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InterRidge News

Initiative for international cooperation in ridge-crest studies

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Contents cont...

Errata for IR news 12.1, Spring 2003

Please note the name correction of the Korean member of Arctic Ridge WG. The correct name should be Y.K. Jin

Contents continued ....

Private dives to hydrothermal vent sites

Protect your experimental area!

Yes, the IR office has been contacted about plans for private dives to hydrothermal areas around the world.

Yes, other visitors to hydrothermal vent sites do want to avoid disturbing your long term observation areas and experiments in progress.

Yes, non-scientist visitors do respect scientific research!

Yes, it is your responsibility to inform the general public of the whereabouts of your activities.

Yes, you can protect your site by informing non-scientist visitors of vent areas you do not wish to be disturbed.

.....HOW?

By submitting your experimental area to the "proposed reserves" pages on the IR website:

http://www.intridge.org/reser-f.htm

InterRidge Office Updates

Letter from the Chair

We hosted the InterRidge Office for the past four years. It was the last third, and the most mature stage, of the InterRidge Program, with a total of 11 countries providing financial contribution and another 17 corresponding countries. It was the first time for Japan to host a central management office of such a large international program like InterRidge. During the time the InterRidge Office was hosted in Tokyo, Korea joined the InterRidge as an associated member and China is about to join. I believe the movement of the InterRidge Office to Asia substantially enhanced ridge-related research by the Asian countries.

Besides the enhancement of the ridge research activities in Asia, one of the major contributions of the InterRidge Tokyo Office was the continued delivery of routine and reliable coordination service of InterRidge. For the last four years, the InterRidge Office in Japan edited and published biannual issues of InterRidge News with research reports, updates and cruise/meeting information and distributed about 2700 copies to over 40 countries. The Office organised at least two InterRidge science meetings (workshops, symposia, or theoretical institutes) each year during the four years. InterRidge homepage was maintained with increased access to all the documents in electronic format. Continued coordination is really the key to InterRidge activity. One other major contribution of InterRidge Office was the coordination of the activities (workshops, meetings, and electronic communications) leading to the production of the InterRidge Next Decade Program.

We, Dr. Agnieszka Adamczewska, the full time InterRidge coordinator, Mr. Marek Kaczmarz, a part-time InterRidge assistant, and myself are proudly closing the InterRidge Tokyo office at the end of this year and transferring it to Germany. We appreciate the friendly and kind support and advice of InterRidge steering committee members, national correspondents and the majority of the world ridge community. We also thank the Ocean Research Institute of University Tokyo and its Center for International Cooperation of the institute for their continuous and generous support of InterRidge. We express sincere thanks to the International Cooperation Special Fund of the University of Tokyo that provided us crucial financial support at the beginning of the term.

We believe InterRidge will continue its success with the Next Decade Program through coordination by Germany.

Best regards, Kensaku

Kensaku Tamaki
Professor of Ocean Floor Geoscience
Ocean Research Institute, University of Tokyo
E-mail: tamaki@ori.u-tokyo.ac.jp

Coordinator's Update

InterRidge meetings

IR Steering Committee meeting

The next IR Steering Committee meeting will be held in Seoul, Korea, 21-22 May 2004.

Joint R2K-IR Theoretical institute: Interactions among Physical, Chemical, Biological, and Geological Processes in Backarc Spreading Systems

The second IR theoretical Institute will take place on Jeju (Cheju) Island, a shield volcanic island, located at the southern end of the Korean peninsular, from 24-28th May, 2004.

The IRTI will consist of 2 days of invited lectures and short courses, a one day field excursion, followed by a 2 day workshop devoted to discussions by subgroups.

Please contact the IR office (intridge@ori.u-tokyo.ac.jp) to pre-register your interest in attending.

InterRidge Workshop: Tectonic & oceanic processes along the Indian Ocean Ridge System

Is planned at National Institute of Oceanography, Goa, India 19 – 21 January 2005. For more information see the back of this issue. Please contact the IR office (intridge@ori.u-tokyo.ac.jp) to pre-register your interest in attending.

InterRidge meeting publications

IR workshop "Opportunities and Contributions of Asian Countries to the InterRidge Next Decade Initiative", held in Beijing, China, in October, 2003 was a great success, you can download the abstracts volume for this meeting from the IR website at: http://www.intridge.org/absvolbeijing03.pdf.

The abstract volume from the Symposium and Workshop: "Ridge-Hotspot Interaction: Recent Progress and Prospects for an Enhanced International Collaboration", held in Brest, France, September, 2003 is available from the IR website at: http://www.intridge.org/rhi03absvol.pdf.

InterRidge Office Updates

The meeting report will also be available for download very shortly.

The InterRidge office is moving!

The IR office has finished its term in Japan and will move to Germany in January 2004. The new Chair of InterRidge will be Prof. Colin Devey. CONGRATULATIONS Colin, we wish you the very best in continuing to expand the activities of InterRidge. Watch this space, for the next issue of IR news will provide all sorts of new information about the new office.

I would like to take this opportunity to express my gratitude and appreciation to some very special people who have made it possible for me to get this job done, for without them I certainly could not have managed. First of all I wish to thank Kensaku Tamaki, who has been the Chair of IR for the past four years, for being such a great person to work with and for making my stay in Japan a wonderful experience, without his trust in me and always finding a way "around" the obstacles we encountered I do not think I would still be here. I thank you, the entire international community, for your input and for reading IR news which we devoted a lot of time each year to prepare for you. I wish to give my thanks to all the people that have helped in the IR office over the past four years, but particularly to Hiroshi and Dan, without whom IR news would never get sent out! Last but not least I wish to thank Marek who has taken on the task of IR assistant with an unwavering diligence and has been the best assistant that anybody could ever wish for.

InterRidge membership

Germany has upgraded its membership in 2003 from an Associate to a Principal membernation. New steering committee members for Germany will be nominated next year.

Italy has downgraded its membership status from an Associate to a Corresponding member nation. Dr Paola Tartarotti from the University of Padova has agreed to be the Correspondent for Italy and work closely with the IR office to unite forces within Italian research community between the various research groups. For an update on what is happening in Italy see the Italian update on page 42 of this issue.

Steering Committee membership

On behalf of the Steering committee I wish to thank Prof. Kensaku Tamaki for leading the InterRidge program for the past 4 years. Prof. Colin Devey will take over as the new chair and two new German steering committee members will be selected from next year. Thank you also to Catherine Mével (France), Kim Juniper (Canada), Paul Dando (UK) and Enrico Bonatti (Italy) who have finished their term as the national representatives. Steve Scott from the University of Toronto will be the new national Canadian representative from 2004. Special thanks go to all the Working Group Chairs (current and past) who play such a crucial role in carrying out the InterRidge activities and have made the first decade of IR such a success. Since there will be large changes in the working groups during next year we can expect a number of new ad hoc steering committee members from next year.

The Next Decade Science Plan

The original, ten year, IR Science Programme has now come to an end. From the year 2004 the "Next Decade Science Plan" will come into operation. This means large changes for the IR community.

The Next Decade Science Plan is available for download at: http://www.intridge.org/imd.pdf, find out what's in store for the future of IR!

Working Groups

The current working group structure has undergone a major revision under the "Next Decade Plan", and the new Working Groups will start their activities from next year. For a brief overview of the New working groups see page 7 of this issue.

Information about IR working groups and projects can be found on the IR website:
http://www.intridge.org/act2.html

InterRidge website

We are continuing to upgrade and improve our website to maximise information transfer and make it user friendly. To make our homepage more interactive it is divided into two frames. The latest information about IR meetings, announcements and any other current, ridge related items is now at your fingertips, accessible directly from the left hand side frame on our homepage. The right hand side frame contains the familiar menus with lots of ridge related information. Due to the volume of information on our website a brief outline of what can be found there is available on page 6 of this issue.

Remember, you can always access our homepage by simply typing: http://www.intridge.org

The IR databases are unique, they provide an international pool of information about all manner of issues related to mid ocean ridges. The "Global hydrothermal vents database" as well as the "Ridge-Hot Spot Interaction Reference Database" can be searched by conventional method, by typing in search words in any of the fields but also these two databases contain interactive area maps to make searches easier. Thus, you can do your search by location just by clicking on the different areas on the globe. The databases take a lot of work to maintain but we relay on your input to keep them up to date!

As always, any comments and suggestions are welcome and remember that the IR office always waits for your input about meetings and ridge related cruises, as well as job vacancies and other ridge related bits and peaces of information. A brief summary of what can be found on the InterRidge website is also available at http://www.intridge.org/latest.htm

Agnieszka Adamczewska
InterRidge Coordinator
November 2003

InterRidge Office Updates

InterRidge Publications

The following InterRidge publications are available upon request. Fill out an electronic request from at http://www.intridge.org/act3.html
The most recent reports and meeting abstract volumes are available as downloadable files from the same site.

InterRidge News:

Past issues of InterRidge News, are available starting with the first issue published in 1992 until the present. Information about the research articles published in each issue can be found on the InterRidge website: http://www.intridge.org/irn-toc.htm

The InterRidge News issues published from 2000 (ie. InterRidge News 9.1 and all following issues) are available as downloadable PDF files from the same URL address on the InterRidge website, using Adobe Acrobat 4.0 or later versions.

Workshop and Symposium Abstract Volumes:

A full list of Abstract Volumes available from the IR office can be found on the IR website at the following URL: http://www.intridge.org/act3.html#abs. The latest Abstract Volume additions include:

InterRidge Workshop: Opportunities and Contributions of Asian Countries to the InterRidge Next Decade Initiative. pp47, Oct. 2003.

InterRidge Symposium and Workshop, Ridge-Hotspot Interaction: Recent Progress and Prospects for Enhanced International Collaboration, pp47, Sept. 2003.

Workshop and Working Group Reports:

IR MOMAR II (Monitoring the Mid-Atlantic Ridge), Workshop report pp.64, June 2002

Management and Conservation of Hydrothermal Vent Ecosystems, workshop report. Pp 29. May 2001.

IR MOMAR (MOnitoring the Mid-Atlantic Ridge) workshop report, April, 1999.

IR Mapping and Sampling the Arctic Ridges: A Project Plan, pp.25, December 1998.

ODP-IR-IAVCEI Workshop Rep.: The Oceanic Lithosphere and Scientific Drilling into the 21st Century, pp.89.

IR Global Working Group Workshop Report: Arctic Ridges: Results and Planning, pp.78, October 1997.

IR SW IR Project Plan, pp.21, October 1997 (revised version).

IR Meso-Scale Workshop Report: Quantification of Fluxes at Mid-Ocean Ridges: Design/Planning for the Segment Scale Box Experiment, pp.20, March 1996.

IR Active Processes Working Group Workshop Report: Event Detection and Response & A Ridge Crest Observatory, pp.61, December 1996.

IR Biological Ad Hoc Committee Workshop Report: Biological Studies at the Mid-Ocean Ridge Crest, pp.21, August 1996.

IR Meso-Scale Workshop Report: 4-D Architecture of the Oceanic Lithosphere, pp.15, May 1995.

IR Meso-Scale Project Symposium and Workshops Reports, 1994: Segmentation and Fluxes at Mid-Ocean Ridges: A Symposium and Workshops & Back-Arc Basin Studies: A Workshop, pp.67, June 1994.

IR Global Working Group Report 1993: Investigation of the Global System of Mid-Ocean Ridges, pp.40, July 1994.

IR Global Working Group Report 1994: Indian Ocean Planning Meeting Report, pp.3, 1994.

IR Meso-Scale Working Group Meeting Report, Cambridge, UK, pp.6, 1992.

IR Steering Committee Meeting Reports

Tokyo, Japan, 2003.
SestriLevante, Italy, 2002.
Kobe, Japan, 2001.
WHOI, USA, 2000.
Bergen, Norway, 1999.
Barcelona, Spain, 1998.
Paris, France, 1997.
Estoril, Portugal, 1996.
Kiel, Germany, 1995.
San Francisco, USA, 1994.
Tokyo, Japan, 1994.
Seattle, USA, 1993.
IR Meeting Report, York, UK, 1992.
IR Meeting Report, Brest, France, 1990.

Program Plan Reports:

IR Program Plan Addendum 1997, pp.10, Jan. 1998.
IR Program Plan Addendum 1996, pp.10, Apr. 1997.
IR Program Plan Addendum 1995, pp.10, 1996.
IR Program Plan Addendum 1994, pp.15, 1995.
IR Program Plan Addendum 1993, pp.9, 1994.
IR Program Plan, pp.26, 1994.

InterRidge Office Updates

InterRidge Website

http://www.intridge.org/

The InterRidge office devotes a considerable amount of effort into maintaining an extensive web site with updated information as it comes into the Office. Our website also provides you with various ridge related information including upcoming meetings, scheduled ridge related cruises, job vacancies as well as 9 different databases. These databases on the InterRidge website were initiated in response to a request by the international community to have a 'centralised' clearing house for information collected by scientists all over the world so that relevant information is readily available to everybody at one site. A brief summary of what can be found on the InterRidge website is available at:
http://www.intridge.org/latest.htm

1) Information section

This section provides links to Ridge related meetings, cruises and other miscellaneous information, as well as a little bit about InterRidge structure and its role, including: Latest ridge related News; an introduction to what is InterRidge, with a short description of the InterRidge programme, outlining the objectives of the programme as well as management structure and national membership of InterRidge; as well as a calendar of international conferences, meetings and workshops.

2) Activities section

This section is concerned with the scientific and management structure of InterRidge. The 'Activities' section includes an outline of the scientific purpose of InterRidge. A description of the activities of the IR working groups, which are responsible for directing different aspects of ridge research with updates of their activities can be found here. You can also find links to major projects that InterRidge is currently involved in and projects that are directly relevant to InterRidge activities - such as MOMAR and the Marine Protected Areas project. Additionally, in this section, you can find a list of all the publications distributed by the InterRidge office as well as a list of the InterRidge National Correspondents, and their contact details, from all of our Member Nations.

3) InterRidge databases section

One of the major objectives of InterRidge is to facilitate the advancement of ongoing work of individuals, national and international groups by providing centralised information and data-exchange services. Thus, we maintain a number of databases that contain data submitted from Ridge scientists from around the world. We rely on contributions from individuals to continually update the information and increase the number of records. Familiarise yourself with the databases on our website and please contribute information on a regular basis to ensure that this important resource contains current and up to date information. A list of the databases maintained by InterRidge with a brief introduction can be found on our web site at: http://www.intridge.org/data1.html

Furthermore, there is a neat little program, which you can use to calculate the spreading rate of the sea floor at any place around the globe.

Hydrothermal Ecological Reserves Page:
http://www.intridge.org/reser-db.htm

This page lists all the current ecological reserves that have been proposed at hydrothermal vents. These vary in breadth and scope; from the Endeavour vent field as a pilot marine protected area, to requests from individual scientists conducting experiments in specific areas. There is also an on-line form to submit reserves to the page.

InterRidge Mailing List
Sign up on the web at:
http://www.intridge.org/signup.htm

InterRidge Office Updates

Overview of InterRidge Working Groups: the past and the future

Most of the IR Working Groups that you have been familiar with of the last few years will finish their activities at the end of this year, some will remain, others will morph into different working groups and a number of new Working Groups will appear as of next year. More information on the current and past Working Groups can be found on our website:
http://www.intridge.org/act2.html

However, lets take a look at what the future holds in store, on this page you will also find a brief outline of the changes that will take place in the Working Group structure from next year. More information about each of the Next Decade working groups is available in the IR Next Decade Project Plan:
http://www.intridge.org/innd.pdf

Arctic Ridges WG
Chair: Colin Devey (Germany). This working group will finish its activities in 2003.

Back-Arc Basins WG
Chair: Sang-Mook Lee (Korea).

This working group will continue its activities into the Next Decade under the name of "Back-arc Spreading Systems" under the current Chair. New members will be selected in the near future.

Biological Studies WG
Chairs: Francoise Gaill (France) and S. Kim Juniper (Canada).

This working group will continue its activities into the next decade under the name of "Mid-oceanic ridge Ecosystems" under the current Chairs and membership.
WG members: M. Biscoito (Portugal), O. Giere (Germany), J-H Hyun (S. Korea), A. Metaxas (Canada) T. Shank (USA), K. Takai (Japan), P. Tyler (UK) and F. Zal (France)

Global Digital Database WG
Last chair: Phillippe Blondel (UK). This working group has finished its activities.

Global Distribution of Hydro-thermal Activity WG
Last chair: Chris R. German (UK). This working group has finished its activities.

Hot Spot-Ridge Interactions WG
Chairs: Jian Lin (USA) and Jerome Dyment (France).

This WG will continue its activities into the Next Decade under the current Chairs and the current membership.
WG members: R.K. Drolia (India), J. Escartín (France), J. Freire Luis (Portugal), E. Grácia (Spain), D.W. Graham (USA), K. Hoernle (Germany), G.T. Ito (USA), B. Murton (UK) N. Seama (Japan), F. Sigmundsson (Iceland)

Monitoring and Observatories WG
Chairs: Javier Escartin (France) and Ricardo Santos (Azores, Portugal).

This WG will continue its activities into the Next Decade under the current Chairs and some changes to the membership.
WG members: K. Mitsuzawa (Japan), Pierre-Marie Sarradin (France), Adam Schultz (UK), Paul Snelgrove (USA), Paul Tyler (UK).

SW IR WG
Last chair: Catherine Mével (France). This working group has finished its activities.

Undersea Technology WG
Last chair: Spahr C. Webb (USA). This working group has finished its activities.

New Working Groups that will start their activities under the Next Decade Project Plan.

Ultraslow-spreading Ridges WG

The Chair(s) and members of this working group will be selected shortly. The Southwest Indian Ridge (SWIR) and Arctic Ridges working groups have been some of the most successful programs in InterRidge thus far. The members of these groups have reached a general consensus that the two share a common objective - Ultraslow spreading - that should be given a common focus in the future. Therefore this new working group based on the scientific theme of ultraslow spreading (1/2 rate < 1cm/yr) will combine both of these previously geographically based groups. Themes which this Working Group plans to work on in the next decade include:
- Lithosphere/Asthenosphere interaction
- Magma genesis/mantle composition
- Hydrosphere/Lithosphere interaction
- Biogenesis
- Biogeography

Deep Earth Sampling WG

The Chair(s) and members of this working group will be selected shortly. This WG plans to promote interdisciplinary investigations of the 4-D architecture of the ancient and modern ocean crust and shallow mantle at all scales, and explore the extent and diversity of the sub surface biosphere of the oceanic lithosphere. The focus will be on promoting the development and use of different drilling platforms ranging from over-the-side rock drills to riser drilling, and land-based platforms. It would be instrumental in formulating a new international drilling project that will seek to achieve total penetrations of in situ ocean

InterRidge Office Updates

crust in the Atlantic and Pacific within 20 years, and partial sections of crust and mantle in different tectonic settings. Drilling of active hydrothermal systems and young ocean crust and mantle at the ridge axis and in tectonic windows would be a high priority for the working group. Recognising the value of ophiolite studies to understand the ocean lithosphere, the working group should promote on-land drilling to acquire long sections of the ocean crust and shallow mantle in well understood ophiolite complexes thought to represent key end-members for mid-ocean and arc environments.

Global Exploration

The Chair(s) and members of this working group will be selected shortly. The following are important areas of global exploration which this group will attempt to address in the next decade:

- Global bathymetry and tectonics
- Global distribution of hydrothermal activity and global vent biogeography
- Acoustic remote sensing
- Global fluxes
- Off-axis volcanism and extinct spreading centres

Call for Proposals

Third International Symposium on Deep-Sea Hydrothermal Vent Biology

To be held in 2005

The InterRidge Biology Committee will be meeting in January 2004 to consider "Expressions of Interest" to host the 3rd International Symposium on Deep-Sea Hydrothermal Vent Biology in 2005. The previous Symposium was held in Brest, France in October 2001, following the 1st Symposium in Madeira, Portugal in 1997. Proposals to host the 3rd Symposium at a location in the Americas and Asia are particularly encouraged.

The Expressions of Interest should be in the form of a 2-3 page letter, outlining the proposed dates and location for the Symposium, together with a brief description of the host institution or agency, the proposed meeting facility (200 anticipated participants), a proposed organisational structure for the symposium and a plan to raise funds to cover meeting costs. As a guide, meeting costs, including publication of proceedings, for a 200 person symposium can be expected to be in the range of US$400 per person, of which around US$140 is recovered through registration fees. This requires the raising of approximately US$52,000 from outside sources.

At it's meeting in Bremen on January 19-20, the InterRidge Biology Committee will examine the Expressions of Interest to hold the 3rd Symposium and invite full proposals to be submitted to the InterRidge Steering Committee for it's meeting in late May 2004.

Expressions of Interest are to be submitted by email, to both Co-Chairs of the InterRidge Biology Committee prior to January 10, 2004.

The IR Biology Co-Chairs:

Françoise Gaill
francoise.gaill@snv.jussieu.fr

S. Kim Juniper
juniper.kim@uqam.ca

Updates on InterRidge Projects

Biology Working Group

S. Kim Juniper (Canada) and Francoise Gaill (France)

Kim Juniper prepared a draft code was developed in collaboration with Lyle Glowka, an environmental lawyer who has been actively involved in this dossier since the 2000 InterRidge workshop on the Conservation and Management of Hydrothermal Vents in Victoria, Canada (see IR news 12 vol. 1 pp 8).

The STCOM was asked to read over the draft code in advance and discussed it during its annual meeting (27 – 28 June 2003, Tokyo, Japan) to improve and adapt the Code. Based on the feedback at the Tokyo meeting, and subsequent community and national program input, the InterRidge Biological Studies Committee plans to put together a final draft document for adoption at the 2004 STCOM meeting.

The overall goal is to provide a structure for self policing at heavy use vent sites. We also hope that the Code will serve as a model for managing scientific research at vents in marine protected areas under national jurisdiction. For the moment there are no rules. It is in our interest to develop a model that will both permit sustainable use of vent sites for research, and hopefully influence how MPA vents are managed for research (i.e. avoid excessive and misguided rule making by bureaucrats).

The STCOM unanimously agreed that IR needs to produce a code of conduct that can be made available to government bodies to provide a framework for regulation within the EEZ of countries that do not have their own regulations at this point in time as well as in international seas. It was agreed that the draft code will need some revisions before it is accepted and adopted by IR as an official document. A preamble to the code of conduct needs to identify various issues as to why we need this document and what role this document should play in the general community.

The Next Decade Science Plan for InterRidge will come into effect from January 2004 and the Bio WG is one of the IR working groups that will continue to operate into the next decade under the new name of "Mid-Oceanic Ridge Ecosystems". The Biology WG will be meeting in Bremen on January 19 and 20, 2004 to identify priorities related to biological objectives outlined in the Next Decade Science Plan, to discuss a new draft of the Code of Conduct and to consider proposals for the next Hydrothermal Vent Biology Symposium in 2005.

Biology Working Group web page
http://www.intridge.org/wg-bio.htm

Hydrothermal Vent Management Workshop Report
http://www.intridge.org/ventrep.pdf

Vent Reserves web page
http://www.intridge.org/reserve.htm

Database of Biological Samples web page
http://www.intridge.org/samp-db.htm

Sample Exchange Agreement web page
http://www.intridge.org/samp-exc.htm

Updates on InterRidge Projects

Monitoring and Observatories Working Group

Javier Escartin (IPGP/CNRS, Paris, France) AND
Ricardo Serrão Santos (DOP, U of Azores, Horta, Portugal)

As a result of the II MoMAR Workshop (June 2002, Horta, Portugal), two proposals were coordinated and submitted to the European Union's 6th Framework Program. These proposals were accepted by the EU and are now under negotiation to establish the funding level and their organization. In addition France has setup a MOMAR steering committee in coordination with the National Research Council (CNRS) and IFREMER. This committee will coordinate all MoMAR-related efforts (link with other national and international programs and participation in meetings, coordination of the French MoMAR-related proposals, etc.). During early 2004 the EU will select 2 or 3 sites to initiate a network of seafloor observatories (ESONET project) out of 9 proposed sites, including MoMAR. If selected, implementation of a MoMAR seafloor observatory could be initiated shortly after.

EXOCET/D. This technology and development proposal is coordinated by P.-M. Sarradin (IFREMER, France) and is formed 13 partners from France, Germany, Portugal and the UK, including 3 private companies (SMEs). It focuses on the technological development of specific instrumentation to allow the study of ecosystems in the deep ocean, is structured around 7 projects, and includes 10 days of ship time for instrument deployment and tests at the seafloor; the Lucky Strike vent in the MoMAR area will be used as the testing site, in coordination with other scheduled cruises and submitted proposals in France. Development is geared towards imagery (automatic analyses, video and acoustic imagery, 3D reconstructions, mosaics), in situ chemical and physical analyses and sampling of macro and micro-organisms, and in vivo experiments. The estimated cost of the project is approximately 2 million EUR, and a final funding decision will be made by early 2004.

MOMARNET. This research training and mobility network is coordinated by M. Cannat (CNRS/IPGP, France), as is formed by 13 institutions from France, UK, Germany, Belgium, Spain, Sweden and Italy. The aim of this network is to train a group of young scientists in the broad range of disciplines needed to carry on deep seafloor environmental and long-term observations and research, with the goal of advancing and supporting the implementation of long-term observations in the MoMAR area. This project will finance several PhDs and Postdocs, and will coordinate general meetings, short courses, and exchanges of scientists and students among institutions. The total cost of the project is ~2.9 million EUR, and a final funding decision will be made by early 2004.

ESF/LESC Workshop. ESF/LESC funded a Exploratory Workshop on "Long-term monitoring of deep-ocean hydrothermal fields". This Workshop overviewed the status of monitoring-related activities in Europe, the possible link with other related programs (e.g., Ridge2K, IDN, ORION, etc), and the formalization of a Europe-wide coordination focused on the monitoring of the slow-spreading MAR, with a focus on the MoMAR site. The workshop report as well as other information on other MoMAR-related efforts can be accessed at:
http://www.ipgp.jussieu.fr/rech/lgm/MOMAR.

The latest information about MoMAR related activities
can be found at:

http://www.ipgp.jussieu.fr/rech/lgm/MOMAR

Past updates of the MOWG can be found on the InterRidge web page at:

http://www.intridge.org/wg-mo.htm

The abstracts volume and the workshop report from the
II MOMAR workshop are avilable from:

http://www.intridge.org/act3.html

Updates on InterRidge Projects

EXtreme ecosystem studies in the deep OCEan: Technological Developments: EXOCET/D

Pierre-Marie Sarradin[1*], Jozée Sarrazin[1], Eberhard Sauter[2], Bruce Shillito[5], Christoph Waldmann[10], Karine Olu[1], Ana Colaço[3] and the EXOCET/D consortium.

* Corresponding author, Ifremer centre de Brest, DRO/EP, BP70, F-29280 Plouzané

FP6, Proposal of STREP, Specific programme: Integrating and Strengthening the European Research Area, Priority thematic area: GLOBAL CHANGE AND ECOSYSTEMS, SUB-PRIORITY 1.1.6.3 Call, 1. Call identifier FP6-2002-GLOBAL-1, proposal n°505342. The EXOCET/D contract is currently being signed at IFREMER and the project will start at the beginning of 2004.

The use of manned deep-sea research vehicles during the last decades brought new insights into deep-sea environments with the discovery of unusual biologically rich areas at plate/continent margins. The acquisition of deep underwater vehicles by several European countries brings our scientific community at the leading edge of the studies of these remote ecosystems. Moreover, the increasing anthropic pressure on the deep-sea (offshore exploitation, wrecks, waste disposal) and the requirements of the Convention on Biological Diversity, reinforce the strategic importance on our ability to observe, sample, measure and conduct experiments in deep environments through the development of non-invasive approaches that will help to minimise threats to their fragile biodiversity.

The aim of this proposal is the technological development of specific instrumentation allowing the study of natural or accidentally perturbed ecosystems found in the deep ocean. These ecosystems are related to the emission of reduced fluids (cold seeps, hydrothermal vents), peculiar topographic structures (seamounts, deep corals), massive organic inputs (sunken woods) or to unpredictable events (pollution, earthquakes). Beside their insularity in the abyssal plain, the targeted ecosystems are characterised by patchy faunal distributions, unusual biological productivity, steep chemical and/or physical gradients, high perturbation levels and strong organism/habitat interactions at infra-metric scales. Their reduced size and unique biological composition and functioning make them difficult to study with conventional instrumentations deployed from surface vessels. Their study requires the use of submersibles able to work at reduced scales on the seafloor as well as the development of autonomous instruments for long-term monitoring (seafloor observatories).

The general objective of EXOCET/D is to develop, implement and test specific instruments aimed at exploring, describing and quantifying biodiversity in deep-sea fragmented habitats and to identify links between community structure and environmental dynamics. Inboard experimental devices will complement the approach, enabling experiments on species physiology. The EXOCET/D working fields include:

- video and acoustic imagery;
- in situ analysis of physico-chemical factors;
- quantitative sampling of macro- and micro-organisms, in vivo experiments;
- 4D integration of multidisciplinary data;
- implementation on European deep-submersibles;
- technical and scientific validation.

EXOCET/D is a three-year project that involves partners from ten different research institutions and three SME's. It will increase the European capacity to operate on the deep seafloor for biodiversity studies and increase our ability to better evaluate anthropogenic impacts on remote marine ecosystems.

Table 1. The three-year EXOCET/D project involves partners from ten different research institutions and three private companies.

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International Research: **Biological Studies**

Live *Alvinella pompejana* Onboard Ship

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Alvinella pompejana is one of the most intriguing creatures of the deep-sea. Despite having focused the scientific attention since its discovery, some 20 years ago, this invertebrate remains an enigma, especially regarding the biochemical, physiological and behavioural features that allow it to thrive in the harsh environment of hydrothermal vent chimney walls (Desbruyères *et al.,* 1998; Cary *et al.*, 1998; Chevaldonné *et al.,* 1992) (East Pacific Rise). Unfortunately, this worm has so far never been maintained alive on board oceanographic ships, therefore forbidding *in vivo* laboratory studies **(**Chevaldonné *et al.,* 2000). We examined this problem, by placing freshly collected *A. pompejana* specimens in a video-equipped pressure vessel (IPOCAMP; Shillito *et al.*, 2001). For the first time, we were able to show that most of the specimens can be recovered alive at the surface.

During the **PHARE** oceanographic cruise (LeBris *et al*., 2002) (May 2002, 13°N, EPR), we re-pressurized 26 Alvinellas, at 260 bars and 15°C temperature, under constant flow (ca. 10 L/h) of seawater, and controlled oxygen level (about 100 µmol/L, using the SYRENE regulation sytem). The worms had been collected at 2600 m depth using the ROV Victor 6000, and therefore submitted to a 260 bar decompression upon ascent to the surface. 4 hours after re-pressurization on board the *R/V Atalante*, survival rates exceeded 85 %, and remained above 60 % after 8 hours. This rate dropped to about 40 % from 6 to 10 hours. From this time and up to 20 hours, when the experiments were deliberately stopped, survival remained quite stable suggesting that even longer survival times could have been expected.

We conclude that most worms are alive when they reach the surface, although they barely show signs of life at atmospheric pressure. After re-pressurization, some of the worms gradually returned to a very active state of behaviour: they were observed crawling backwards and forwards, around and up the walls of the experimental cage, often resting on their ventral side, and laying fresh tube or mucus on the substratum. The present data represent a great progress, in view of the reports stating that *in vivo* laboratory work is impossible with *Alvinella pompejana* (Desbruyères *et al.,* 1998; Chevaldonné *et al.,* 2000; Gaill, F. and Hunt 1991). In the near future, survival rates approaching 100% for longer time periods will be aimed at. Reaching this goal would allow carrying out crucial *in vivo* experiments: resistance to heat, to sulph ide, respirometry, are but 3 of the many burning issues that remain to be dealt with, in order to characterize the adaptations that allow this animal to live in one of the most extreme environments on the planet.

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International Research: **Biological Studies**

Symbiont – host interraction in the association of the scaleworm *Branchipolynoe* aff. *seepensis* (Polychaeta: Polynoidae) with the hydrothermal mussel, *Bathymodiolus* spp. (Bivalvia: Mytilidae)

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Introduction

Symbiotic polynoids of the genus *Branchipolynoe* associated with mussels are a common component of hydrothermal vent and cold-water seep communities. Recent detailed studies carried out on the Atlantic scale-worm *B.* aff. *seepensis* Pettibone, 1986 (Jollivet *et al.,* 2000) revealed some interesting features of its reproductive biology: external sexual dimorphism, internal fertilisation and dominance of females in the population. Nevertheless, the role of symbiotic polychaetes in the communities and their relationships with their hosts remain virtually unknown. In fact, the association of the different species of *Branchipolynoe* with their host mytilids *Bathymodiolus* spp. has been usually regarded as commensalism (Pettibone,1986; Chevaldonne *et al.*, 1998). However the finding of bits of mussel gills in the gut of *B. symmyitilida* from the Galapagos Rift (Desbruyères *et al.*, 1985) pointed to a parasitic behaviour.

The present paper reports preliminary results based on material collected mainly during a recent cruise of the *R/V Akademik Mstislav Keldysh* (2002) at the hydrothermal vent fields along the MAR and complimentary data of previous French and Russian expeditions which allowed to better understand the true nature of the relationships between the Atlantic scale worm *B.* aff. *seepensis* with their mytilid hosts *Bathymodiolus puteoserpentis* and *B. azoricus*.

Material and methods

The bivalves were collected from hydrothermal vent fields along the MAR. At the Logatchev, Snake Pit, Lucky Strike, and Rainbow vent fields mussels were sampled durig expeditions of the Russian *R/V Akademik Mstislav Keldysh* (1998, 1999, 2002). In addition, material obtained in expeditions of the French *R/V Nadir* (1993, 1995, and 1997) at Snake Pit, Lucky Strike and Menez Gwen was also used. At present two species of mytilids are known from the MAR: *Bathymodiolus puteoserpentis* occurs at the Logatchev, Snake Pit and Broken Spur and *B. azoricus* at Lucky Strike, Rainbow and Menez Gwen. In total 300 specimens of *Bathymodiolus puteoserpentis* and 680 specimens of *Bathymodiolus azoricus* were examined. In the former 41 and in the latter 400 specimens of *Branchipolynoe* aff. *seepensis* were found.

Firstly, the length, width and height were measured for each mussel. Then the shell was opened, the number and location of symbiotic polychaetes were recorded, the polychaetes were measured and modifications in the morphology of soft tissues of the host were quantified and analysed.

Gut content was analysed in 13 symbionts associated with *B. azoricus* and 9 symbionts associated with *B. puteoserpentis*. To analyse the gut content, polychaets were dissected along the dorsal side.

All statistical analyses were carried out using the SYSTAT 5 (vers. 5.2.1) statistical package.

Table 1. Characteristics of the infestation by *Branchipolynoe seepensis* of the two hydrothermal mytilid hosts *Bathymodiolus puteoserpentis* and *Bathymodiolus azoricus*.

Host	Locality	Prevalence (n)	Abundance (Intensity)
Bathymodiolus puteoserpentis	Logatchev, 1998	7.2% (180)	0.07 (0-1)
	Snake Pit, 2002	23.3% (120)	0.275 (0-6)
Bathymodiolus azoricus	Rainbow, 1999	65.0 % (20)	0.70 (0-2)
	Rainbow, 2002	60.8% (51)	0.80 (0-2)
	Lucky Strike, Statue de la Liberte, 1993	76.5 % (34)	0.73 (0-1)
	Lucky Strike, Elisabeth, 1995	54.8% (445)	0.47 (0-3)
	Lucky Strike, 2002	71.5% (130)	0.80 (0-6)

Results

Characteristics of infestation

Infestation varied from 7.2% to 90.5% and was significantly lower ($p < 0.02$) for the host *B. puteoserpentis* (Table 1). Abundance was also highly variable, ranging from 0.07 to 0.8 symbionts per host, and significantly lower ($p < 0.007$) for the host *B. puteoserpentis* (Table 1). Infestation increased with increasing mussel size (Fig. 1). In the case of *B. azoricus*, this trend was recorded

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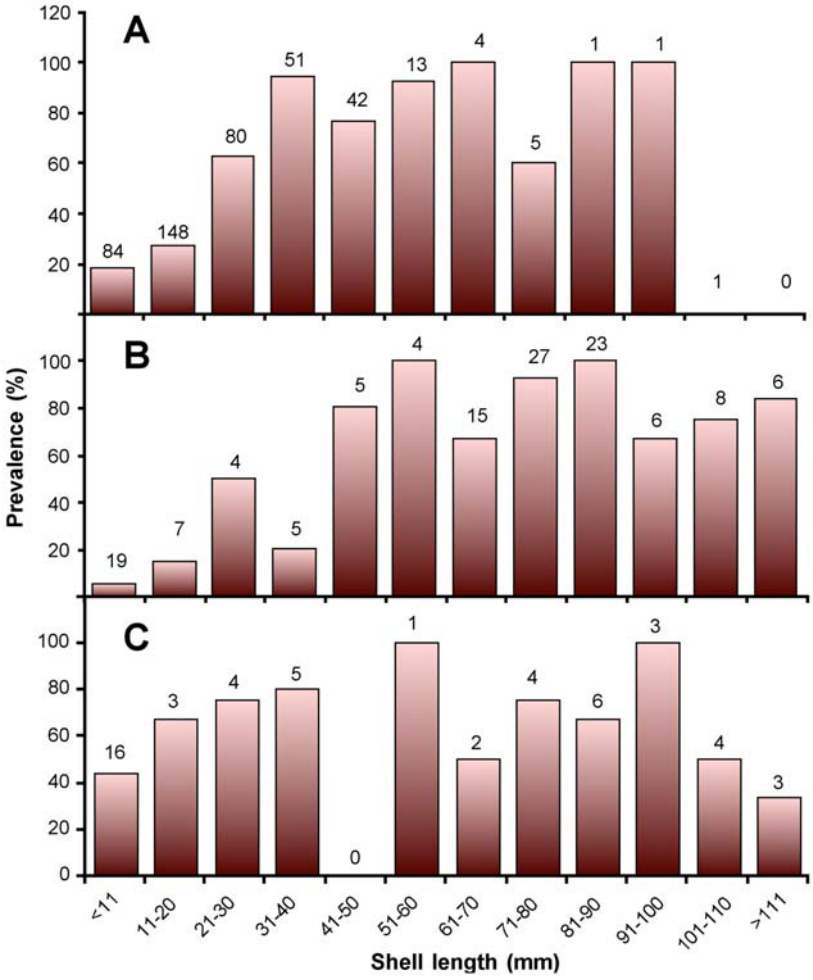

Figure 1. Relationships between prevalence and host size. *Bathymodiolus azoricus* from Lucky Strike: (A) 1995; (B) 2002; *B. puteoserpentis* from Snake Pit, 2002; (C) Figures on the top of bars indicate the number of mussels.

only for mussels with the shell length less than 40 mm (Fig. 1A, B). Infested host can harbour from 1 to 6 worms (Table 1), in most cases one mollusc harboured only 1 polychaete.

Location of symbionts

The polychaetes were most frequently located in the mantle cavity of the molluscs between the mantle wall and the external demibranchs, while the positions between the internal and external demibranchs and between the internal demibranch and the foot were less frequent (Fig. 2A). The prostomia (Fig. 2B) were mostly directed towards the siphon opening, but the orientation towards the host palps was also frequent. Orientations towards the body centre or the outer edge of the valves were remarkably less frequent.

Symbiont's gut content

Six from the 13 studied guts of the symbionts of *B. azoricus* contained food remains. The guts were filled with detritus and a suspension of inorganic particles, including the peculiar ochroid particles, which are found on the host shell surface. In addition, four specimens contained polychaete chaetae belonging to the same species. Single findings of crustacean chaetae, diatom theca and fragments of a pelagic predator copepod of the family Oncaeidae were also observed.

Among nine guts of symbionts associated with *B. puteoserpentis*, four contained identifiable food remains. Detritus and suspended inorganic particles were found in 3 worms, while ochroid particles, diatom theca and fragments of a non-identified crustacean occurred in 1 worm.

Analysis of traumatism in the host Bathymodiolus

The traumas observed in mussels included shortenings of some ctenidial filaments and deformation of labial palps and feet (Fig. 3). Among the different samples, the number of mussels with traumas varied from 59.1% to 72.2%. The number of traumas was significantly higher in infested (n=204) than in non-infested molluscs (n=248, ANOVA, $p < 0.001$). Among the infested hosts, traumas of palps were most frequent, followed by those of ctenidia, which were usually located in the anterior parts of the demibranches (Fig. 3). The hosts harbouring female symbionts showed a higher number of traumas, particularly on palps.

The symbionts were frequently found inside tunnel-like structures formed by gill filaments between demibranches. Sometimes, an epithelial ridge (or callosity) outlining the polychaete body is developed on the mantle wall. These structures were present sometimes in non-infested mussels.

Shell length-width ratio in infested and non-infested hosts

To determine the possible influence of symbionts on the host shell morphology we compared the shell length-width ratio of infested and non-infested mussels. The cross correlation analysis demonstrated the existence of a significant association between the two patterns in the case of *B. azoricus*. In this species, the maximal Pearson's correlation index had a position lag of 0.012 in width-length ratio (correlation = 0.974, $p<0.001$), indicating that the infested shells were relatively wider than the non-infested ones (Fig. 4).

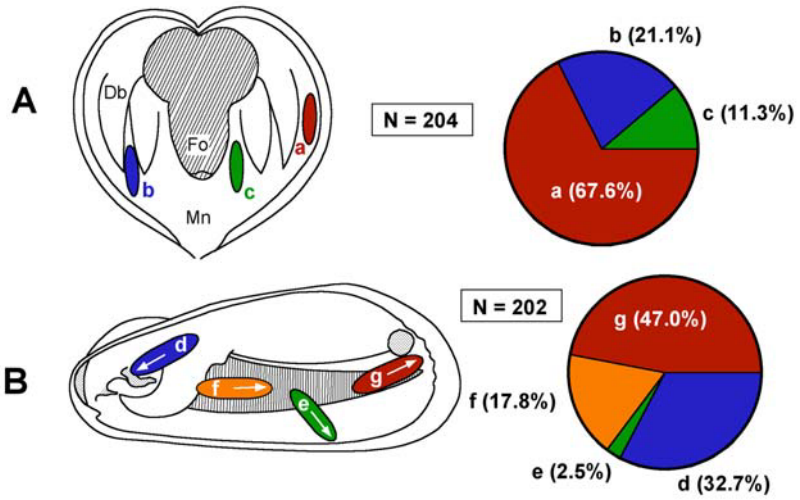

Figure 2. Location of the symbionts inside the host Bathymodiolus azoricus. (A) Relative to the ctenidia and foot: between the mantle wall and the external demibranch (a), between the internal and external demibranch (b) and between the internal demibranch and the foot (c). (B) Orientation of the prostomium: towards the host palps (d), towards the outer edge of the valves (e), towards the body centre (f), towards siphon opening (g). The figures of percentages on the circled diagrams indicate the frequency of associations with given location of worms. Do - demibranch, Fo – foot of mussel.

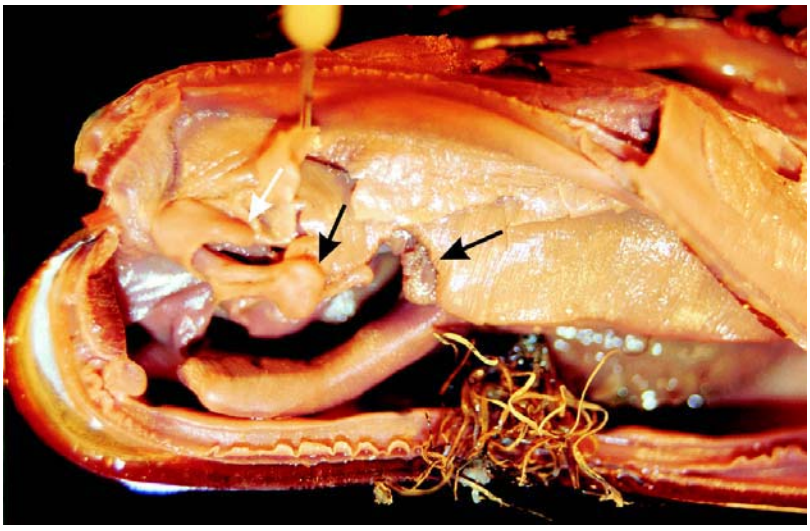

Figure 3. Light micrograph of traumas observed in *Bathymodiolus azoricus*. Anterior pair of palps is intact (white arrow); posterior palps are shortened and have bulbous thickenings, and also ctenidial filaments are shortened (black arrows).

Discussion

Infestation of mussels by *B.* aff *seepensis* varies substantially between different hydrothermal fields and sites, depending on the host species and size. Although two parts of a mussel population separated only by a few meters from each other may show different infestation levels, some general trends may be inferred. The infestation by *B.* aff *seepensis* is higher in larger than in smaller hosts, as is common among other symbiotic polychaetes . Conversely, it already occurs among the smallest mussel size classes. This is a very rare trend for a symbiotic association and may be related to the suggested continuous reproduction and settlement of the symbionts (Jollivet *et al.*, 2000). On the other hand, infestation of *Bathymodiolus azoricus* is significantly higher than in *B. puteoserpentis*. According to our data, this trend is more likely related to environmental differences of localities of both species rather than to the peculiarities of host's biology.

The specimens of *Branchipolynoe*, like most symbiotic scaleworms, are able to move inside the mantle cavity of their host, as it may be inferred from the different adopted positions. However, they usually remain immobile for a long time, as indicated by the presence of epithelial ridges on the mollusc mantle walls along the polychaete body and tube-like structures formed by the host gill filaments. The location of the symbiont inside the mantle cavity can be particularly related to the peculiarities of their feeding behaviour. The two predominant head orientations, head-to-siphon and head-to-mouth, suggest that symbionts may consume filtered and agglutinated suspension particles, transported with the water flow to the host mouth, or suspended organic particles transported to the siphon opening. This is supported by the presence of detritus and suspended inorganic particles, including the ochroid ones that are often found on the shell surface, inside the polychaete intestine. The single finding of a planktonic copepod of family Oncaeidae also supports this suggestion. Similar behaviour (*i.e.* kleptoparasitism) is typical for some other symbiotic animals, such as the polychaete *Branchiosyllis exilis*, associated with the brittle star *Ophiocoma echinata* (Hendler & Meyer, 1982), or the nemertine *Malacobdella grossa*, associated with bivalves (Gibson, 1967).

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The only previous report on trophic preferences of *Branchipolynoe* showed the presence of pseudofaeces and bits of mussel demibranches in the gut of *B. symmitilidae* (Desbruyères *et al.*, 1985). We did not find traces of host tissues or pseudofaeces in the gut of *B.* aff. *seepensis,* which may probably result from the different food preferences in this species. However, it seems clear that the symbionts are the responsible for the traumatism on host palps and ctenidia, with the relationship between the level of damage and the presence of symbionts being indirect evidence. According to our data, the host traumas seem to be an accidental result of "normal" symbiont feeding activities, so that their behaviour may be more reliably considered as kleptoparasitic (stealing food from a host) than as true parasitic (feeding on the host) or commensal (sharing food with a host).

Additional information on the nature of a symbiotic association may be inferred from the influence of the symbiont on the host metabolism or growth. In the case of bivalves, decreasing growth rates may lead to changes in shell shape, which tend to become relatively wider. The studied populations of *B. azoricus* show a relative increase of shell width in infested mussels when compared to non-infested. Assuming that these shell modifications are caused by the inhibition of shell growth in infested hosts, this strongly supports that the behaviour of the symbionts is closer to parasitism than to commensalism.

In summary, our data point out that the symbiosis between *Branchipolynoe* aff. *seepensis* and its host mitylids is exceptional in that the association starts from the smallest mussel size classes and in that it can be demonstrated that the presence of the symbiont has a negative influence on the host growth (and, thus, on its productivity). Taking into account that the species of *Bathymodiolus*, *B. azoricus* and *B. puteoserpentis*, are among the most abundant inhabitants of Mid Atlantic hydrothermal vents and the high prevalence of the infestation by *Branchipolynoe*, the role of the symbiotic polychaetes in the functioning of the hydrothermal vent community appears to be substantially more significant than previously thought.

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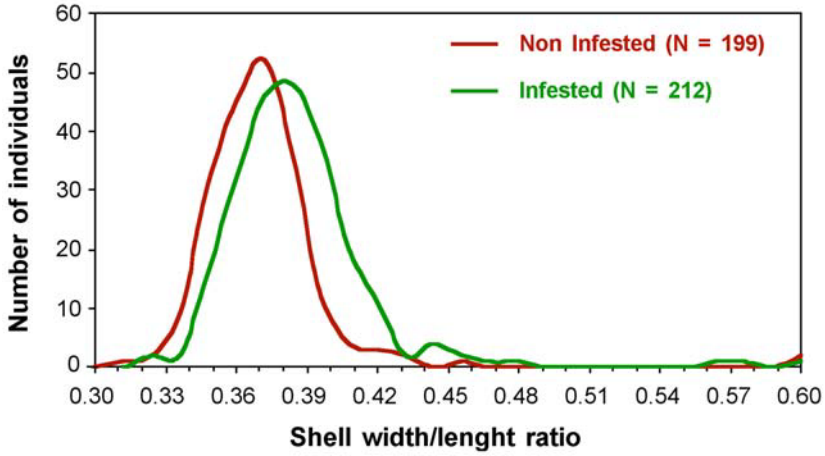

Figure 4. Patterns of length-width ratio in shells of infested and non-infested *Bathymodiolus azoricus*. The maximal Pearson's correlation index had a position lag of 0.012 in width-length ratio, indicating that the infested shells were relatively wider than the non-infested ones.

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International Research: **Biological Studies**

Insights from modelling of physico-chemical conditions in vent habitats

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The ecological and biological consequences of physico-chemical constraints in vent habitats have been widely emphasized (Tunnicliffe, 1991; Childress and Fisher, 1992). Even though dedicated studies have addressed main chemical features for some of these environments (Johnson *et al.*, 1986; Sarradin *et al.*, 1998), their variability among vent habitats is still a big question. Particularly, not only the total concentration ranges of chemical species in the habitats, but also their biogeochemical reactivity, deserve further investigation.

Modelling the temperature dependence of biologically significant compounds and their chemical speciation in the mixing gradient reveals to be particularly pertinent to address this question. Such relationships are not easily established from a discrete sampling approach, due to several experimental limitations. *In situ* measurement was shown to be more suited to this focus. However, since most of the *in situ* analysis methods do not enable to access selectively different chemical forms, geochemical modelling usefully complements this field approach. Here we report the main insights of a combined *in situ* analysis and modelling approach that was as dedicated to the chemistry of sulphide in specific habitats of two EPR 13 °N vent fields (Le Bris *et al.*, 2003). A more recent study (PHARE 2002; Le Bris *et al.*, 2002), focussed on the study of organisms-environment interactions on this vent field, has confirmed that the particular patterns displayed are distributed among the different sites.

Sulphide to temperature relationship

First, very contrasting sulphide to temperature relationships were obtained at the same site, over only a few meters distance, surrounding a *Riftia pachyptila* tubeworms clump or above a colony of *Alvinella pompejana* (Fig. 1). With respect to the end-member dilution line, sulphide appears depleted in the tubeworms habitat, whereas it is highly enriched in the Pompeii worms surroundings. This result highlights the fact that different processes were undergone by the venting fluid in the two types of habitats, resulting not only in difference in its temperature but also in its chemical composition.

The millimolar sulphide range depicted for the Alvinella surrounding at the Genesis site (Fig. 1) was recently confirmed as a common feature of this habitat over the EPR 13 °N segment scale (Table 1). The different sites however exhibit marked difference in their iron ranges, implying very different patterns of sulphide chemical speciation.

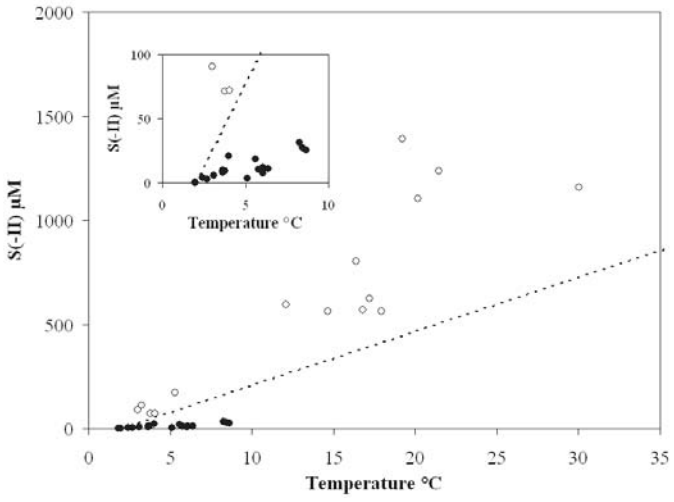

Figure 1. Sulphide concentration versus temperature determined *in situ* in the *R. pachyptila* (dark circles) and the *A. pompejana* (open circles) habitats at the Genesis EPR 13°N site. The line displays conservative dilution of the end-member fluid.

Sulphide chemical forms

From a first geochemical modelling approach described in (Le Bris *et al.*, 2003), the variation of the different sulphide forms along the vent fluid-seawater mixing gradient was quantitatively assessed for two sites of contrasted iron end-member fluid contents (Fig. 2). From this, exposure to the most toxic form of sulphide H_2S (Visman, 1991) is shown to be very contrasted among the sites. In the first case (Genesis), where iron is depleted in the fluid (< 0.5 mM in the end-member fluid), iron sulphide only accounts for a minor fraction of sulphide. As the result of the pH decrease associated with the increase of vent fluid contribution, hydrogen sulphide clearly appears as the dominant sulphide form in this case. In contrast, iron sulphide forms are dominant at the second site (Elsa) where iron and

International Research: **Biological Studies:** Le Bris, cont...

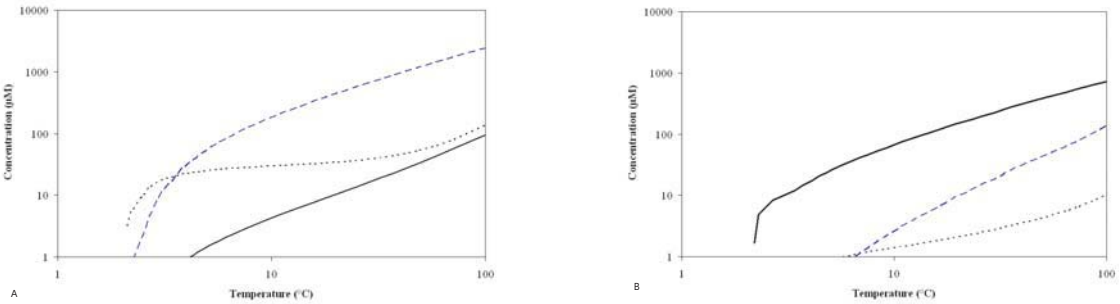

Figure 2. Calculated H_2S (dashed line), HS^- (dotted line) and $Fe(HS)^+$ (bold line) concentrations as function of temperature along the fluid-seawater mixing gradient, at two sites of the EPR 13°N vent field. A- Genesis site. B- Elsa site

Table 1. Chemical and thermal ranges determined *in situ* surrounding alvinellid colony over four EPR 13°N vent sites (S^{-II}: total dissolved sulphide; Fe^{II}: total dissolved ferrous iron, dl: 33 µM iron detection limit. Numbers under brackets denote the number of measures). Data from (Alain *et al.*, in press).

Site	T (°C)	pH	S^{-II} (µM)	Fe^{II} (µM)
Genesis	4-77 (n=1109)	4.5-7.5 (n=1109)	14-860 (n=24)	< dl
Elsa - a	2-70 (n=485)	4.7-8.0 (n=485)	199-775 (n=10)	289-839 (n=10)
Elsa - b	3-124 (n=1313)	3.8-8.0 (n=1313)	5-142 (n=27)	29-77 (n=27)
Actinoir	3-94 (n=416)	5.7-7.8 (n=416)	141-985 (n=20)	< dl

sulphide display similar contents in the vent fluid. The maximum hydrogen sulphide content is then limited to about one hundred micromolar.

The previous *in situ* approach of (Luther *et al.*, 2001) at one 9°N EPR site led to a conclusion that was consistent with this second case. Our recent study of 13 °N alvinellid habitats chemistry, however indicates that iron depleted conditions, and hence higher toxic sulphide constraints, are observed over at least two distinct sites along this vent field.

Conclusion

Considering that the end-member composition is variable in space and time, and that emission types and their corresponding subsurface pathways are very diverse, very contrasted physico-chemical conditions should be expected in various vent habitats. Since it enables to highlight main differences between distinct assemblages, circumventing the short scale spatial and temporal variability of chemical conditions encountered, modelling of physico-chemical characteristics in the mixing gradient then constitutes a valuable tool for habitat comparison.

Acknowledgements

This work was financially supported by Ifremer, the Dorsale (Ifremer, CNRS-SDV, INSU) and GEOMEX (CNRS) programs and the European Ventox project (contract EVK3-1999-00056P).

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International Research: **Indian Ridge**

Preliminary report of the Carlsberg Ridge Cruise

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This year Indian Ridge program (InRidge) got a boost as the Council of Scientific and Industrial Research (CSIR), New Delhi, and the Department of Ocean Development (DOD), New Delhi committed to support the ridge research for next five years along with the ship-time onboard ORV Sagar Kanya. Under this new program, two cruises were undertaken during June-August, 2003 for the exploration of medium to slow spreading ridges in the northern Indian Ocean namely, Carlsberg Ridge and northern segments of the Central Indian Ridge. A brief summary of the Carlsberg Ridge cruise is presented here.

Carlsberg Ridge

A cruise onboard *R/V Sagar Kanya* was undertaken for exploration of the Carlsberg Ridge between 2°30'N and 4ºN from 21 June to 25 July 2003. This research cruise was multi-disciplinary comprising of geophysics, physics, geology, geochemistry, water chemistry and biology. The main objectives of the cruise were to trace hydrothermal signatures in the water column and to acquire additional geophysical data from the area. We made water column measurements using CTD combined with Light Scattering and Transmissometer sensors and rosette water sampler, acquired underway-geophysical data (multi beam bathymetry, gravity, magnetic & sub-bottom profile) and collected seafloor samples from the region (Fig.1). We surveyed ~14,855 sq km area on both sides of axial valley of the Carlsberg Ridge in this cruise. During our earlier two visits to the Carlsberg Ridge, we mainly focused on studying the ridge segmentation in relation to the emplacement of the mantle and lower crustal rocks at the sea-floor (Mudholkar, *et al.*, 1996, 2000 & 2002). The total surveyed area in the three cruises spanned on either sides of axis of the Carlsberg Ridge up to magnetic anomaly 2 and covered about 43000 sq km.

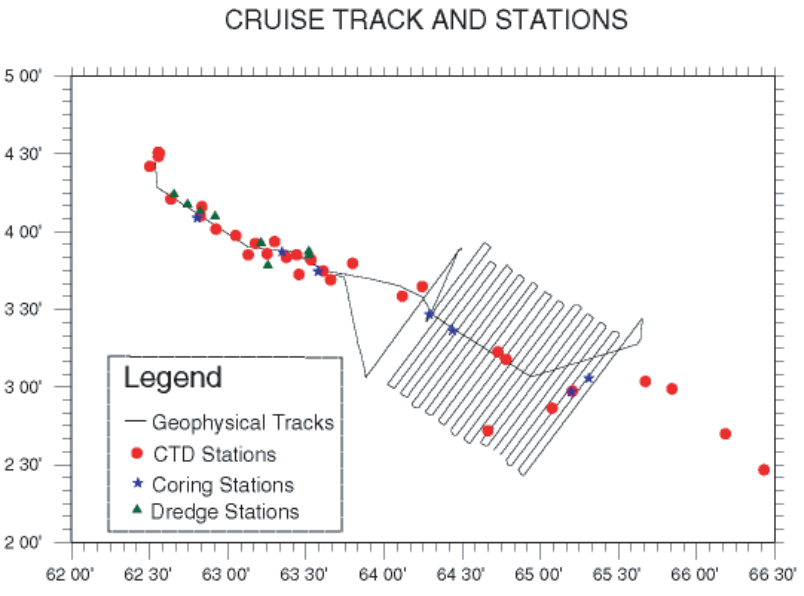

Figure 1. Cruise tracks and stations occupied for CTD & geological sampling.

The newly mapped area shows ~150 km long NW-SE trending linear ridge segment which is bounded by a major transform fault at its southeast extremity (Fig. 2). Morphology of the ridge reveals that the axial valley is shallow (water depth 2200 m) at the middle of the ridge segment and gradually deepens towards both NW and SE extremities of the ridge segment where it shows an axial deep of about 4200 m. The rift valley is about 10-15 km wide, with its walls rising by ~ 700 to 2000 m from the valley floor, and narrows southeastward. This narrow axial valley meets a transform fault at southeasternmost end of the surveyed area. At the transform fault, the ridge segments exhibits a possible overlapping spreading center (OSC), which needs to be confirmed by merging earlier acquired multi-beam bathymetry data with the present data.

Total magnetic intensity in the survey area varies from ~37200 nT to ~38200 nT. The observed magnetic signatures are correlatable from profile to profile. The central axial anomaly too is well defined and well-correlatable along the lines crossing the rift valley. In general, northeast part of the rift valley has higher total magnetic intensity values compared to the southeast part of the rift valley. Detailed analyses of magnetic data along with bathymetry and gravity data may provide age, tectonic segmentation and evolution of the ridge.

International Research: **Indian Ridge:** Mudholkar *et al*., cont...

Free-air gravity low varies from about 40 mGals to about 80 mGals in the rift valley region, which is about 10-15 km wide with a relief of about 700 - 2000 m. The spreading center offsets noticed in swath bathymetry have correlatable signatures in the free-air gravity pattern.

The underway geophysical profiles demonstrate good agreement amongst the axial valley, the gravity anomaly low, and the central magnetic anomaly low. V-shaped topographic lineament observed at 3°15'N, 64°45'E may suggest a NW-ward propagating ridge segment which need to be ascertained with detailed magnetic lineation map. Integrated analyses of the gravity, magnetic and multi-beam bathymetry data is envisaged to provide insights about the deep crustal variations that are responsible for the along axis variations in the gravity signature.

Rocks were dredged from three locations along the ridge axis (Fig. 1). Most of the samples collected are fresh and have vesicles with minor amount of phenocrysts while some are pillow basalts with a thick glassy margin. Glass was separated from the rocks for the future work. Some basalt samples show variations in alteration of the ridge basalts whereas others show deposition of the thin ferro-manganese oxide coating on the rocks. In addition, small quantities of fresh glass were also recovered from core catcher at three sampling locations, meant for the sediment collection.

A CTD system with light scattering and transmissometer sensors was deployed at 35 stations along the Carlsberg Ridge which was mapped during previous two cruises in addition to the presently surveyed area. Syntheses of the data are in progress and will be published in the near future.

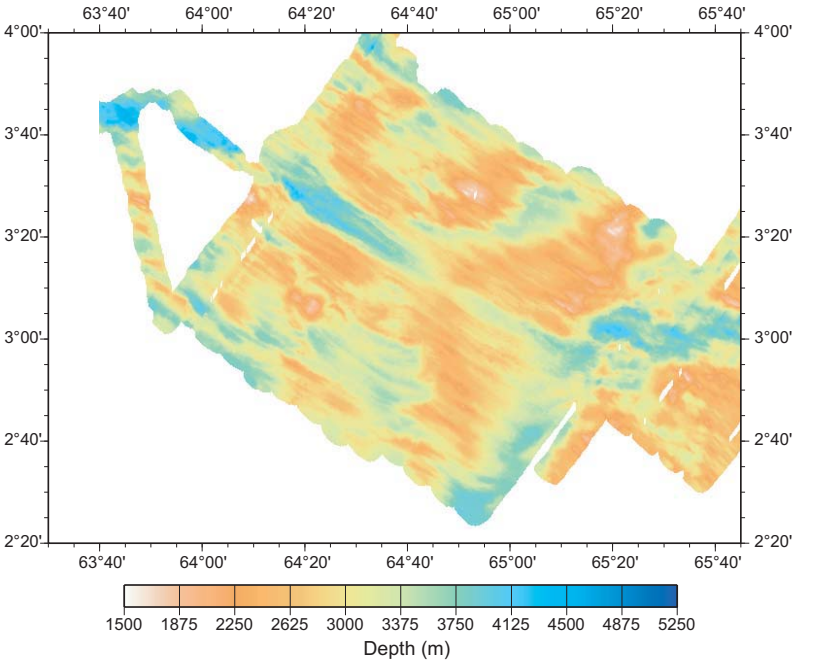

Figure 2. Colour coded bathymetry map of surveyed area of the Carlsberg Ridge.

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Agnieszka Adamczewska
InterRidge News Editor

International Research: **Ocean Bottom Observatories**

SN-1 observatory: the first node of the Italian geophysical and environmental monitoring network

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Introduction

The Istituto Nazionale di Geofisica e Vulcanologia (INGV) has started activities aimed at the extension of permanent monitoring of the Italian region seafloor. Recent deployment of the Submarine Network-1 observatory (SN-1) offshore Eastern Sicily (Southern Italy) is an important step in the preparatory phase for the settlement of the first node of the submarine monitoring network. SN-1 was deployed in early October 2002, 25 km offshore, at a depth of 2105 m, and operated in autonomous mode for about 7 months. The SN-1 site is close to the Ibleo-Maltese seismogenic structure, which is one of the major tectonic structures of the Eastern Sicily area.

SN-1 was developed in the framework of the 2000-2003 programme of the Italian National Group for the Defence against Earthquakes (GNDT) and is an outgrowth of the consolidated experience in the previous European GEOSTAR and GEOSTAR-2 projects (Beranzoli *et al.*, 1998, 2000, 2003; Favali *et al.*, 2002).

Figure 1. Photo of the observatory off board of the moto-pontoon "Mazzarò" during final trials before deployment of offshore Eastern Sicily.

In the next trial, thanks to a fruitful synergy between Geophysics, Environmental Sciences, High Energy Astrophysics and Marine Technology within different Italian research frameworks, the SN-1 will be re-positioned on the mission site and connected to an existing underwater electro-optical cable deployed in the same area by the Italian National Nuclear Physics Institute (INFN). The cable has the aim to primarily supply an experiment of neutrinos detection, NEMO (for a short description see Favali *et al.*, 2003). The land terminus of the underwater cable is located in the harbour of the city of Catania (Eastern Sicily), and linked to the INFN laboratory facilities (Laboratori del Sud). Offshore, around 20 km far from the coast, the cable is split in two branches, each 5 km long. *Ad hoc* built junction boxes will terminate the two cable ends to set the physical connection to the SN-1 observatory and the NEMO devices. A schematic layout of the joint experiments is given in Figure 4.

The deployment of the SN-1 junction box and the connection to the observatory is foreseen in spring-summer 2005. The SN-1 will become thus the first cabled seafloor European observatory being powered from land and providing data in real-time.

Within the European Seafloor Observation NETwork project (ESONET) funded by the European Commission within the Fifth Frame-

International Research: **Ocean Bottom Observatories:** Beranzoli *et al*., cont...

Table 1. SN-1 technical features (configuration of the 2002-2003 experiment).

Dimensions	(2.9 x 2.9 x 2.9) m^3
Weight in air	~ 15 kN
Weight in water	~ 8 kN
Lithium Batteries	12 VDC, 1920 Ah
Power consumption	~ 5.5 W

Table 2. SN-1 sensor packages and sampling rates during the 2002-2003 experiment.

Sensor	Model	Sampling rate
3-Component broad-band seismometer	Guralp, CMG-1T	100 Hz
Gravity meter	Prototype IFSI-CNR	1 Hz
Hydrophone	OAS, E-2PD	80 Hz
3-Component single point current- meter	FSI, 3ACM - CBP - D	2 Hz
Conductivity, Temperature and Depth	CTD, Sea Bird SBE-37	1.6 x 10-3 Hz

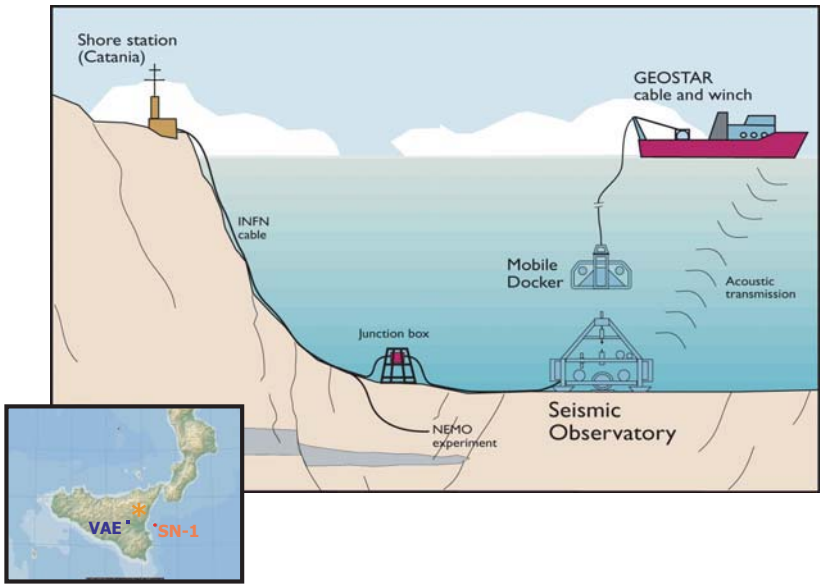

Figure 2. Operational scheme of the SN-1: The management of the system is performed from a ship: an operator drives MODUS (mobile docker) during the operations. The future instalation of SN-1, in synergy with the NEMO project, is depicted with a junction box at the end of the underwater cable which will supply power to the observatory and will allow the data flow from the observatory to on-land networks. The bottom-left panel shows the area of SN-1 deployment. The star marks the Etna volcano location. The location of VAE seismological station belonging to MEDNET is also marked.

work Programme in co-ordination with the Global Monitoring for Environmental and Security programme (GMES), a number of "applicant" sites, called "ESONET sites", are going to be proposed at the European standard for the implementation of permanent continuous seafloor monitoring from the Baltic to the Black sea. The intrinsic importance of off-shore Eastern Sicily area is related to the regional and local tectonics, the high seismic and volcanic activity, the importance in Mediterranean sea water circulation both shallow and deep, the high density of both populated centres and plants. The presence of adequate logistics and infrastructures for the sea operations have led to the nomination of the SN-1 site as one of the ESONET sites.

The SN-1 deployment area

In the frame of the global dynamics of the Mediterranean basin, characterised by the collision processes between the African and the European plates, Sicily represents the connection between the Apennine and the North-African chains. The region experiences an intense volcanic basaltic activity, probably related to extensional tectonics responsible of the Iblean volcanism and the formation of the Etna edifice, and by frequent and strong seismic events. In particular, Eastern Sicily region is characterised by two main structural units, a northern chain and the Iblean plateau: Mt. Etna is located just between these two units. The northern chain is a structure formed by a sequence of sediments superimposed from Eocene to Quaternary, with a progressive movement of the compressive front towards the eastern area. The Iblean plateau, that represents an emerged part of the foreland, is formed by a thick Meso-Cenozoic carbonatic sequences with frequent volcanic elements (older than Etna products). The adjacent Ionian region is characterised by the presence of the large Malta escarpment submerged structure. According to some hypothesis, the genesis of this structure is related to the evolution of the southern Tyrrhenian slab, whose southern border has been recognised in correspondence of Eastern Sicily. Many Authors attribute to the Malta escarpment a prolonged tectonic activity in time. However, in spite of its regional extension and kinematics, the temporal periods of activity and the geometry are still not well defined. The north-west continuation of this

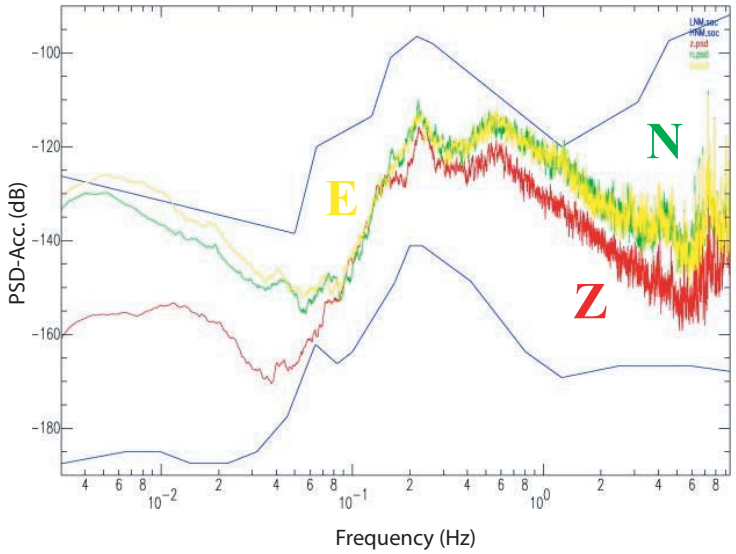

Figure 3. Power spectral density in acceleration of the background noise recorded by the SN-1 seismometer computed over one hour of E-W, N-S and vertical signals (E, N, and Z labels respectively). The upper and lower broken lines are the NLNM and NHNM from Peterson (1993).

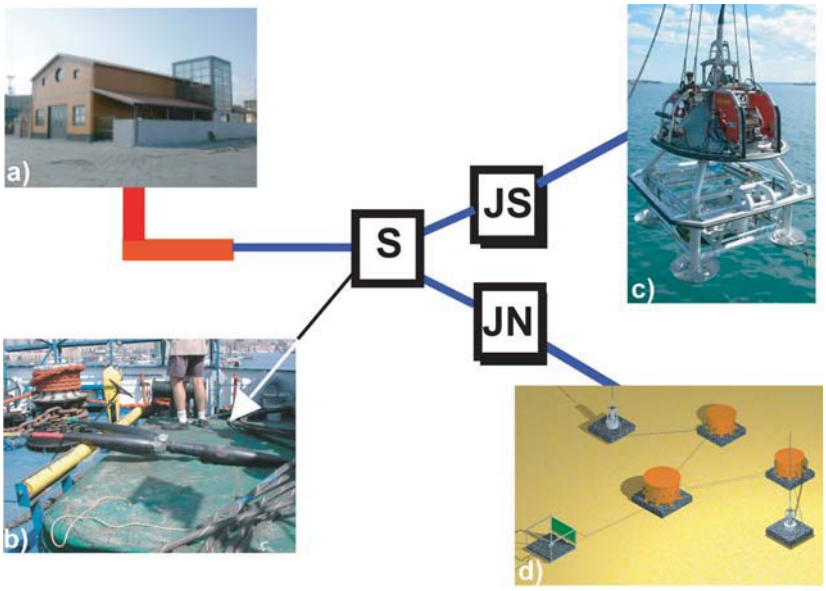

Figure 4. The configuration of the NEMO and SN-1 joint experiments. a) the INFN Lab on shore hosting the land termination of the cable; b) the cable splitter during the cable deployment; c) SN-1 and d) NEMO connected to JS and JN junction boxes installed in the two seafloor terminations of the cable.

structure seems to directly involve the roots of the Etna volcanic edifice, as it has been proposed by some authors.

The existence of other important submerged seismic structures is confirmed by off-shore bathymetric and seismic prospecting investigations; nevertheless, medium-low magnitude marine seismicity, which could provide useful information on the characteristics of the area, is neither well detected nor localised .

Eastern Sicily has experienced in the past disastrous seismic events, some of them accompanied by tsunamis, mostly generated by seismogenic structures lying at sea. The 1693 and 1908 earthquakes, both reaching an intensity of XI on the MCS scale, completely destroyed the city of Catania and Messina respectively and produced destructions all over the south-eastern Sicily (Boschi *et al.*, 1995). Damage was observed in a large area, from the southern Calabria to Malta. Both shocks were followed by a large tsunamis involving the whole of the eastern Sicily coast, the Messina Straits and, probably, the Aeolian Islands. According to some bibliographic sources, the 1693 shock gave rise to an inundation about one mile inland along the whole Eastern Sicily coast.

In recent times Eastern Sicily was interested by events of minor intensity, some of which originated by offshore tectonic structures, causing serious damage along the coast. An example is the December 13, 1990 earthquake with intensity VIII MCS, provoking severe damage south of Catania in the town of Augusta, and losses in the small town of Carlentini. This shock was accompanied by anomalous sea behaviour along the Augusta coast.

Due to its geographical position, Eastern Sicily represents a key area, from the geophysical point of view, and a chance to extend the monitoring to marine areas could certainly contribute new, important information to the study of geophysical processes. Furthermore, Eastern Sicily constitutes an interesting test area for the study of marine streams and, as a consequence, processes of sedimentation. Investigations undertaken will undoubtedly make a compelling contribution to risk assessment and mitigation.

SN-1 description

SN-1 is a two-module system based on the approach and technological

International Research: **Ocean Bottom Observatories:** Beranzoli *et al*., cont...

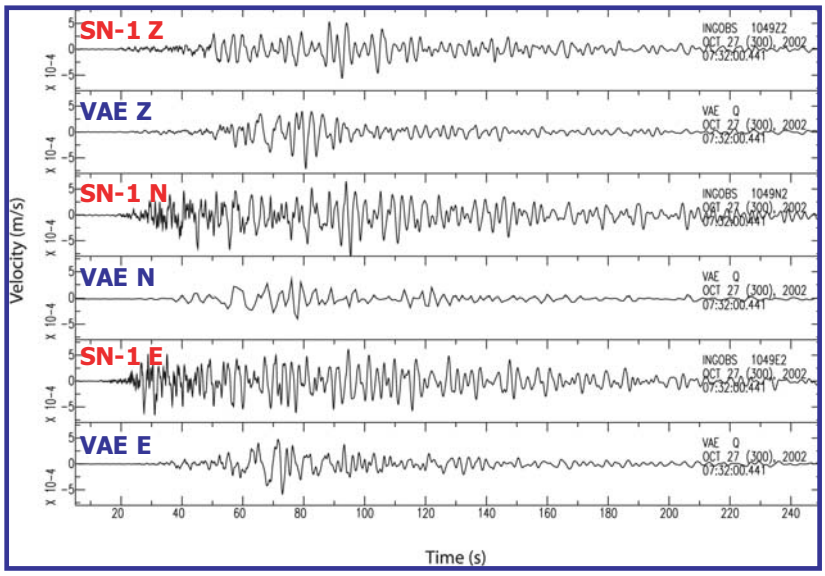

Figure 5. The SN-1 broad-band seismometer recordings of one of the largest shock of the Etna seismic sequence (October 27, 2002, M_L= 4.3) compared with the recordings of the broad-band VAE station belonging to MEDNET (see Fig. 2).

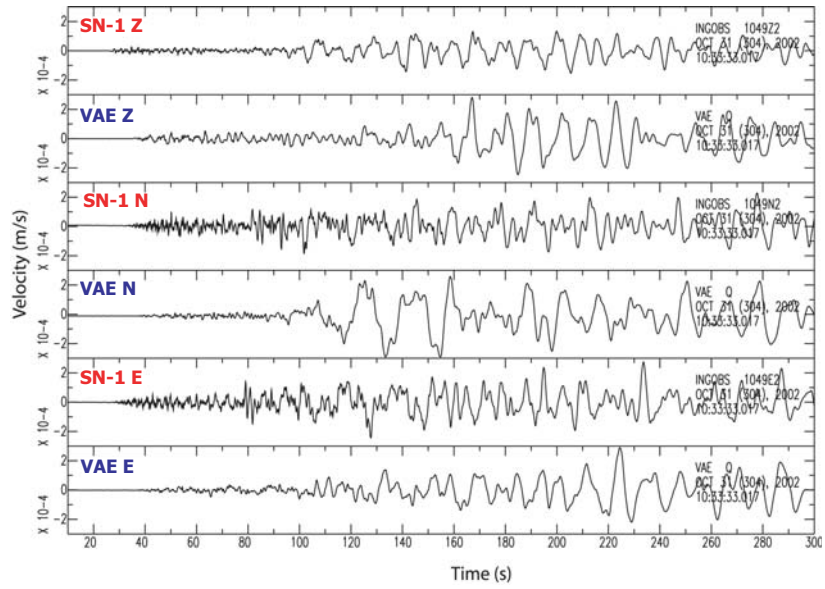

Figure 6. Comparison between SN-1 and VAE recordings of the regional event of Molise (M_L=5.4)

solutions developed and validated in the GEOSTAR projects for the deployment/recovery procedure, the communications, and the seismometer installation. The SN-1 includes the bottom observatory and the MODUS (Mobile Docker for Underwater Science), the latter developed in the GEOSTAR projects. Dimensions, weight and main characteristics of the whole system are given in Table 1 with reference to the configuration in autonomous mode. A picture of the observatory during deployment is shown in Figure 1 and the scheme of the deployment/recovery procedure is depicted in Figure 2.

The bottom observatory is presently equipped with sensors primarily addressed to seismic monitoring but in the design the possibility to extend the set of sensor packages has been taken into account. The sensors mounted on the observatory are listed in Table 2 with the indication of the sampling rate used during the mission. One of the peculiarities of both GEOSTAR and SN-1 is the unique time reference for the different sensors. This provides time-series immediately comparable in the time domain. A water current meter and a CTD are used, both, to characterise the site environment and as auxiliary sensors to discriminate between possible sources of disturbance. Status sensors have also been installed to control operating parameters (*e.g.*, tilt, battery level), malfunctioning and events that can put the integrity of the observatory at risk (*e.g.*, water intrusion, internal vessel temperature increase).

A special device validated in the previous GEOSTAR missions, is devoted to the ground-coupling of the three-component seismometer of the SN-1. The seismometer was installed in a benthosphere protected by a double housing (one inside the other) to prevent the disturbance of seawater currents on the seismological signal. The seismometer housing is kept hanging to the seafloor observatory frame and released by the sea surface operator once the observatory has been located in place. An example of power spectral density (PSD) of the acceleration of the background seismic noise is shown in Figure 3 in comparison to the New Low and High Noise Models (NLNM, NHNM) according to Peterson (1993).

The sensors are managed by a central unit, namely the Data Acquisition and Control System (DACS), also mounted on the seafloor observatory frame, which acquires the measurements, tags them according to a unique time reference and then stores on hard disks. The bottom observatory is also equipped with a

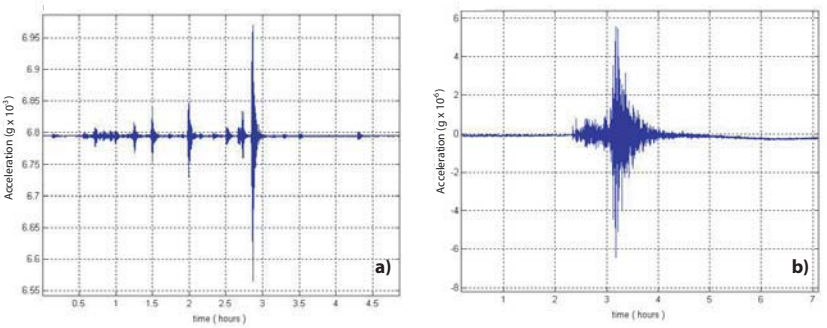

Figure 7. Gravity meter recordings of earthquakes: a) a sequence of shocks of the Etna volcano; b) an earthquake occurred in Mexico, on January 22, 2003 (Magnitude M_s 7.6).

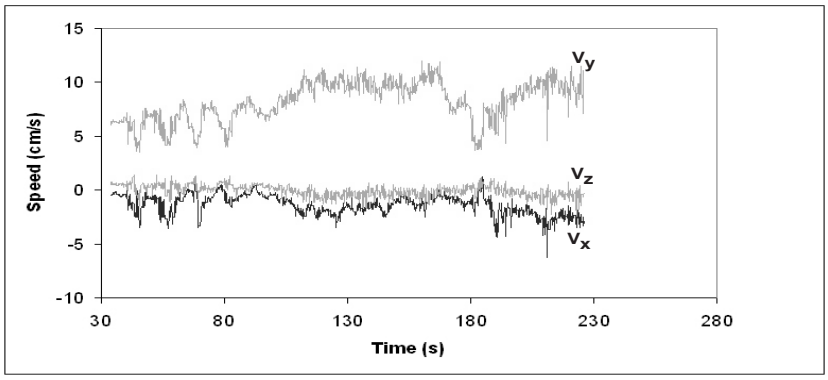

Figure 8. Three components of the water current speed V_x, V_y and V_z, at the seafloor station (2100 m w.d.) over the week 11-18 October 2002. The V_y component, that in the N-S direction, has an average value larger than the other components possibly due to the effect of the Messina Strait on the water exchange between Tyrrhenian and Ionian Seas.

standard acoustic communication system, which is used to periodically check the status of the observatory when at the seafloor. Through this system an operator on board of a ship of opportunity can retrieve some significant parameters related to the functioning and segments of scientific time series.

MODUS is a dedicated tool for deployment and recovery of the observatory. It is a simplified Remotely Operated Vehicle able to carry heavy loads, which is equipped with thrusters for movement, six video cameras for visual inspection of the seafloor, a sonar for detecting the echo of the observatory in the recovery phase and an altimeter to control the distance from the seabed. The vehicle, able to latch and release the bottom station, is driven by an operator on board a vessel through an electro-optical cable and a winch system. The status of the SN-1 during the deployment can be controlled through the cable telemetry, providing echo sounder and altimeter measurements, status parameters and images. When the observatory has touched the seabed, the surface operator turns on all the sensors packages and devices by means of MODUS telemetry and after checking their regular functioning, the acquisition of the geophysical and environmental measurements is started and checked. Then the command for the SN-1 release by MODUS is given and the vehicle is recovered on board. The operations made by means of MODUS telemetry system can also be performed through the acoustic communication system of the bottom station that represents a useful redundancy.

During the recovery, once the ship reaches the site of deployment, the MODUS is lowered in deep water and driven to approach the station. The MODUS can detect the echo of the bottom observatory by means of a sonar installed on its frame (300 m detection radius) and within a distance of 15-20 metres the video cameras are able to return images to the surface operators, helping to achieve a gradual approach. The latching of the observatory is performed through a specific device of the MODUS. The large cone of the vehicle allows to mate the docking pin on top of the observatory frame. After the latching, the data acquisition is stopped upon the operator's command and the sensors are switched off. Then the lifting of the observatory can start.

The procedures of deployment and recovery have been validated during two previous GEOSTAR missions in shallow waters (around 40 m) and deep waters (around 2000 m) under moderately rough sea conditions.

Results of the first SN-1 long-term mission

The SN-1 deployment area is comprised within the Ibleo-Maltese escarpment area, among the most important seismogenic structure of the Central Mediterranean. The location site (37° 26,53312' N, 15° 23,58716' E, 2105 m w.d., 25 km off shore the city of Catania) has been selected after a bathymetric survey implemented with side scan and CHIRP. The results of the campaign were made available in the framework of another GNDT project coordinated by Istituto di Scienze Marine-Sezione di Geologia Marina of the Italian CNR.

The longterm mission of the SN-1, from Oct. 2002 to May 2003,

provided around 10 Gbyte of data. The largest contribution, 7.6 Gbyte, comes from the seismometer due to its high sampling rate. The only failure concerned the hydrophone, which was squashed by the water pressure in spite of a certification for full depth. All the data recorded show very high quality in term of signal/noise ratio.

During the SN-1 mission, significant geophysical events occurred both in the SN-1 site nearby areas and in some Italian peninsular zones. The volcano Etna increased its eruptive activity from September 2002 with large lava production. The activity, which in December progressively diminished down to normal level, was characterised, as usual during eruption, by the intensifying of the seismic activity and by the development of clouds of eruption products of extraordinary dimensions, which released ashes all over the surrounding areas, including the city of Catania.

On 31st October 2002, one of the strongest among the recent earthquakes (M_L=5.4) occurred in the central-southern sector of the Italian peninsula (Molise region) heavily damaging the small town of San Giuliano di Puglia.

The Figures 5 and 6 show the recordings of the seismometer of SN-1 of the Etna and Molise earthquakes respectively. The comparison of the SN-1 signals with the ones of the VAE station also in Sicily and belonging to MEDNET, reveals a high quality of the recording of the submarine observatory.

Significant seismological and gravimetric signals related to some of the mentioned events were also collected during the mission (see Fig. 7).

The SN-1 also acquired oceanographic and environmental data, specifically water current speed (three component), temperature, conductivity and pressure at the seafloor station. In Figure 8 the water current speed over a week (11-18 October) is reported. A predominant water flux in the N-S direction is evident.

The SN-1 mission together with the previous GEOSTAR missions demonstrated that these kinds of seafloor observatories are reliable systems that are rather easy to manage. They represent one of the elements on which a seafloor network can be based on, being modular and re-configurable according to the requirements of specific missions.

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International Research: **Mid-Atlantic Ridge**

Taking the temperature of the Lucky Strike area

Luckyflux Science Party:

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Introduction and geological setting

The Mid-Atlantic Ridge south of the Azores Island shows a large bathymetric and gravity gradient associated with the effect of the nearby Azores hotspot. The portion of the ridge between ~35°N and 39°N is oblique to spreading, with several segments hosting hydrothermal vent sites occurring over a wide range of depths (from <1000m to >3000 m) and hosted both in basalt and peridotite. This area is also the MOMAR (**MO**nitoring the **M**id **A**tlantic **R**idge) site selected by InterRidge for implementing long-term observations, due to the variety of hydrothermal vent sites and slow-spreading segments found in the area. The Lucky Strike vent field, located at the summit of a central volcano along the Lucky Strike segment (Fig. 1), is one of the primary investigative objectives of the MOMAR. Quantification of heat flow and constraints on hydrothermal circulation in the MOMAR area in general, and the Lucky Strike segment in particular, is an important component to understand the mode of heat loss in the area and the mechanisms driving and influencing lithospheric cooling in proximity to the ridge axis. These studies require a first-order, regional study of the region prior to more localized, long-term observations at or near the hydrothermal areas. While good bathymetric and gravity coverage of the area (Cannat *et al.*, 1999; Escartín *et al.*, 2001), as well as detailed studies of the Lucky Strike system exist (Humphris *et al.*, 2002), there is little information on the thermal state of the area, the mode of fluid flow in the crust and sediments, and the rate of cooling of the lithosphere in this area.

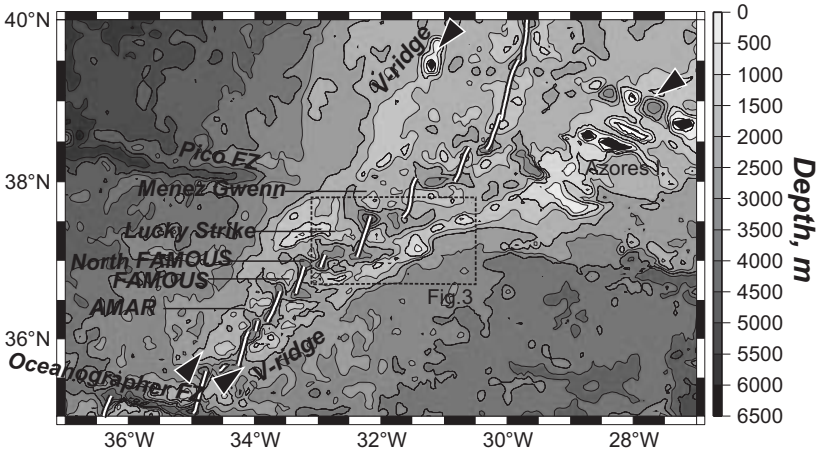

Figure 1. Location map of the study area South of the Azores hotspot. Double lines mark the ridge axis segmentation, with the names of the different segments indicated. The triangles indicate the ends of 2 V-shaped ridges (*e.g.* Cannat et al., 1999) that emanated from the Azores hotspot >10 Myrs ago. Bathymetry from Smith and Sandwell (1997).

The ' Lucky Flux ' project that we report in this note is part of this effort, and has been initiated with a cruise to conduct heat flow measurements around the Lucky Strike segment, both near- and off-axis. While some recent detailed studies exist in fast-spreading crust (*e.g.*, Fisher *et al.*, 2003), these data represent one of the most comprehensive studies of the heat flow in young (<10 Ma) oceanic lithosphere formed along a slow-spreading ridge. Older data along a non-transform offset in the FAMOUS area (Williams *et al.*, 1977) just south of Lucky Strike (Fig. 1), have suggested that this zone could be the locus of intense hydrothermal circulation. These early data were obtained with short probes (1-2.5 m) and were possibly affected by ocean bottom temperature fluctuations. The Lucky Strike area is located in the immediate vicinity of the Africa-America-Eurasian plate triple junction, and is characterized by two V-shaped ridges that emanate from the Azores Islands, propagating southwards. These ridges record the southward propagation of a magmatic pulse that initiated at ~14 Ma at the Azores hotspot, which weakened with time, and that is not visible at the present time. The seafloor at these ridges rises to <1000 m above the surrounding seafloor, is associated with crustal thickness that locally exceeds >12 km, and is characterized by lack of faulting and numerous volcanic edifices (Cannat

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et al., 1999; Escartín *et al.*, 2001). The seafloor within the V-shaped ridges has a typical slow-spreading texture, with numerous axis-parallel faults, and a sediment cover that shows significant variations in thickness both along- and across-axis. Outside the V-shaped ridges the oceanic crust is blanketed by a smooth 200-400 m thick sediment layer, with very few and partially sedimented basement outcrops.

The « LuckyFlux » cruise

The « Lucky Flux » cruise took place between June 11th and July 1st 2003, in and out of Ponta Delgada (Azores, Portugal). This project is financed by CNRS-INSU, and was carried out onboard *R/V Poseidon* (Germany), as part of an exchange program of ship time between France and Germany. We performed a total of 186 penetrations of the heat flow probe, and we obtained more than 150 heat flow measurements. We also deployed 3 NOAA PMEL MAPRs (Miniature Autonomous Plume Recorders) in collaboration with Ed Baker, to obtain nephelometry profiles during the deployment of the heat flow probe.

Heat flow Probe

The heat flow probe deployed (Fig. 2), which was originally designed and operated by R. Von Herzen and colleagues at Woods Hole Oceanographic Institution during the 70's through the 90's, is operated by the Laboratoire de Geosciences Marines (IPGP). The 5-m long probe was equipped with 7 thermistor and heater wire sensors, and with two pressure cases hosting the batteries, acoustic transmission system, and the measurement circuitry. The probe is programmed to perform a measurement cycle (~15½ min duration) after each penetration (temperature measurements, continuous heating for thermal conductivity measurements, and measurement of the near-bottom water temperature). Battery and memory capacity allows for deployments of up to 70 hours, and the probe is operated in a 'pogo' mode during each deployment.

Figure 2. Deployment of the heatflow probe during the LuckyFlux cruise. The 1-Ton weight holds the acquisition and power supply system. The thermistors protruding from the 7-m long probe are also visible.

MAPR

We deployed 3 NOAA PMEL autonomous nephelometry-temperature-pressure recorders (MAPR; Baker and Milburn, 1997) during the heat flow probe lowerings in proximity to the ridge axis. These instruments were loaned by NOAA PMEL to carry out the measurements in cooperation with Ed Baker. In each lowering a MAPR was placed 50 m above the heat flow probe. In the lowerings performed the MAPRs functioned properly, but we identified no nephelometry anomaly in the water column that may be associated with hydrothermal plumes.

Heat flow Profiles

Heat flow measurements were conducted along profiles with a spacing of ~1 mile, both near-axis (within the v-shaped ridge) and off-axis, over older sedimented seafloor East of the ridge axis (Fig. 3). Measurements were restricted to areas with sufficient sediment cover, as indicated by 6-channel and 3.5 kHz seismic profiles from the *Sudaçores'98* cruise (Cannat *et al.*, 1999).

Off axis heat flow profiles (A-B, C-D, O-P). One of profiles followed the ~10 Ma isochron as interpreted from the Sudaçores magnetic data (*Cannat et al.*, 1999; Escartín *et al.*, 2001), sub-parallel to the overall

trend of the ridge axis. Two additional profiles were conducted along flow-lines, between the isochron profile and the outer base of the V-shaped ridge (Fig. 3).

Near-axis heat flow profiles (E-F, G-H, K-L, M-N). Due to the irregular distribution of sediments, the rugged terrain, and the available data, we restricted our axial heat flow measurements to the outside corner crust at each side of the ridge axis (Fig. 3). The sediment thickness decreases from the outside corners towards the inside corners, and sediments are almost absent at the axial valley. We obtained useful data along 6 axis-perpendicular profiles, following existing seismic profiles from the *Sudaçores* cruise, and one profile subparallel to the axis. Due to the presence of rocks and the rugged terrain, we were unable to complete and obtain profiles with regularly spaced measurements for the 2 profiles west of Lucky Strike (K-L, M-N, Fig. 3).

Preliminary results

The off- and near-axis oceanic crust show distinct heat flow patterns, probably due to the presence of the V-shaped ridge, and the difference in the geometry, thickness and continuity of the sediment cover. Below we present preliminary results, and updates on work related to LuckyFlux will be available at: *http://www.ipgp.jussieu.fr/rech/lgm/luckyflux*

Near axis

The near-axis profiles are located in outside-corner crust at the end of the segment, between the rift-bounding fault and the inner limits of the V-shaped ridge. Seafloor ages interpreted from the *Sudaçores'98* magnetic data are between ~1.5 and 4.5 M.y. (see Fig. 5 in Escartín *et al.,* 2001). Measured values are in general ~30% or less of those theoretically expected for these seafloor ages (Stein and Stein, 1992). Heat flow stations exceeding the theoretical values appear to be very localized, and do not define broad, systematic variations in heat flow. These patterns may be caused by fluid circulation and heat loss through exposed basement, such as along fault scarps, or along the inside corner terrain. Fluid flow in the crust is expected to be highly variable along both parallel and across-axis directions.

Off-axis

One of the off axis profiles follows the ~10 Ma isochron (profile A-B, see Fig. 3 and Fig. 5 in Escartín *et al.*, 2001), with two profiles extending from the ~10 Ma isochron to the outer limit of the V-shaped ridge. The age of the crust at the westward end of profiles C-D and O-P is not well constrained from existing data due to the diachronous emplacement of the V-shaped ridge, but is probably 6 and 8.5 Ma. This area has a continuous and thick (>200-m) sediment cover, and a smooth basement with vertical relief <200 m that is completely sedimented. Overall the measured heat flow is in good agreement with the theoretical values expected for this seafloor age, with superimposed long-wavelength (>10 km) anomalies.

The two most prominent heat flow anomalies are at the West end of profile C-D and at the vicinity of the intersection of profiles A-B and O-P (Fig. 3). The low at the end of profile C-D shows relatively constant values of 20-50 mW/m^2, and is ~100 mW/m^2 below the average value of the profile. These low values extend ~15 km away from the base of the V-ridge, and transition to a local heat flow high ~45 km from the end of the profile. In contrast, the West-end of profile O-P shows constant and normal heat flow values in the immediate vicinity of the V-shaped ridge. The second anomaly at the intersection of profiles A-B and O-P is also a two-dimensional heat flow low (~100 mW/m^2 in amplitude), extending >25 km along profile A-B and >15 km along profile O-P. A local heat flow high is observed at the midpoint of profile O-P (~31°W, Fig. 3). These relatively large variations in heat flow at lateral scales of tens of km demonstrate that, despite the presence of a thick and homogeneous sediment layer in >6-8.5 Ma old crust, there is probably important fluid flow through the upper oceanic crust, perhaps with diffuse discharge zones through the sediment column. Mostly linear gradients over a 5-m-length probe preclude discharge at rates greater than a few tens of cm/yr.

Detailed analysis of the heat flow

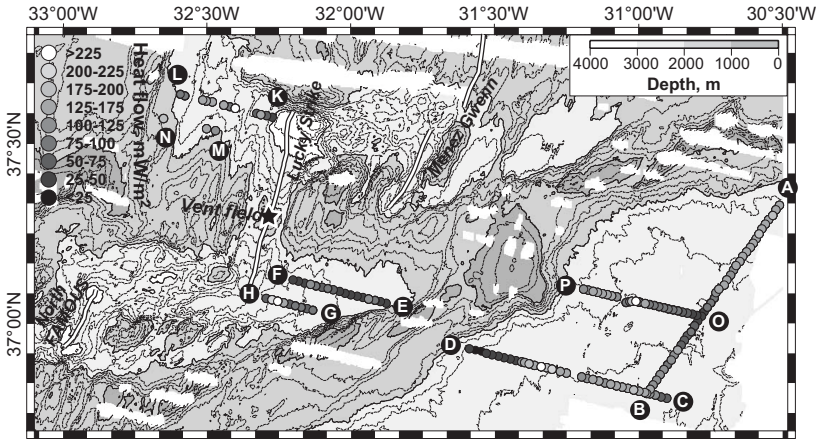

Figure 3. Heat flow stations and values along profiles realized during the « Lucky Flux » cruise around the Lucky Strike area. Off-axis heat flow data show systematic two-dimensional variations at scales of >10 km. The Lucky Strike hydrothermal vent field is indicated by the star. Multibeam bathymetry from the Sudaçores cruise (Cannat *et al.*, 1999; Escartín *et al.*, 2001) with 200 m contours.

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data needs to be integrated with bathymetric and seismic data available in the area. In particular, buried basement structures, as seen in Pacific crust (abyssal hills, seamounts; *e.g.* Fischer *et al.*, 2003) and faults in the sediments may strongly control the zones of recharge/discharge. Comparison of these data with results from numerical models of fluid flow and heat flow will provide constraints on the different modes of cooling both near- and off-axis of slow-spreading ocean crust.

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Multibeam sonar survey of the central Azores volcanic islands

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In September-October 2003, we surveyed the central Azores islands (Fig. 1)with a portable Reson Seabat 8160 multibeam echo-sounder installed on the University of the Azores *R/V Arquipélago*. The cruise was a unique collaboration between marine geophysicists from Cardiff University, and marine biologists and geologists from the University of the Azores. Besides revealing the volcanic and tectonic structure of parts of the Azores spreading plate boundary, the data will aid the assessment of spawning grounds for pelagic fish, which form an important resource for the local economy, and will inform local authorities of geological hazards to coastal populations.

The Azores islands are often visited by scientists as they provide convenient and pleasant ports for research vessels working in the central Atlantic but they have been less a focus for marine geophysics themselves. Along with the 1999 Italian-UK AZZORRE99 TOBI deep-tow sidescan sonar survey around the central islands (Ligi et al 1999), forthcoming multibeam sonar surveying by the Portuguese STAMINA group around Terceira (N Lourenço, pers. comm.) and rock dredging from FS Poseidon (CW Devey, K Haase pers. comm.), this project represents a renewed interest in the Azores.

The Azores as an ultra-slow spreading plate boundary

There has been much recent interest in the volcanic and tectonic structure of ultra-slow spreading ridges such as the Southwest Indian Ridge and Gakkel Ridge in the Arctic, because the extreme spreading rate may potentially shed light on melting processes in the underlying mantle and delivery of melt through the lithosphere to form the oceanic crust (Mapping and Sampling the

Arctic Ridges: A Project Plan, InterRidge, pp. 25, Dec. 1998). Spreading at ~3 mm/yr (Searle, 1980), the Azores region is an ultra-slow spreading plate boundary, much slower than the Gakkel Ridge (6-15 mm/yr; deMetts *et al.*, 1990). Volcanism is distributed sporadically across the plate boundary, creating the individual islands and interspersed submarine edifices, a result of a broad underlying melting anomaly (Bonatti, 1990). The volcanic centres illustrated by the topography (Figure 2) show that volcanism is localized in a way that is comparable to that of Gakkel Ridge (Edwards *et al.*, 2001).

The Azores as a 'natural laboratory' of mid-ocean ridge processes

The islands and their adjacent submarine ridges reveal volcanism and tectonic features over a range of water depths and with different tectonic-volcanic configurations, which have the potential to shed light on a variety of mid-ocean ridge processes. For example, the elongated morphology of the islands of São Jorge and Pico-Faial and of their adjacent submarine ridges suggest that they are tectonically controlled. São Jorge and eastern Pico, in particular, are bisected by linear arrays of volcanic cones - studying their geometrical relationships to faults may aid understanding of how volcanism is affected by tectonics. Furthermore, the submarine ridges transcend a variety of water depths and ambient pressures. By studying the distribution of different surface morphologies of cones in these ridges over a range of water depths, it may be possible to infer if ambient pressure affects the style of volcanic extrusion. The geochemistry of rock samples dredged from Poseidon will help to reveal effects of varied lava chemistry on extrusion style, as well as spatial heterogeneity of the underlying melt source.

The Azores as a 'natural laboratory' of volcanic ocean island processes

The Hawaiian, Canary and several other volcanic ocean islands have been imaged with multibeam sonars over the past decade (we use the term 'ocean island' to distinguish these from arc islands). However, those data were collected with deep-water sonars fitted to large vessels that were unable to work in the coastal zone. The small vessel Arquipélago was able to work to very shallow water (10 m) where the unique dynamic beam focusing of the Reson Seabat 8160 sonar allowed us to image fine-scale features. As the system also functioned well in 1000 m, we were able to collect data over the whole profile of the islands, to address both deep and shallow processes during the same survey.

Many issues concerning the submarine volcanic growth and modification of volcanic islands remain unresolved, and much of the existing work has been carried out on Hawai'i, which is not representative of most oceanic volcanism. The submarine parts of volcanic islands are usually much larger than their parts above sea level but it is still unclear to what extent the submarine parts grow from direct volcanic extrusion or from material originating from above sea-level (debris from coastal lava-sea water interactions and erosion or from lava tubes transcending the surf zone (Moore *et al.*, 1973)). The new data should help address these aspects. Furthermore, the coastal zones of the Azores contain abundant submarine terraces. Correlating them with the global sea-level curve and interpreting them along with cliff and shelf geometry and rock dating at Kiel University, will help unravel the history of tectonic vertical motions, volcanic growth and coastal erosion.

Multibeam sonars have revealed some spectacular landslides around the Hawaiian, Canary and other volcanic islands (Moore *et al.*, 1989; Watts and Masson, 1995). Such giant landslides are infrequent, however, probably occurring on average only every 10,000 years globally. The Azores are remarkable in that they show relatively little evidence for such large-scale landslides (Mitchell, 2003). Small landslides around lava deltas and the upper submarine slopes of the islands, though individually less hazardous, probably represent a more frequent threat to local populations. Subma-

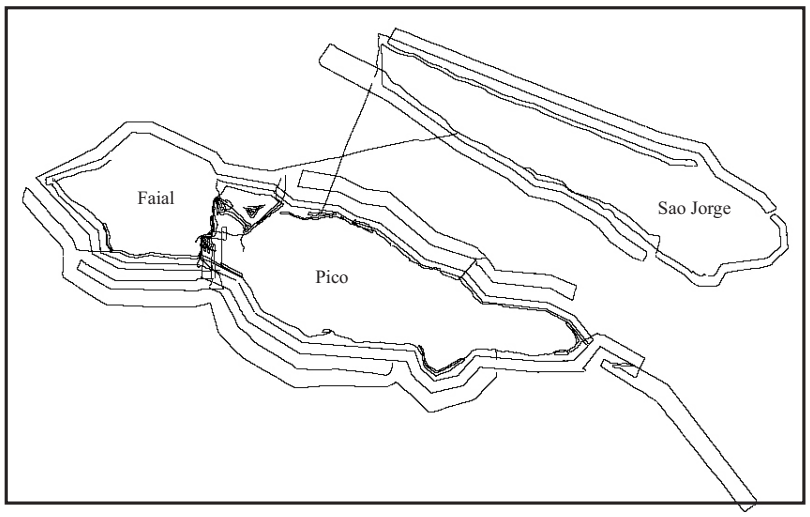

Figure 1. Survey tracks around the coasts of Faial, Pico and São Jorge. The system was used to map from depths as shallow as 10 m down to below 1000 m.

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rine landslides could explain some of the several historical tsunamis in the Azores. The new data collected reveal a remarkable array of submarine slope failures, which will assist local hazard assessment and also help in developing a more complete understanding of seismic and other causes of slope failure around such islands.

Habitat mapping for sublittoral biological communities

Due to increasing anthropogenic activities affecting the ocean bed, the demand for comprehensive environmental appraisals of benthic habitats and associated biological communities (biotopes) is growing in the Azores. The scarce knowledge on the variety and distribution of marine biotopes has complicated well-informed decision making on issues of conservation and management of shallow and deep water areas and biological resources.

From the point of view of ecology, these new data will aid the description, classification and mapping of sublittoral habitats/biotopes at one of the areas of the coastal Azores most relevant for conservation: the Faial-Pico channel. This information will not only assist the refinement of the management measures proposed for this area but will also be helpful for the planning of other marine activities and Special Areas of Conservation (SACs – Natura 2000 network), the prioritisation of new potential sites for nature conservation and the establishment of baseline conditions for monitoring studies.

For further information please contact Neil at neil@ocean.cf.ac.uk (geological aspects), Eduardo at eduardo@notes.horta.uac.pt (biological aspects) or João Carlos at nunes@notes.uac.pt (Azores geological hazards aspects). (Websites *http://www.ocean.cf.ac.uk/people/neil/*, *http://www.horta.uac.pt/* and *http://www.uac.pt/~jcnunes*.)

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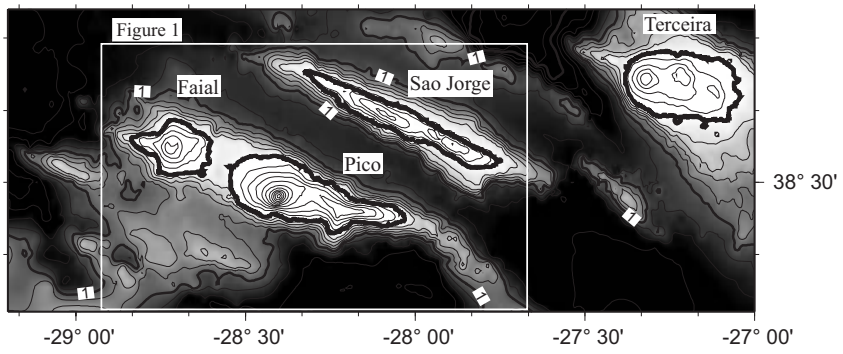

Figure 2. Topography of the central Azores islands (contours every 200 m with bold contours annotated every 1 km). The structure forming Faial-Pico and the island of São Jorge are elongated volcanic ridges, and further volcanic ridges exist among the islands. An eruption on the ridge immediately west of Terceira in particular was the subject of a previous article by Freire Luis *et al.* (*InterRidge News*, *8(1)*, 13-14, 1999).

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International Research: **Mid-Atlantic Ridge**

PGM AND PGE IN LOGATCHEV-2 ORE FIELD, MAR

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A large number of native ore mineral samples collected from the Logatchev-2 hydrothermal field were subjected to detailed mineralogical and geochemical investigations of ferromanganese hydrothermal crusts overlying massive sulphides hosted in ultramafic and serpentinite exposures. Crusts were analyzed using IC-PMS (with preliminary concentration), as well as microprobe analysis of polished thin sections (with preliminary treatment by epoxy resin).

Native elements hosted in manganese crusts include such minerals as copper-rich gold, electrum, native zinc, native alloys and intermetallides (Fe, Cr, Co), (Fe, Cr, W, Mo), (Fe, W, Mo), (Co, Ni, Cr), $(Pd_{0.83}Pt_{0.06}Fe_{0.05}Cu_{0,06})_{1.00}$ (Fig.1). It is important to note that the discovery of native palladium in Logatchev-2 ferromanganese hydrothermal crusts is associated with ultramafic rocks, repeating the finding of solid palladium alloy in serpentinite-ultramafic-hosted massive sulphides sampled from the Rainbow field $(Pt_{0,37}Fe_{0,35}Cu_{0,27}Ni_{0,01})_{1,00}$ (Lazareva et al., 2002). However, a separate study of mineral complexes of serpentinites from the Logatchev-2 field revealed no native PGM alloys. Geochemical analysis of sulphide ores from Logatchev-2 provided interesting results for a number of noble metals (sample 384-3) (detailed description of the sample was given in Torokhov et al., 2002), including PGE-s. Analysis was done by means of ICP-MS analysis using CHR-Pt+ and CHR-Bkg Cr standards of BRGM, France (in ppm) with 1 kg of sample, revealing metal concentrations as follows:

Ru 0.02, Rh 0.49, Pd 0.90, Ag 79.36, Re 0.51, Os<0.02, Ir<0.01, Pt<0.02, Au 28.08

The predominance of Pd in our analysis of massive sulphide shows, however, that PGE distribution is not typical for ultramafic rocks and indicates that geochemical evolution of PGE composition took place during hydrothermal leaching and transport, and/or partial melting of ultramafic host rocks. We suggest that PGE transport took place either through the formation of chloride complexes with consequent fixation by sulphur (hydrothermal), or direct transportation in sulphur droplets from melted host rocks (melting). High concentrations of PGE can result in the formation of native metal minerals, with fixation of the rest of PGE within a sulphide matrix. Further investigations should definitely show a wider number of sulphide PGM phases.

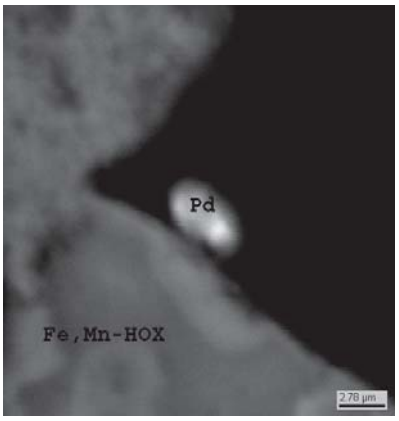

Figure 1. Native Pd with admixture of Pt, Cu, Fe, Logatchev 2, ferromanganese hydrothermal crust, sample 92-10, bse.

Acknowledgements

The authors wish to thank Dr Daniel Curewitz for eiditing the article.

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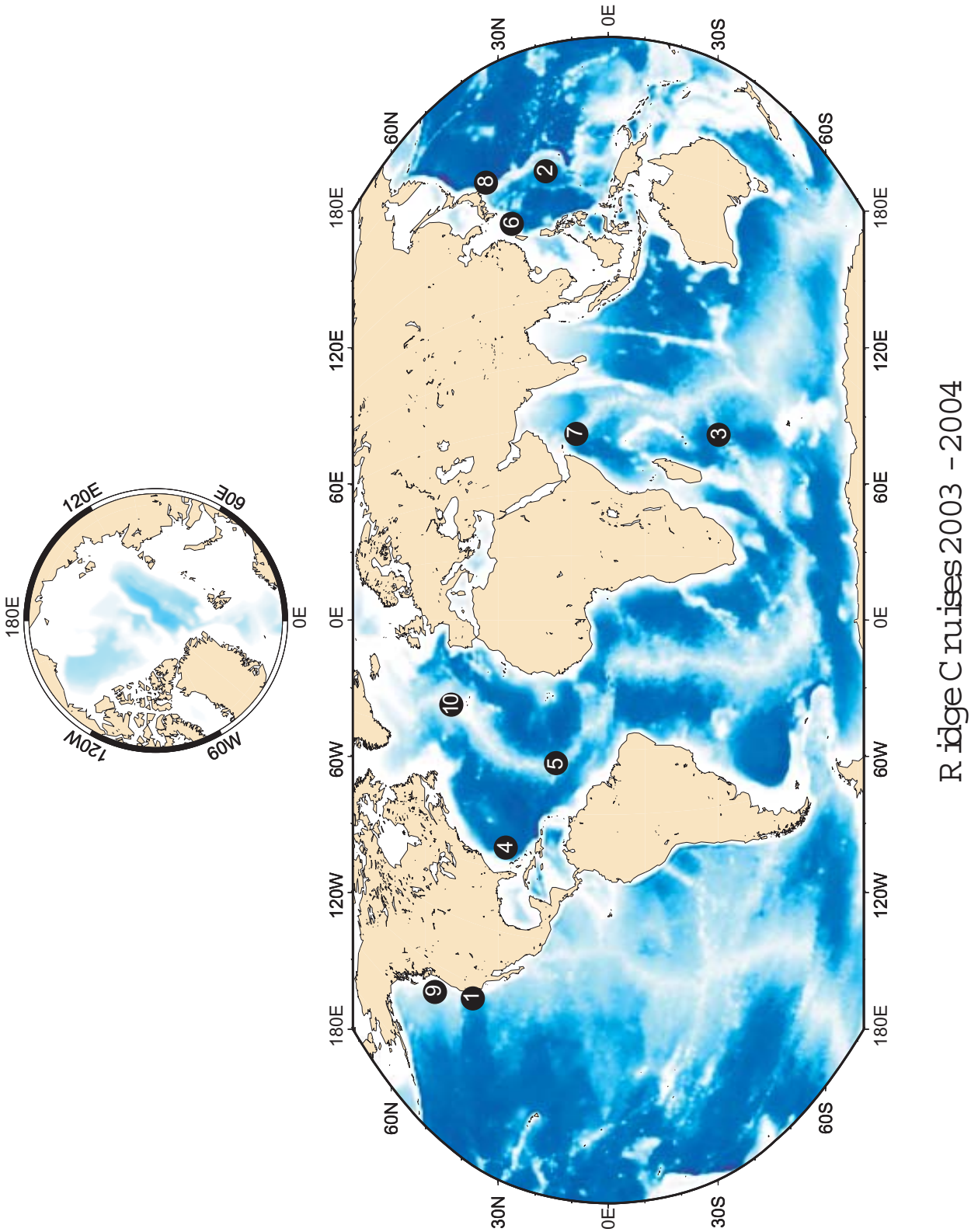
World Ridge Cruise Map, 2003-2004

A listing of international ridge cruises, compiled by Daniel Curewitz can be found on the following pages. Each cruise is coded with a number, which represents it's location on the map below. The list of world cruises is organised by date. Please submit scheduled and upcoming cruises by filling in the online form at: http://www.intridge.org/cruisefm.htm



Map No.	Country	PI	Institution	Cruise ID/Location	Research Objectives	Ship	Dates
1	USA	Voight	Field Museum	Gorda Ridge Monterey Fan Valley seeps	Biological collections at vents and seeps, chemical and geological studies, mapping	Atlantis Alvin	2003
2	Japan USA	Ohara	Hydrogr. Dept. Japan	Parece Vela Basin, Phillipine Sea	Comprehensive petrological investigation of the Parece Vela backarc basin amagmatic spreading center. 25 to 30 dredge hauls.	Karei	Jan 6 - Jan 25, '03
3	USA	Dick Lin	WHOI	Southwest Indian Ridge	Rock dredging and geophysical studies to investigate the influence of ridge geometry on cresutal accretion and mantle structure of an ultra-slow spreading ridge	Melville	Jan 19 - Feb 9, '03
4, 5	France	Cosson Lallier	ISOMer Roscoff	MALABAR/MAR (Logatchev), Barbados (Orinoco-El Pilar)	Sampling of microbes to study their biodiversity and adaptations to hydrothermal vents and cold seeps.	L'Atalante Nautile	Mar 12 - Apr 8, '03
5	USA	Dziak Smith	NOAA WHOI	Mid Atlantic Ridge (10°-35°N)	Deploy and recover autonomous hydrophones monitoring seismicity along the northern Mid Atlantic Ridge	Maurice Ewing	Apr 17- May 14, '03
5	USA	Reves-Sohn Humphris Canales	WHOI	Mid-Atlantic Ridge, 26°N TAG segment	Install long-term seismic and exit fluid temperature instrument networks	Atlantis	June 11- June 28, '03
6	Japan	Nunoura	JAMSTEC	Okinawa Trough	Microbiological studies of hydrothermal sites using Shinkai 6500 submersible	Yokosuka Shinkai 6500	July 1- July 18, '03
7	England	Murton	SOC	Carlsberg Ridge, Indian Ocean	Plume-ridge interaction, multibeam, TOBI Sidescan sonar, hydrothermal/biological studies	Charles Darwin	July 18- Aug. 6, '03
6	Japan	Inagaki	JAMSTEC	Okinawa Trough	Microbiological studies of hydrothermal sites using ROV Hyper-Dolphin	Natsuhima Hyper-Dolphin	Aug 12- Sept 6, '03
2	Japan	Takai	JAMSTEC	S. Mariana Trough	Microbiological studies of hydrothermal sites using Shinkai 6500 submersible	Yokosuka Shinkai 6500	Aug. 19- Sept. 19, '03

World Ridge Cruise Schedule, 2003 -2004, continued...

Map No.	Country	PI	Institution	Cruise ID/Location	Research Objectives	Ship	Dates
8	Japan	Matsuyama	JAMSTEC	Japan Trench Cruise: Japan Trench	Genome analysis of the symbiotic bacteria of molluscans that grow in chemosynthesis-based environments	Kairei Kaiko	Aug. '03
9	USA	Chadwell	SIO UCSD	South Cleft Segment, Juan de Fuca Ridge	Deploy system for continuous (daily) measurements of acoustic range across (~1-km wide) axial valley floor.	Revelle	Sept. 4 - Sept. 20, '03
10	France, US, Portugal	Goslin	CNRS Brest	SIRENA-2/D274 North Atlantic	Recovery (or turn-over) of six autonomous hydrophones moored in the SOFAR channel to record signals from MAR earthquakes occuring north of the Azores	Discovery	Sept. 11 - Oct. 5, '03
2	Japan	Utsumi	Tsukuba	S. Mariana Trough	Geochemical studies of hydrothermal sites using Shinkai 6500 submersible	Yokosuka Shinkai 6500	Oct. 14- Nov. 14, '03
2	Japan	Deschamps, Fujiwara, Tokuyama	JAMSTEC ORI	MICRO-MAR Central Mariana Trough	High resolution side-scan (Wadatsumi) of the Mariana Trough spreading axis.	Kairei Wadatsumi	Oct. 22 - Nov. 14, '03
2	Japan	Ohara	JAMSTEC	S. Parece Vela Rift, Phillipine Sea	Shinkai6500 dives on the walls of the axial valley of the Parece Vela Rift	Yokosuka Shinkai6500	Nov. 5 - Nov. 14, '03
5	Germany UK	Devey Rhein	U Bremen, SOC U Hamburg Freie U GEOMAR	MAR 2°-11°S	Detailed bathymetry and side-scan (TOBI) of the MAR. Locating and exploring hydrothermal sites with BRIDGET, CTD, and new Bremen 4000m ROV	Meteor	Nov. 9 - Dec. 30, '03
2,8	Japan	Ishii	ORI	Mariana Arc- Parece Vela Rift	Rock sampling in the southern Mariana forearc and backarc regions. Geophysical mapping of the amagmatic Parece Vela Rift.	Hakuho	Nov. 11 - Nov. 28, '03
8	Japan	Nishizawa	JAMSTEC	Bonin Arc	Geophysical studies of hydrothermal sites using ROV Kaiko	Kairei Kaiko	Dec. 12- Dec. 26, '03
5	Germany	Herzig	Freiberg	HYDROMAR, MAR 15°N	ROV investigations of hydrothermal and biological interactions in ultramafic hosted hydrothermal systems	Meteor	Jan 15 - Feb 13, '04
5	Germany	Reston	GEOMAR	MAR 8°S Ascension Fracture Zone	Wide-angle seismic refraction and reflection, microseismicity and tomography.	Meteor	2004

National News....

Canada: CanRidge

During the summer of 2002, several submersible cruises were undertaken by CanRidge researcher, in collaboration with American colleagues. Briefly, a joint cruise with the NOAA Vents program visited Axial Volcano on the Juan de Fuca Ridge and the vent fields of Southern Explorer Ridge, both in the northeast Pacific. This cruise deployed the ROPOS submersible from the R/V Thomas G. Thompson. A second, CanRidge only cruise to the Endeavour Segment vent fields deployed ROPOS from the Canadian vessel John P. Tully. As usual, all cruises were multidisciplinary and submersible operations ranged from deployment of experimental modules for colonisation by larvae and microbes, to the sampling of basalts and sulphides. Further details of these cruises are given in reports to the InterRidge News.

Another major collaborative field effort is planned for summer 2003. A three leg cruise with ROPOS on the R/V Thomas G. Thompson will visit the Endeavour Segment vents and Axial Volcano. Legs 1 and 2 are in collaboration with the University of Washington, while Leg 3 is a collaboration with the NOAA Vents program.

Canadian biologists from the Verena Tunnicliffe, Kim Juniper, Anna Metaxas and John Dower laboratories will be participating in a NOAA cruise to series of submarine volcanoes along the Marianas Arc north of Guam, from March 27 to April 18, 2004. The primary objective will be to examine the role of bathymetry (50m to >1600m depth range) in generating patterns of vent ecosystem structure and function, and to examine the factors influencing midwater trophic structure above seamounts. Dive operations will use the Canadian ROV ROPOS, aboard the R/V Thomas G. Thompson.

We are beginning the final year of a 4-year, non-renewable collaborative grant that funded the consolidation and expansion of ridge research in Canada. During the past three years 8 more Canadian university laboratories have become involved in hydrothermal vent research, bringing the total to 13. Other funding avenues to continue group activities are presently being explored. We will also soon begin the final year of funding of the ODP Canada program, which has been paying Canada's Associate membership in InterRidge. Again, other funding will have to be obtained to maintain this level of membership.

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Marine Protected Areas in Canada

University of Qubebec, Endeavour hot vents area:

http://www.er.uqam.ca/nobel/oasis/

Marine Protected Areas programme:

http://www.dfo-mpo.gc.ca/canwaters-eauxcan/oceans/mpa-zpm/dmpa_e.asp
http://www.pac.dfo-mpo.gc.ca/oceans/mpa/default_e.htm

The Remotely Operated Platform for Ocean Science: http://ropos.com/

Previous updates from Canada can be found at:

http://www.intridge.org/can.htm

National News....

Germany

The German Ridge program officially commenced on 10 October 2003. A total of 15 projects have been funded in the first round, titles and abstracts of these projects can be found at: http://www.ozeankruste.de following the links "DFG Priority Programm 1144" and then "Actually running projects". At the time of writing (early December) containers are being packed for the first cruise in this programme, scheduled to depart Martinique 15 Jan 2004, arriving Martinique 13 Feb 2004 under the leadership of Thomas Kuhn. This cruise will lay the foundations for a multi-year series of observations at and around the Logatchev hydrothermal field in the Atlantic and will be the first deployment of the Bremen Quest 4000m ROV within the German ridge program.

The coordination of such a diverse group of scientists as the German Ridge program has made it imperative that the coordination office maintains close interdisciplinary contacts with the participants. To this end a bi-annual newsletter has been conceived and is in the last throes of revision. We hope to be able to distribute it before the first cruise begins.

The German community will be holding its annual workshop sometime in late spring/early summer 2004 to discuss the results of the Logatchev cruise and plan the continuing activities within the program.

Last but not least the German Office is very busy with the preparations to take over running the InterRidge Office as of 2004. Various complicating external factors have meant that things have not proceeded as quickly as hoped, nevertheless we will be up and running at the start of 2004.

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InterRidge - Japan

InterRidge Office will leave Japan at the end of 2003 after 4 years activity of the office at Tokyo. The Japanese community of InterRidge is proud of having hosted InterRidge Office for four years at the very last phase of the InterRidge Program Plan. InterRidge Japan is assured to receive InterRidge Japan fund from the MEXT (Ministry of Education, Culture, Science and Sports) for two more years. From the fund we will continue to contribute the InterRidge as a principal member. Now we are about to launch Next Decade InterRidge program. If our Next Decade program goes well, we believe it will not be difficult for us to get another four years program of InterRidge Japan. We, Japanese ridge research community, keep strong intension to be an active member for the InterRidge Next Decade as a principal member. Recently the seagoing activity of Japanese research fleet in the western Pacific is being enhanced by the activity of the Archean Park Project and other several independent smaller programs by biologists and geologists. As InterRidge Japan welcome China's participation to the InterRidge, we would like to strengthen the collaboration with Asian countries for research on active back-arc basins in the Western Pacific. We are also anticipating that the InterRidge Theoretical Institute in Korea next May will greatly facilitate such collaborations.

InterRidge Japan will support the travel of a number of four young scientists to participate the theoretical institute. At last one good news from Japan is the first very successful operation of the deep sea AUV, R2D4 in July 2003. The AUV was developed by the Institute of Industrial Science of University of Tokyo. R2D4 is designed to detect active smokers automatically and has a cruise scheduled to the Southern Okinawa Trough to search for active hydrothermal areas in December 2003 and to the Mariana Trough in June 2004.

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National News....

USA : R2K

More than 100 members of the Ridge 2000 community met on November 7-8, 2003, in Boulder, Colorado, to provide updates and to help plan the future of the program's Integrated Studies Sites (ISS) and Time Critical Studies (TCS). A general theme that emerged from the meeting was that all aspects of the Ridge 2000 program are off to strong starts. However, it was also emphasized that there is still a need for a considerable number of additional studies to meet the goals of the program, and there are abundant opportunities for new investigators to participate.

Implementation of R2K research is well underway as the program prepares to enter its fourth cycle of ISS proposals to the US National Science Foundation. Ridge 2000 proposals have fared very well in peer review, with a success rate that is above the average for proposals in the Ocean Sciences. In the first two cycles, 22 proposals received funding. Five proposals have been funded for work on the East Pacific Rise (EPR), 5 for the Lau Basin, and 2 for the Endeavour Segment on the Juan de Fuca Ridge. Six proposals have been funded for Time Critical Studies, and 4 for work on data management, laboratory studies, or modeling. Review of the third cycle of proposals is underway as of this writing, and the fourth-cycle target date is Feb. 15, 2004.

TCS research explores the immediate consequences of transient events, both magmatic and tectonic, related to seafloor spreading. The US Navy's SOSUS hydrophone array, which allows real-time detection of events in the NE Pacific, has recently been renovated and is functioning at near 100% capacity. Although a wide spectrum of work is funded in anticipation of the next event worthy of response in the NE Pacific, the TCS working group emphasized that new and innovative approaches to this theme are needed.

Integrated Studies on the Endeavour Segment of the Juan de Fuca Ridge are off to a strong start. This was the site of the RIDGE program observatory effort and the focus of a number of current projects funded by other US sources. In addition, considerable activity by Canadian researchers contributes to the interdisciplinary activities in the area. The 2004 field program has 90 scheduled ship days between May and September. This high level of activity will likely continue into the future because the NEPTUNE Canada project has recently received full funding and the area has been selected for the first US regional observatory effort (NEPTUNE).

The range of studies already funded for the EPR ISS will provide an excellent start on the modeling, experimentation, and interdisciplinary monitoring of this ISS. Several of the meeting participants seemed almost to be holding their breath, expecting another magmatic/tectonic event in the near future at this ISS. Seven cruises in 2004 will continue experiments to image the subsurface, document upper crustal deformation, and examine the links between the mantle, seismic activity, chemistry, and biology of this ISS.

The 2004 field season will inaugurate R2K work on the East Lau Basin Spreading Center. Five cruise have been funded by the NSF for 2004. In addition to collecting a variety of data necessary to understand this system, the first four cruises will conduct a coordinated series of investigations to collect the data necessary to choose a single vent field that will serve as the focus for future Integrated Studies on this spreading center. It is anticipated that this focus area will be determined by late 2004, either in an open, web-hosted forum, or if needed, in January 2005 at an open workshop.

Central to R2K science is a community commitment to share data. Dale Chayes from the new R2K Data Management Office at Lamont-Doherty Earth Observatory (Columbia University) introduced the Ridge 2000 Open Data Exchange System (RODES) at the Boulder meeting. The architecture of RODES is already well developed, interaction is planned with a wide variety of national and international data bases, and the metadata collection forms will be alpha tested on R2K cruises in 2004.

R2K Education and Outreach

Several exciting activities involving numerous ridge researchers were initiated this year. The Ridge 2000 Distinguished Lecturer Series will begin during the 2004 spring semester. Margaret Tivey (WHOI), Charles Langmuir (Harvard), Cindy Lee Van Dover (William and Mary), and Andrew Fisher (UC Santa Cruz) will visit 16 US universities and colleges to share the latest in mid-ocean ridge research and to engage potential students in mid-ocean ridge science. Lecturers also will offer talks for public audiences.

SEAS (Student Experiments At Sea), a pilot program for middle and high school students, is also underway this year. Patterned after NASA's Student Involvement Programs, the R2K program provides middle and high school teachers with a curriculum that engages students in mid-ocean ridge studies through their own investigations. Students are invited to submit proposals for

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simple deep-sea experiments from which five will be selected and taken to sea aboard the April R2K research cruise to the EPR. The SEAS Web portal (http://ridge2000.org/SEAS/) provides the means for all students to follow the progress of the experiments at sea and to access data from these experiments for their own analyses. Given the success of the pilot, E&O staff will expand the program, starting with teacher workshops coordinated through the COSEE (Centers for Ocean Science Education Excellence) network.

A parallel effort to develop undergraduate student lessons based on real R2K data sets has begun. RODES co-PI Kim Kastens will facilitate the development of these lessons, called "data tips," through scientist/educator workshops to begin next summer. Tested data tips will be distributed through DLESE (Digital Library of Earth System Education) and the R2K Web site.

Outreach plans also are underway to feature the inaugural R2K Lau Basin expeditions in a media campaign showcasing the Ridge 2000 research program and a wide range of interdisciplinary activities. A Web site will be developed along with a variety of publications aimed at the general public, and news media coverage. Outreach to regional interests including SOPAC and Tongan scientists and citizens, will be a significant component of this effort.

R2K also continues to support relevant international mid-ocean ridge meetings, workshops, and field schools.

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Korea

In the year 2003, the Korea Ocean Research and Development Institute (KORDI) celebrated its 30th anniversary and a number of events took place that were relevant to mid-ocean ridge and back arc basins as a whole. As a part of the 30th anniversary celebrations, we organized "Distinguished Lecture Series" throughout the year. Two well-known earth scientists were invited to Korea. Both gave two lectures. On September 2, Prof. Michael Gurnis from Caltech Geological and Planetary Sciences Division gave a lecture titled "Inside the Dynamic Earth" at KORDI. More than 200 people, including 100 students from special Science High Schools in Korea and their teachers, attended this lecture. The success of Prof. Gurnis's talk could be felt from the expression of the students. Two days later, on September 4, Prof. Gurnis delivered his second lecture to a more specialized group of audience at the Seoul National University, School of Earth and Environmental Sciences titled "Subduction Dynamics: From Initiation to Maturity." In November, KORDI invited Prof. John Delaney of University of Washington. Prof. Delaney is also the executive chair of the NEPTUNE Project. On November 7, in conjunction with the Korean Oceanographical Society Annual Fall Meeting, KORDI organized Prof. Delaney's lecture titled "The NEPTUNE Regional Cabled Ocean Observatory: Interactive Networks of Remotely Operated Submarine Laboratories." It opened the eyes of Korean scientists to new possibilities. On November 10, Prof. Delaney appeared on Korean Educational Broadcasting Station (EBS) to record his second lecture to the general public. The EBS lecture was titled "Ocean, Volcanoes and Life in the Solar System" and will be televised in early December. We at KORDI are very grateful that these two scientists came to Korea and shared their knowledge and enthusiasm to a wide group of people, including the scientists, students and the general public.

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France

Research programs in France

Programme National Dorsales of CNRS and IFREMER has officially ended at the end of Year 2001. Since that time no specific Ridge program exists in France, and Ridge scientists continue their research in different frameworks.

1) IFREMER has focused its Geoscience activities on passive continental margins. However, an internal program on mid-ocean ridges has been recently implemented, which includes IFREMER's research groups working on hydrothermal vent studies (both in terms of Geosciences and Biology). These groups are currently extending their research activity to cold seep investigations.

2) CNRS INSUE (i.e. the CNRS division for Earth and environmental sciences) has been reviewing its programs during year 2002. A list of new programs was established in the Spring of 2003 and these are now being implemented, although in a quite limited way due to recent financial restrictions.

Among these programs, some of the ridge activities fall into a program entitled "Dynamic and evolution of the internal Earth", inside the themes:

- "Mantle Plumes" - the ridge-hotspot interaction is specifically mentioned,
- "Localisation of the lithospheric deformation" - which may include some of the tectonic studies on ridges, and
- "Tracers of mantle convection" - which includes the geochemistry at ridges.

The result is that the French Ridge community will be split up into different groups, and the visibility of the community as built by the Dorsales program may diminish.

The importance of the MOMAR project has been recognised, and the MOMAR area is one of the two "Sites" specified by CNRS INSUE. The notion of "Site" has still to be defined, especially in terms of budget!

3) CNRS SDV (i.e. the CNRS division for Life Sciences) has established a joint program with CNRS INSUE, the GEOMEX program (Geomicro-biology in extreme environments) which includes micro-biology at mid-ocean ridges but also in the polluted areas and other extreme environments. This program has a relatively large budget.

For the transition period, CNRS INSUE has provided limited support for the current InterRidge activities (i.e. the French contribution to InterRidge and the participation of French scientists to meetings such as, in 2003, the STCOM meeting in Tokyo and the Ridge-Hotspots interaction workshop in Brest). For the future, some mechanism has to be defined to continue the French participation to InterRidge and improve the visibility of the French Ridge community abroad, but also to allow French Ridge scientists, now split among different programs, to interact and maintain a community feeling – one of the great achievements of the former Dorsales program!

On the European side...

Many proposals to the European Union have attempted to place MOMAR on Brussels agenda. Proposals to establish a "Network of Excellence" and ensure that MOMAR is an "Integrated Project" under the EU regulations were not considered for immediate implementation, although they remain in the system. So in the near future these proposals may be improved and examined again. Currently, two MOMAR proposals have been positively reviewed by the EU, the first one to develop specific technology (led by Pierre Marie Sarradin), the other one to create a "Marie Curie Research Training Network" (led by Mathilde Cannat). These projects will help to prepare the community for the MOMAR project.

Research ships and deep sea vehicles in France

Research vessel R/V Nadir is no longer used for scientific cruises and will shortly be discontinued. A new research vessel called R/V Pourquoi Pas? will be operational in 2005 (contract was signed with the shipyard in December 2002). The new ship will be approximately 100 m long and able to take 40 scientists. The ship will mostly be devoted to "site" cruises with deep sea submersible Nautile and ROV Victor. This will be a much needed upgrade but there will be a period of two years when the French scientists will have reduced means for getting ship time.

Nautile has been refurbished in 2002. Cyana is soon to be discontinued. ROV Victor is now fully operational. "Coastal" AUVs (down to 3000 m) are going to be acquired soon, and may be available for Ridge research.

Cruises

- Cruise "Graviluck" (gravity & deep sea geodesy on MOMAR; V. Ballu, IPG Paris) has been cancelled due to Nautile operations on the wreck of oil tanker Prestige off Galicia.
- Cruise "Luckyflux" (heat flux measurements on MOMAR; A. Bonneville, IPG Paris) has been successfully carried out in June 2003 on R/V Poseidon.
- Cruise "Sirena 2" (recovery of OBH on the MAR North of Azores; J. Goslin, IUEM Brest, in collaboration with NOAA) has

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been successfully carried out in September 2003 on R/V Discovery.

Several ridge cruise proposals have been submitted on 15th January, for Year 2004. Some obtained a good scientific ranking and are likely to be scheduled.

- PacAntarctic 2 (collecting rock samples between Juan Fernandez microplate and Heezen-Tharp FZ system ; L. Dosso + H. Ondreas, IFREMER Brest)
- Parisub (Geosciences, Nautile transects across the EPR at 16°N ; P. Gente, IUEM Brest)
- Biospeedo (Biology + Geosciences, Nautile dives on EPR 7-15°S ; F. Lallier, Roscoff)

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Meetings

The InterRidge Workshop and Symposium on "Ridge-Hotspot Interaction" has been hold in Brest on September 8-10, 2003. Both an abstract volume and a meeting report are available from the IR website.

Previous updates from France can be found at:
http://www.intridge.org/fra.htm

Italy

Following is a brief overview of Italian research programs related to the ocean ridge system and to ophiolites.

Ridge-related projects

Italian marine geology and geophysics research includes, among others, many projects on oceanic areas where crustal accretion occurs (MOR, back arc basins). Most of ridge-related projects have been (and are) conducted by the IGM, Istituto di Geologia Marina of the Italian National Research Council (now ISMAR) in Bologna. Many cruises have been carried out in collaboration with the Geology Institute of the Russian Academy of Sciences (PRIMAR: Russian Italian Mid-Atlantic Ridge Project) by using russian research vessels. The cruise locations were near transform faults, such as Vema F.Z., Romanche F.Z., and Chain F.Z., in the Equatorial Atlantic; Bouvet triple Junction in south Atlantic. The main objective was to investigate the relations between the structure and composition of ridges and the thermal regime of the lithospheric mantle. More recent research is devoted to geophysical and geodynamic aspects of the Tyrrhenian sea, Red Sea, Equatorial Atlantic, and Antarctic basins.

The Geomare Sud (Napoli), is involved in scientific research regarding the volcanic and geodynamic evolution of the Tyrrhenian sea and, more in general, the western Mediterranean area, although not strictly related to ridges.

The Istituto Nazionale di Oceanografia e Geofisica Sperimentale (OGS) in Trieste has recently carried out geophysical and magnetic surveys in the Pacific-Antarctic region with the PNRA project (the National Program on Antarctica), and in the Indian ocean, mostly addressed to investigate the organization of tectonic plates and plate boundaries in regions close to crustal accretion. The OGS is provided of a research vessel (OGS-Explora) equipped with various geophysical instruments (multi-channel and single-channel system, Multibeam echosounder, one marine gravimeter and a gradiometer) and other oceanographic equipments.

In addition to the IGM research projects, other Italian ridge-related studies have been (and are) provided by scientists from other institutions, such as the Universities of Milano, Padova, Udine, Genova, Bologna, Pisa, Firenze, Roma, Napoli, who participated to various projects (e.g. PRIMAR; PNRA, Ocean Drilling Program, see below), basically as petrologists and structural geologists.

Italian researchers have been working on an ocean bottom obervatory. The initial trials of the Italian ocean bottom observatory plans have been a great success. See the full article on page 21 of this issue

The University of Milano is also involved in research topics regarding the volcanic and geodynamic evolution of the west Mediterranean area, although not strictly related to MOR. One of the most recent studies deals with the geology of Pantelleria island. The Pantelleria island is located in the Sicily Channel in the median part of the continental rift system due a to right transtensional fault along the Sicily

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Channel. Pantelleria is the emerged area of a volcanic field. The outcropping rocks are usually pantellerite related to the alkali series. Rare and recent basalt shields outcrop outside two caldera rims and can indicate the existence of two different reservoirs.

ODP

The Italian scientific community has been very active in the Ocean Drilling Program (ODP) since 1986 when Italy joined officially the ODP as a member of the ESCO, the European Consortium. More than seventy scientists, senior and younger, as well as a number of PhD and undergraduate students have been involved in the program (now changed into IODP). The Italian scientific contribution to ODP spans on various topics and disciplines including biostratigraphy of various fossil groups, sedimentology, structural geology, geochemistry, petrology, geophysics. Italian scientists contributed significantly to the improvement of the biostratigraphic resolution from the Lower Cretaceous to Holocene, of the paleogeographic reconstructions and paleoenvironmental significance of Cretaceous fossils, of the architecture of continental margins and of accretionary prisms. As far as oceanic basement, Italian scientists involved in the ODP have focused their research on the petrogenesis of igneous basalts, on the effect of hydrothermal circulation upon crust near mid-ocean ridges, as well as on the architecture and structural evolution of the oceanic litosphere. All Itialian petrologists and structural geologists had previous experience on ophiolites, that has provided a strong background for comparisons with the modern oceanic crust. Most studies have been carried out on the Pacific oceanic basement (e.g., marginal basins of Sulu and Celebes, developed during the collision between the Australia and the Philippine plates; the young oceanic crust (5.9 Ma) created close to the Costa Rica Rift characterized by intermediate-spreading rate - a complete crustal section going from the top extrusive lavas down to the sheeted dike complex is here shown by the deepest hole in the oceans, Hole 504B, first drilled by DSDP; the young ocean crust (0.8-3.5 Ma) drilled on the eastern flank of the Juan de Fuca Ridge).

More recently, Italian scientists involved on basement studies participated to ODP Leg 195 - Kuroshio current, in 2001 (Massimo d'Antonio, University of Naple); Leg 200 - Hawaii-2 Observatory and Nuuanu landslide, 2002 (Michele Lustrino, University of Rome), and Leg 206 - young oceanic crust created at superfast spreading rate, EPR, in 2002/2003 (Paola Tartarotti, University of Milano and Laura Crispini, University of Genova).

ODP Leg 195

Serpentinized ultramafic clasts were cored at Site 1200 (east of Guam island), located on top of the South Chamorro seamount, a serpentine mud volcano belonging to the Mariana forearc; basalts of the basement and arc volcaniclasts were cored at Site 1201, located west of the Palau-Kyushu Ridge, a now submerged, inactive ridge likely the remnant of a palaeo-Mariana arc during Eocene times. A research group, including scientists from the Universities of Napoli, Udine and Pavia, in collaboration with the University of South Florida, USA and of Aahrus, Denmark, is working on samples from both Sites. Several lines of research are being followed:

- Petrological investigations on the melting history of the Mariana forearc mantle (Site 1200), by means of electron microprobe and LA-ICP-MS analyses on relict primary minerals;
- Petrological investigations on the relationships between basement and arc at Site 1201, through Sr-Nd-Pb-Hf isotope and trace element geochemistry;
- Studies on the alteration history of the rocks from both Sites by means of electron microprobe analyses on the secondary minerals.

ODP Leg 200

The ~ 45 Ma old igneous basement was cored in north Pacific, representing one of the few cross-sections of the Pacific oceanic crust with a total depth >100 m. The

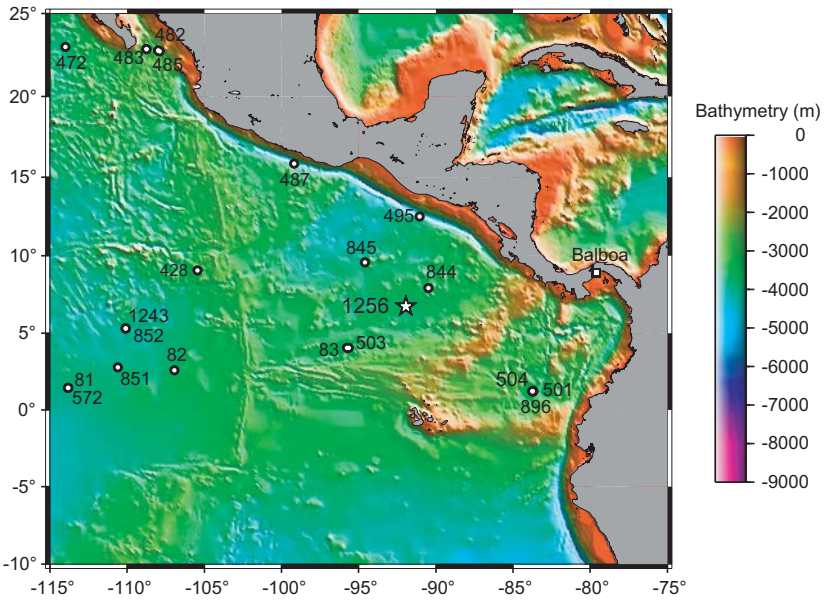

Figure 1. Bathymetric map for ODP Site 1256

National News....

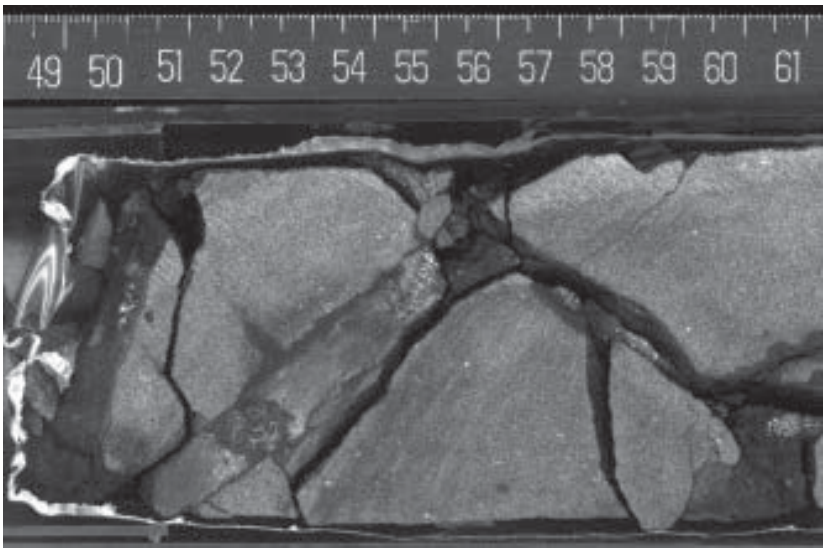

Figure 2. Brecciated basalt with sediment infill from Hole 1256D

lithostratigraphy of the basement (cored down to ~ 170 meters below seafloor) is divided into three units. The deepest unit (unit 3) is a succession of lava flows of no more that a few meters thickness each. The intermediate unit (unit 2) is represented by intermixed thin flow and pillows, while the shallowest unit (unit 1) is constituted by two massive flows. The University of Rome, in collaboration with the Geowissenschaftliches Zentrum of the Göttingen (Germany) and the Ocean Research Institute of the University of Tokyo, is carrying out geochemical (major, trace and isotope) analyses on basalt samples as well as biological studies on unique filamentous structures resembling fungal hyphae which have been found during Leg 200 within a massive tholeiitic lava flow unit, at depth of 51 mbsf underneath a water column of > 5000 m.

ODP Leg 206

Drilling operations were performed at Site 1256 (lat 6.736°N, long 91.934°W) on the Cocos plate (Fig. 1), which formed at a superfast spreading rate about 15-m.y.-ago. Two holes, 1256C and 1256D were drilled into the basement, covered by a 250.7 m-thick layer of sediments, to a depth of 340.3 mbsf and of 752 mbsf, respectively. The main stratigraphy of upper oceanic crust at Site 1256 differs from the one classically constrained from the crustal seismic structure. It consists of a sequence of massive flows and thin sheet flows with minor amounts of pillow basalts and various types of breccias (Fig. 2). The sequence is slightly altered and has N-MORB composition. Leg 206 is the initial phase of a planned two leg project to drill in situ ocean crust, which formed at a superfast spreading rate. The deeper hole, Hole 1256D was left clean and in good conditions, thus representing a good candidate for being re-entered and deepened into the sheeted dikes and gabbros during future drilling operations. Studies on samples cored during Leg 206 are in progress. The Universities of Milano and Genova, in collaboration with the Universities of Marseille (F), Montpellier (F), and Leicester (UK) are working on structural and physical aspects of the sampled basalts.

Ophiolites

Many italian geologists have been involved for a long time in various research projects on ophiolites. The GLOM (Gruppo di Lavoro sulle Ofioliti Mediterranee) is the national group including petrologists, geochemists, and structural geologists from various Universities (e.g. Firenze, Pisa, Ferrara, Udine, Milano, Genova, Pavia, and Parma). These projects are mostly concentrated on understanding the tectonic significance, litostratigraphy and geodynamic setting of Mesozoic ophiolites of the Mediterranean area. Basically they focus on ophiolites from the North Apennines, characterized by a SSR character and a weak orogenic metamorphic imprint, and from the Alpine chain (more strongly metamorphosed), emplaced during the continental collision between the paleo-European and paleo-African plates that lead to the closure of the western Tethys ocean basin. Outside Italy, other Mediterranean ophiolites are investigated in Albany and Greece. More recently, research projects have been undertaken on ophiolitic complex outside the Mediterranean area (Urals, Caribbean area).

A list of the websites of the main Italian Institutions involved in ridge-related research can be found on the IR website at:
http://www.intridge.org/www.htm

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India: InRidge

India became an associate member of IR in the year 2000 and created InRidge as a part of the India's ridge research initiative. As a result, India has renewed her interest in ridge research by launching a five-year plan to undertake comprehensive interdisciplinary research over the Indian Ocean ridge systems. In the current program (2002-2007) India's researchers expect to intensify ridge activities. The program is expected to receive funding of about 7 million USD for the next 5 years.

The vision of the program is to include full range of disciplines and can be summarized as follows: "To understand the tectonic processes and their interaction with hydrosphere and biosphere along the Indian Ridge System and the Backarc Basin."

Objectives of the program are to investigate:

- the influence of spreading rate on morpho-tectonics..
- tectonic framework and magmatic processes along mid-ocean ridges and back-arc basin.
- the structure and evolution of the back-arc basin.
- mantle signatures along the ridge system and in the back-arc basin using geochemical tracers.
- hydrothermal mineralisation along the spreading centres.
- deep ocean circulation and near seabed oceanographic parameters (physical, chemical and biological) and their relation to tectonic processes.

The target areas of research in the Indian Ocean are: 1. Carlsberg Ridge (CR), 2. Central Indian Ridge (CIR) and 3. Andaman Backarc Spreading Center (ABSC). All of these regions have been very poorly studied so far and have interesting evolutionary histories, since they are in close proximity to India they are ideal places to start.

The network of CSIR and DOD

This network program involves the government research labs NIO (National Institute of Oceanography, Goa) & NGRI (National Geophysical Research Institute, Hyderabad), under CSIR (COUNCIL FOR SCIENTIFIC & INDUSTRIAL RESEARCH) and the Department of Ocean Development (DOD, Govt of India). The program is open to all ridge researchers in India from the research labs and universities.

Plans for the future include intensified studies as well as an increase in the disciplines, such as tectonics, water column studies and biology. The approach is to combine a number of disciplines: tectonics (high-resolution mapping and acoustic imaging surveys, detailed seabed sampling) and water column studies (temperature anomalies, chemical & biological signatures). A team of biologists is waiting for the discovery of hydrothermal vents along the Indian Ridge system and back arc basins.

This program also encourages International collaborations through InterRidge. Effective international collaborations are envisaged by being an associate member of the InterRidge. International collaborations may include US (ONR, SOEST, Hawaii), Japan (ORI, Tokyo), Germany, Portugal, France (Univ. Brest), Russia (SIO), NSERC (Canada), SOC (UK).

Indian researchers expect to intensify effective collaborative efforts, towards Deep-tow, OBS, ROV and Submersible dives. These collaborative studies will greatly help progress the understanding of the Indian Ocean Ridge System.

Workshop at NIO-Goa on Indian Ocean Ridges is planned for January 2005. See the back of this issue for more information.

The years ahead - voyage into the possibilities

'00-05: The current plan (2002-2007)

'05-'10: Submersible dive operations including manned dives to the active vent sites.

'10-'15: To establish seafloor observatory at a selected vent site.

'15-'20: Establishing a network of seafloor observatories and continuous monitoring. Event detection and response, monitoring of fluxes, deployment of additional instrument packages.

Field program of OR/V Sagar Kanya

Cruise-I (SK-194) Carlsberg Ridge: 21 June 03 To 25 July 03 (Karwar-Male)

Cruise-II (SK-195) Central Indian Ridge: 28 July 03 To 30 Aug. 03 (Male-Tuticorin)

K.A. Kamesh Raju and Abhay Mudholkar

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Previous updates from India can be found at:
http://www.intridge.org/india.htm

Recent and Upcoming Meetings and Workshops

Calendar of MOR Research related events

More details about all of the following meetings can be found via the Meetings menu on the InterRidge homepage:
http://www.intridge.org/info3.html

	4-6 June, 2003	Oceanology International Americas, New Orleans, Luisiana, USA
	16-18 June, 2003	Biogeography and Biodiversity of Chemosynthetic Ecosystems: Planning for the future, SOC, UK
	23-26 June, 2003	Fluxes and Structures in Fluids, St. Petersburg, Russia
	24-27 June, 2003	Scientific Submarine Cable workshop, Tokyo, Japan
IR	27-28 June, 2003	IR Steering Committee Meeting, Tokyo, Japan
	30 Jun.-11 Jul., 2003	International Union of Geodesy and Geophysics (IUGG), Sapporo, Japan
IR	8-10 Sept., 2003	Ridge-Hotspot Interaction: Recent Progress and Prospects for Enhanced International Collaboration, Brest, France
	22-26 Sept., 2003	7th International Conference on Gas Geochemistry, Freiberg, Germany
	1-3 Oct., 2003	Interdisciplinary Studies if Slow- and Ultra Slow-Spreading Ridges: From Mantle Melting to Biota Formation at Hydrothermal Vents, Moscow, Russia
	6-10 Oct., 2003	33rd Underwater Mining Institute, "New Horizons for Marine Mining: Progress through International Cooperation, Jeju Island, Korea
IR	27-29 Oct., 2003	IR Workshop: Opportunities and Contributions of Asian Countries to the InterRidge Next Decade Initiative, Beijing, China,
	7-8 Nov., 2003	Ridge 2000 Open community workshop, Boulder CO., USA
	8-12 Dec., 2003	AGU 2003 Fall Meeting, San Francisco, USA
	4-8 Jan., 2004	ORION Workshop, San Juan, Puerto Rico
	14-16 Jan., 2004	The fifth International Conference on Asian Marine Geology, Bangkok, Thailand
IR	19-20 Jan., 2004	InterRidge Biology Committee meeting, Bremen, Germany
	26-30 Jan., 2004	Ocean Sciences Meeting, Portland, OR, USA
	1-2 Mar., 2004	Mid-Atlantic Ridge workshop, Providence, RI, USA
	16-19 Mar., 2004	Oceanology International, London, UK
	25-30 April, 2004	"Minerals Of The Ocean - Integrated Strategies, St. Petersburg, Russia
	26-30 April, 2004	European Geosciences Union (EGU) XXVIX General Assembly, Nice, France
	17-21 May, 2004	Joint Meeting: AGU and the Canadian Geophysical Union, Montreal, Canada
IR	21-22 May, 2004	IR Steering Committee Meeting, Seoul, Korea
IR	24-28 May, 2004	R2K-IRTI: Backarc Basins and Spreading Systems, Korea
	5-9 July, 2004	Asia, Oceania Geosciences Society Meeting, Singapore, Singapore
	16-20 Aug., 2004	Western Pacific Geophysics Meeting, Honolulu, Hawaii
	20-28 Aug., 2004	32nd International Geological Congress, Florence, Italy
	13-17 Dec., 2004	AGU Fall Meeting, San Francisco, USA
IR	19-21 Jan., 2005	IR Workshop: Tectonic & oceanic processes along the Indian Ocean Ridge System, Goa, India
	23-27 May 2005	AGU Joint Assembly, New Orleans, Louisiana, USA
	20-24 Feb., 2006	AGU Fall Meeting, San Francisco, USA

Upcoming Meetings and Workshops

InterRidge Biology Working Group meeting

Bremen, Germany
19 – 20 January 2004

Working Group Co-chairs: Françoise Gaill (France) and Kim Juniper (Canada)

OBJECTIVES:
1) to review the ridge crest biology and ecology components of the Next Decade science plan and decide what we can do as a committee to help advance this program.
2) discuss proposals for the next Hydrothermal Vent Biology Symposium.

The Next Decade Science Plan is available from the IR website at:
http://www.intridge.org/irnd.pdf

InterRidge Workshop:

Tectonic & oceanic processes along the Indian Ocean Ridge System

National Institute of Oceanography, Goa, India
19 – 21 January 2005
http://www.intridge.org/goa05.htm

For further information contact:
Dr. Abhay Mudholkar (abhay@darya.nio.org),
Dr. K A. Kamesh Raju (kamesh@darya.nio.org) or
Dr. R K. Drolia (kumardrolia@yahoo.co.in)

The workshop will consist of invited lectures, presentation of latest results, followed by group discussion.

OBJECTIVES

The workshop will focus on the geological, geophysical, physical, chemical and biological processes at the Indian Ocean spreading centers and provide forum for exchange of ideas and research results.

Please contact the IR office to pre-register your interest in attending the workshop.

Upcoming Meetings and Workshops

Third International Symposium on Deep-sea Hydrothermal Vent Biology

Proposed date, 2005

"Expressions of Interest" to host the 3rd International Symposium Expressions of Interest are to be submitted by email, to both Co-Chairs of the InterRidge Biology Committee prior to January 10, 2004. Further information can be obtained from the IR website: http://www.intridge.org/dshvb3.htm

The IR Biology Co-Chairs:
Françoise Gaill
francoise.gaill@snv.jussieu.fr
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S. Kim Juniper
juniperkim@uqam.ca

The Asia Oceania Geosciences Society (AOGS) annual meeting

Singapore
July 5-9, 2004

http://www.asiaoceania.org/confer.html

Abstact submission deadline - 15 February, 2004
(Hydrological Science (HS), deadline 15 January, 2004)

There are 26 sessions in the Solid Earth (SE) category

Particular sessions of interest to ridge scientists include:

Seismicity and Earthquake Prediction (SE2)
Geodynamics of the Indian Ocean - Past and Present (SE7)
Volcano-Tectonics (SE19)
Adakites and Subduction: pros and cons (SE25)
Understanding oceanic lithospheres: Ideas, trends and future directions (SE26).

The full list of sessions can be found at: http://www.asiaoceania.org/proposals.html

Upcoming Meetings and Workshops

Minerals of the Ocean – Integrated Strategies

St.Petersburg, Russia
25-30 April, 2004

Abstract Submission Deadline - 1 February, 2004

Contact details:
Dr.Mikhail P.Torokhov
Fax: (812) 1141470;
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For meeting programme see the IR website: http://www.intridge.org/minerals04.pdf

32nd International Geological Congress

Florence, Italy
20 – 28 August 2004

http://www.32igc.org/home.htm

Abstract Submission Deadline: January 10, 2004

Relevant sessions

T-18.04 Chemosynthetic communities through time
T-26.01 Recent results from ODP cruises
T-27.01 Igneous petrogenesis of ophiolites
T-27.02 Melt and fluid flow in evolution of oceanic lithosphere
T-27.03 Emplacement tectonics of ophiolites: structures and processes
T-27.04 Ophiolites and suture zones of the Tethysides
T-27.05 Record of oceanic rocks in Precambrian and Early Phanerozoic times
T-27.06 Ophiolites of the Circum-Pacific orogenic belts
G-12.03 Submarine hydrothermalism in the Mediterranean Sea
G-12.04 Hydrothermal mineralization on sedimented ridge

Post-congress field trip P07 - fluid expulsion and authigenic carbonates in miocene foredeep and satellite basins (Northern Apennines): http://www.32igc.org/circularN-field05_1.asp

The Organizing Committee will help individual scientists mainly from developing and East-European Countries to attend the Congress by partially subsidizing their expenses via the GeoHost Program (http://www.32igc.org/circular-gen07.htm).

Upcoming Meetings and Workshops

RIDGE 2000-InterRidge joint Theoretical Institute (R2K-IRTI): Interactions among Physical, Chemical, Biological, and Geological Processes in Backarc Spreading Systems

Jeju (Cheju) Island, Korea
24 - 28 May, 2004

http://www.intridge.org/babti.htm

Registration is now open!

Organisers
Sang-Mook Lee (KORDI, Korea)
Kensaku Tamaki (Univ of Tokyo, ORI, Japan)
David Christie (Oregon State Univ, USA)
Patricia Fryer (Univ of Hawaii, USA)
Peter Herzig (Univ of Freiberg, Germany)
Daniel Desbruyeres (IFREMER, France)
Anna-Louise Reysenbach (Portland State Univ, USA)

The second IR theoretical Institute will take place on the Jeju (Cheju) Island, a shield volcanic island, located at the southern end of the Korean peninsular.

The IRTI will consist of 2 days of invited lectures and short courses (May 24-25), a one day field excursion (May 26th), and a 2 day workshop devoted to discussions by small groups (May 27-28).

There are 14 lectures planned by invited speakers during the first two days.

All participants are encouraged to give poster presentations.

The latest information about this R2K-IRTI is posted on the IR website as it becomes available. You can also contact the local organiser, Dr Sang-Mook Lee (smlee@kordi.re.kr) if you have further questions.

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