preis der Sparkasse Bremen für innovative Kooperationsprojekte der Bremer Universitäten erhalten.

Professorin Andrea Koschinsky-Fritsche (IUB) und Dr. Volker Ratmeyer wurden insbesondere für ihre hervorragende Zusammenarbeit ausgezeichnet. Heiko Starobom, Vorstandsmitglied der Sparkasse Bremen, übergab im Haus der Wissenschaft den mit 5000 Euro dotierten Preis.

Eine weitere Auszeichnung erhielt der Ingenieur Dietmar Koch. Der wissenschaftliche Angestellte im Fachgebiet Keramische Werkstoffe und Bauteile der Universität Bremen bekam den „Bernd-Artin Wessels-Preis“ für ein gemeinsames Projekt mit der Bremer Goldschlägerei GmbH & Co (BEGO). Er hat eine neue keramische Gießmasse für die Dentaltechnik entwickelt, die Vorteile in der Verarbeitung bietet. Das Verfahren wird bei der BEGO künftig eingesetzt, um keramische Bauteile herzustellen. Das Projekt ist zugleich der Grundstein für weiterführende Kooperationen. Der mit

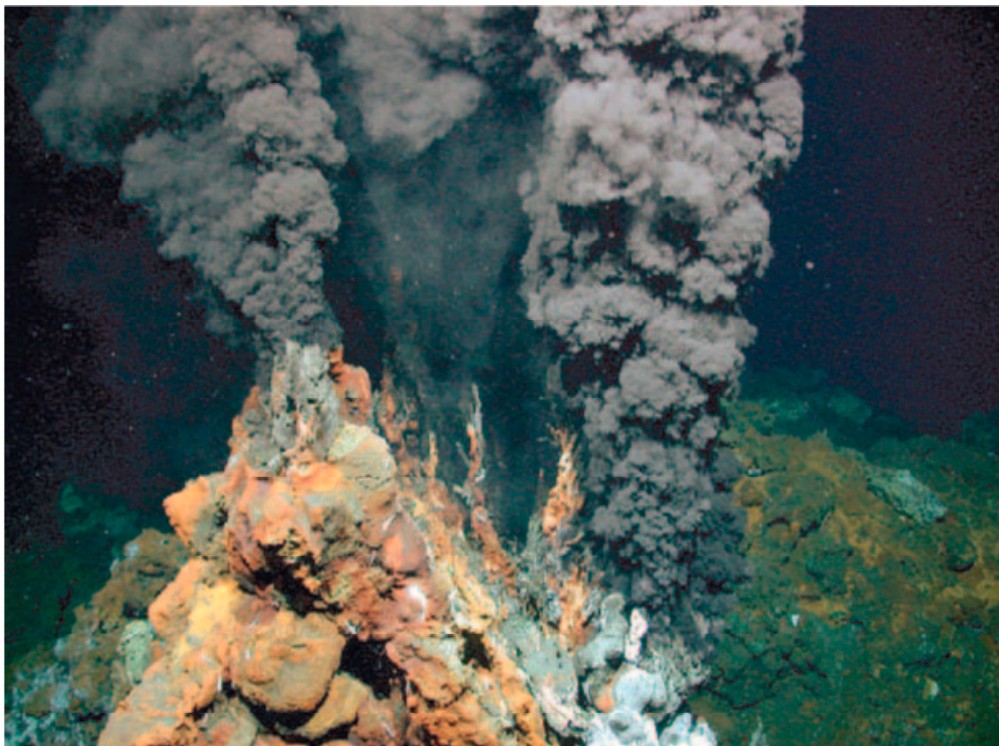
3500 Euro dotierte Preis hat der Stifter Bernd-Artin Wessels überreicht.

Dietmar Koch ist seit 1994 als stellvertretender Leiter im Fachgebiet Keramische Werkstoffe und Bauteile im Fachbereich Produktionstechnik der Universität Bremen tätig. Vor zwei Jahren hat er den ersten Preis beim Wettbewerb „Campus-Ideen 2003“ der Hochschulen des Landes Bremen gewonnen.

Mit Hilfe des Forschungsschiffes „Meteor“ und des Tiefseetauchroboters „Quest“ haben die IUB-Professorin Andrea Koschinsky-Fritsche und Marum-Mitarbeiter Volker Ratmeyer den Ozeanboden im Atlantik untersucht, ihre Forschungsergebnisse haben international für Anerkennung gesorgt und in beiden Universitäten eine Reihe weiterer wissenschaftlicher Arbeiten angestoßen.

Bevor Andrea Koschinsky-Fritsche 2003 zur IUB kam, lehrte sie als Privatdozentin an der Freien Universität Berlin. Ihr Forschungskollege Volker Ratmeyer promovierte an der Uni Bremen im Fachgebiet Meeresgeologie und sammelte bei Expeditionen auf Forschungsschiffen Erfahrungen im Betrieb ferngesteuerter Unterwasserfahrzeuge.

Die Laudatio auf die Preisträger hielten die Professoren Bernhard Kramer (IUB) und Gerold Wefer von der Uni Bremen. Beide Preise wurden anlässlich der Mitgliederversammlung der Unifreunde überreicht, deren Vorsitzender Professor Bengt Beutler ebenfalls gratulierte.



Bis zu zehn Meter hoch sind die Schloten der „Schwarzen Raucher“ am neu entdeckten Hydrothermalfeld im äquatorialen Südatlantik. Der Name, der vom englischen Fachausdruck „Black Smokers“ stammt, ist allerdings irreführend, denn aus den Schloten tritt kein Rauch, sondern eine etwa vierhundert Grad heiße wässrige Minerallösung. Beim Kontakt mit dem kalten Meerwasser fallen die darin enthaltenen Minerale als Feststoffe aus, was dann dem Wasser die dunkle Farbe verleiht.

Fotos Marion Brems

In den Tiefen des Südatlantiks brodet es gewaltig

Vor den Ascension-Inseln gibt es die heißesten hydrothermalen Quellen des mittelozeanischen Rückens

Es war eine wissenschaftliche Sensation, als Mitarbeiter des Meeresforschungsinstituts in Woods Hole (WHOI) in Massachusetts vor nunmehr knapp 30 Jahren in der Nähe der Galapagos-Inseln die ersten hydrothermalen Quellen in der Tiefsee entdeckten. Rund um diese Quellen, aus denen extrem heißes, an Mineralien äußerst reiches Wasser tritt, hat sich ein exotisches Ökosystem angesiedelt. Es besteht aus Bakterien, die Wasserstoff als Energiequelle nutzen, Röhrenwürmern, weißen Krebsen und eigenartigen Muscheln. Mittlerweile wurden solche hydrothermalen Quellen an mehreren Stellen im Pazifik, im Nordatlantik sowie im Indischen Ozean entdeckt. Auf einer kürzlich vom WHOI veröffentlichten, in Form eines Puzzles gehaltenen Weltkarte dieser Quellen fehlten aber im Südatlantik sämtliche Mosaiksteine. Wahrscheinlich, so vermuteten Meeresforscher, sei die mittelozeanische Vulkanzone im Südatlantik nicht aktiv genug, als daß dort hydrothermale Quellen entstehen könnten. Britische und deutsche Forscher haben aber nun etwa 400 Kilometer nordöstlich der Ascension-Insel die ersten heißen Quellen im Südatlantik entdeckt. Aus ihnen sprudelt das heißeste submarine Wasser überhaupt.

Die ersten Hinweise auf die heißen Quellen im Südatlantik fanden die britischen Wissenschaftler in diesem Frühjahr. Vom Forschungsschiff „Charles Darwin“ aus hatten sie entlang des mittelatlantischen Rückens bei etwa fünf Grad südlicher Breite Wasserproben entnommen. Dabei zeigte sich ein besonders hoher Gehalt an Mineralien. Mit einem sich autonom unter Wasser bewegenden U-Boot gelang es dann, den Ursprung des mineralreichen Wassers zu orten. Als das U-Boot nach dem Tauchgang an Bord gehievt wurde, entdeckte die Deckmannschaft, daß

die Farbe des Bootsrumpfes Spuren von Verbrühung zeigte. Allerdings gelang es nicht, Wasserproben zu entnehmen oder Fotos vom Meeresboden zu machen.

Daraufhin informierten die britischen Forscher die wissenschaftliche Besatzung des deutschen Forschungsschiffes „Meteor“, das während seiner 64. Forschungsreise in das Seegebiet in der Nähe der Ascension-Insel fahren sollte. Die Untersuchung der inzwischen als „Turtle Pits“ („Schildkrötenfalle“) bezeichneten untermeerischen Landschaft wurde zum Schwerpunkt dieser Reise. Auf der Herbsttagung der Amerikanischen Geophysikalischen Union in San Francisco stellte die Forschergruppe um Fahrleiter Karsten Haase vom Institut für Geowissenschaften der Universität Kiel jetzt erstmals die Ergebnisse dieser Untersuchungen vor.

Mit dem Tauchroboter „Quest“ aus Bremen gelang es, zahlreiche Proben von den Turtle Pits in knapp 3000 Meter Wassertiefe an die Meeresoberfläche zu bringen.

Diese wurden an Bord der „Meteor“ analysiert. Besonders aufsehenerregend war die Temperatur der heißen Quellen in diesem Gebiet. Mit 400 Grad lag sie nur wenig unter dem sogenannten Tripelpunkt, bei dem Wasser aus dem flüssigen in den überkritischen Zustand übergeht. Nirgendwo sonst gibt es heißere untermeerische Quellen. Das Wasser ist äußerst reich an gelöstem Wasserstoffgas, das die Nahrungsgrundlage für die vielen Bakterien bildet, die sich dort angesiedelt haben. Auch im Gehalt an Mineralien unterscheidet sich das Wasser der Turtle Pits erheblich von denjenigen der anderen hydrothermalen Quellen. Es enthält nur geringe Mengen an Kalzium und Magnesium, statt dessen aber recht viel Eisen.

Die hohe Temperatur und die chemische Zusammensetzung deuten nach Meinung von Haase auf einen untermeerischen Vulkanausbruch hin, der vor einigen Monaten oder höchstens wenigen Jahren stattgefunden haben muß. Tatsächlich zeigen die Unterwasseraufnahmen, die

von dem Tauchroboter gemacht wurden, zahlreiche Formationen frischer Lava. Die Vermutung wird durch die Aufzeichnungen von Seismometern auf der Ascension-Insel bestätigt. Sie registrierten vor drei Jahren einen Erdbebenschwarm in der Gegend, der auf aktive Magmabewegungen schließen läßt. Wenn sich diese Vermutung bestätigen sollte, wäre das der erste Nachweis von aktivem Vulkanismus im südlichen Teil des mittelatlantischen Rückens.

Bei künftigen Fahrten der Meteor sowie britischer und amerikanischer Forschungsschiffe in das Seegebiet in der Nähe der Ascension-Insel wollen die Meeresforscher den mittelatlantischen Rücken auch südlich der Turtle Pits weiter untersuchen. Bisher sind nämlich erst knapp zehn Prozent der mehr als 70 000 Kilometer langen submarinen Rücken in den Weltmeeren systematisch auf das Vorhandensein hydrothermalen Quellen kartiert worden. Dabei wurden aber selbst auf dem Gakkelrücken unter dem Arktischen Ozean heiße Quellen und entsprechende Lebensgemeinschaften entdeckt. Im Durchschnitt, so sagt Chris German, der Leiter der Expedition mit der „Charles Darwin“, sind im Pazifik und Nordatlantik die einzelnen Quellen etwa hundert Kilometer voneinander entfernt.

Möglicherweise kommen die hydrothermalen Ökosysteme aber noch viel häufiger vor. Diese Quellen sind nicht nur die Grundlage der einzigartigen Lebensformen in der Tiefsee. Weil in ihnen ursprünglich eiskaltes Meerwasser auf mehrere hundert Grad aufgeheizt wird, sorgen sie auch für einen erheblichen Transport von Wärme aus dem Erdinneren an die Oberfläche. Diese heißen Quellen, so faßt es Peter Rona von der Rutgers University in New Jersey zusammen, machten aus der Erde einen wassergekühlten Planeten.

HORST RADEMACHER



In der Dunkelheit der Tiefsee haben sich an den Hydrothermalfeldern exotische Ökosysteme gebildet. So sind hier auf den Steinen weiße Bakterienmatten zu sehen.

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