InterRidge News

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InterRidge Update

In January of 1994, the InterRidge Office completed the first of its scheduled rotations, moving from the University of Washington in Seattle, WA, USA, to begin its new three year term of residence at the University of Durham in the United Kingdom. At the same time Roger Searle took over the Chairmanship of InterRidge from John Delaney and David Needham and Heather Sloan took over from Trileigh Stroh as Co-Ordinator.

Since then efforts have been focused on publication of a series of workshop reports and the planning and organisation of a number of meetings and workshops scheduled for 1994 (see below). In addition, InterRidge has been working to strengthen formal links with such international ridge-crest research organisations as the Ocean Drilling Program (ODP), the Scientific Committee on Ocean Research (SCOR) and its parent body, the International Council of Scientific Unions (ICSU), as well as with a number of national ridge-crest research organisations.

The InterRidge objective of promoting multi-national and interdisciplinary ridge-crest research also continues to develop via the activities of working groups centred around the themes of Global, Meso-Scale and Active Processes. Initiation of a new working group, Biological Studies, is being under taken by D. Désbruyères. Brief reports of the activities of the working groups are given below:

Biological Studies

Daniel Désbruyères, Chair

This new working group is intended to meet the need expressed by biologists within the ridge-crest research community to focus on issues specific to the ecosystems found along the mid-ocean ridge such that their investigation may be more effectively integrated into the interdisciplinary scheme of InterRidge. It is anticipated that a workshop will be convened by this working group in late 1994 or early 1995. The objectives of the Biological Studies Working Group are as follows:

- Understand and quantify the relevant biological production pathways and organic matter exportation to the deep-sea.
- Understand the evolutionary biology of the vent organisms and their dispersal mechanisms at different time-space scales.
- Determine the relative influence of biological interactions and physical, chemical, and geological processes on the distribution and abundance of organisms.

Global

Charlie Langmuir, Chair

The Indian Ocean has been identified by the Global Studies Working Group as a focus for global-scale investigation of the mid-ocean ridge during 1995/6. A one

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Dr. Heather Sloan, Editor.

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day InterRidge Global Workshop aimed at facilitating collaboration and co-ordination of various investigators involved in or planning to propose ridge-related studies in the Indian Ocean will be convened in Baltimore by Jean-Christophe Sempéré on May 22, 1994, the day before the Spring Meeting of the AGU.

Publication of the report detailing the transactions and recommendations of the 1993 Global Workshop held in Paris is expected in April, 1994. One of the recommendations of this report is the compilation of a global atlas of the mid-ocean ridge system. This atlas, to be made available both in hard copy and electronically via the Internet, is expected to be one of the Global Working Group's principal foci in upcoming years.

Meso-Scale

Martin Sinha, Chair

The two Meso-Scale Working Group Meetings held in 1993 ("Segmentation and Fluxes: A Symposium and Workshops" and "Back-Arc Basin Studies"), have served as guidelines for the 1994 Working Group agenda. Significant interest demonstrated by Segmentation Workshop participants in the 4-D Architecture of the Oceanic Lithosphere has led to the development and planning of an InterRidge workshop centred around this theme. Its objectives will be to design experiments, establish implementation plans and designate an experiment site(s) for investigation into the 4-D architect of the Oceanic Lithosphere at the second-order spreading segment scale. This workshop will be scheduled in early- to mid-September. This will be followed-up by a RIDGE workshop to plan the US participation in this program and it is hoped that other InterRidge member counties may hold similar meetings to define their own implementation. Organisation of a worshop entitled "Fluxes at the Second-Order Spreading Segment Scale" is currently under discussion. A compilation and synthesis of petrological, geochemical and geophysical data collected in back-arc basins is being discussed and planned by participants in the Back-Arc Basins Studies Workshop.

Reports from the 1993 Meso-Scale Workshops will be published in a single volume in April of 1994.

Active Processes

Joe Cann, Chair

The first Active Process Working Group Meeting is scheduled for June 6-8, 1994, in Woods Hole, MA, USA. This workshop will focus on the theoretical and technical development required to further our event detection and response capabilities and to establish a ridge-crest observatory (see announcement page 21).

A General InterRidge Meeting will be hosted by DeRidge in Kiel, Germany in 1995. Like the York meeting it will for the most part concern InterRidge policy and updating the Program Plan; however, it will also include 'state-of-InterRidge' science presentations as updates on the Working Groups' progress during the past 2 years.

In addition to the meetings listed above, a workshop on international data exchange formats is being discussed and planned. Workshop reports and other pertinent InterRidge documentation, announcements and information will soon be available on an Internet-accessible directory (gofer). This service is a precursor to the eventual creation of data index and information directory for the global mid-ocean ridge system.

Roger Searle,
InterRidge Chair
Heather Sloan,
InterRidge Co-Ordinator ◆

InterRidge 1994 Calendar Summary

Global Workshop: Indian Ocean - Baltimore, MD, USA May 22, 1994
Convenor: Jean-Christophe Sempéré

Active Processes Workshop - Woods Hole, MA, USA June 6-8.
Convenor: Joe Cann, University of Leeds

4-D Architecture of the Oceanic Lithosphere Early- to Mid-September.
Convenor: Lindsay Parson, IOSDL

InterRidge Steering Committee Meeting - Japan September, 1994. (provisional)

Biological Studies Working Group Initial Meeting - late 1994.
Convenor: Daniel Désbruyères (provisional)

Fluxes on the Segment Scale, under discussion.

General InterRidge Meeting - Kiel, Germany 1995

For fruther information about upcoming meeting and workshops or InterRidge Publications please contact the InterRidge Office

Ridge Research around the World

The Gravinaut Cruise: Seafloor Gravity and Electromagnetism at the MARK-Snake Pit Area

Jacques Dubois, Institut de Physique du Globe, Paris, 4 Place Jussieu, 75252 Paris, France.
Scientific Party: Valerie Ballu[1],.Paul Beuzart[3], Sylvain Bonvalot[4], Christine Deplus[1], Michel Diament[1], Jacques Dubois[1] (chief scientist), Ccile Durand[5],, Alain Dubreule[2], Marie-France Esnoult[1], Adam Schultz[6], Pascal Tarits[5]
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Introduction

The Gravinaut cruise aboard the N.O. Nadir, support ship for the submersible S.M. Nautile, sailed from Punta Delgada in the Azores on September 7, 1993 and docked in Fort de France, Martinique on October 4, 1993. Nineteen dives were completed in the course of this survey of the hydrothermal site, Snake Pit, in the MARK area (Mid-Atlantic Ridge at Kane; figure 1).

The MARK area has been the site of numerous geological and geophysical surveys owing to the fact that it includes both a site of hydrothermal activity on the axial valley floor and outcrops on the western axial valley wall of rocks formed deep within the lithosphere. These surveys include classical surface underway geophysics, dredging, direct observations and seafloor measurements collected with the submersibles Alvin and Nautile, and ODP site surveys.

Surface surveys carried out over the Transform section of the Kane Fracture Zone include a preparatory ODP survey in 1985 (ODP Leg 106 Scientific Party, 1986); Sea Beam bathymetry (Detrick et al., 1984; Polkalny et al., 1988); SeaMARC I side-scan sonar and seismics (Kong et al., 1988); gravity (Morris and Detrick, 1991); geomagnetism (Schultz et al., 1988); and FARA cruises SEADMA and SIGMA both aboard the N.O. Atalante (Gente et al., 1991).

Gravinaut Objectives

During the 1988 Hydrosnake Cruise, thirty nine seafloor gravity measurements were made aboard the S.M. Nautile (Mével et al., 1988). Twenty seven of these measurements were made along an east-west profile starting at the top of the western axial valley wall, passing through the Snake Pit hydrothermal site and ending in the central valley to the east. The twelve remaining measurements were made on the ridge-transform intersection massif.

Preliminary analysis of the data collected during earlier surveys (Bergès, 19889; Dubois et al., 1992) has revealed the average density of superficial rock layers beneath each of the stations. In the central valley and at the Snake Pit hydrothermal site, the rock density is 2.6 mGal/m^3, a typical value for basaltic upper crustal rocks. On the western axial valley wall the density is 3.0 mGal/m3 which is consistent with observed serpentinized peridotites in this area. At the ridge-transform intersection massif a density of 3.0 mGal/m3 was observed at depths below 2600 m and of 2.6 mGal/m3 at depths shallower than 2600 m. Furthermore, the Bouguer anomaly obtained for each station from a model of the topography based on Sea Beam bathymetry, indicates the presence of a relatively low density body beneath the Snake Pit hydrothermal site which may be interpreted as a magma chamber. Unfortunately, the precision of the model was limited by the insufficient number of data points and length of the profile.

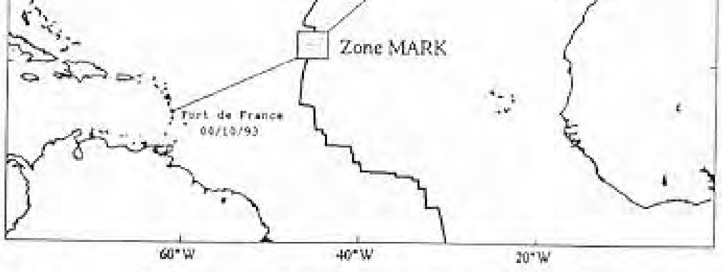

Figure 1. The Mid-Atlantic Ridge, the MARK Zone and transit route.

The principal objective of the Gravinaut survey was to determine the precise geometry of the low density bodies detected by the 1988 survey by extending the data coverage as far as possible on both sides of the axial valley. Complete Sea Beam bathymetry coverage of the Snake Pit

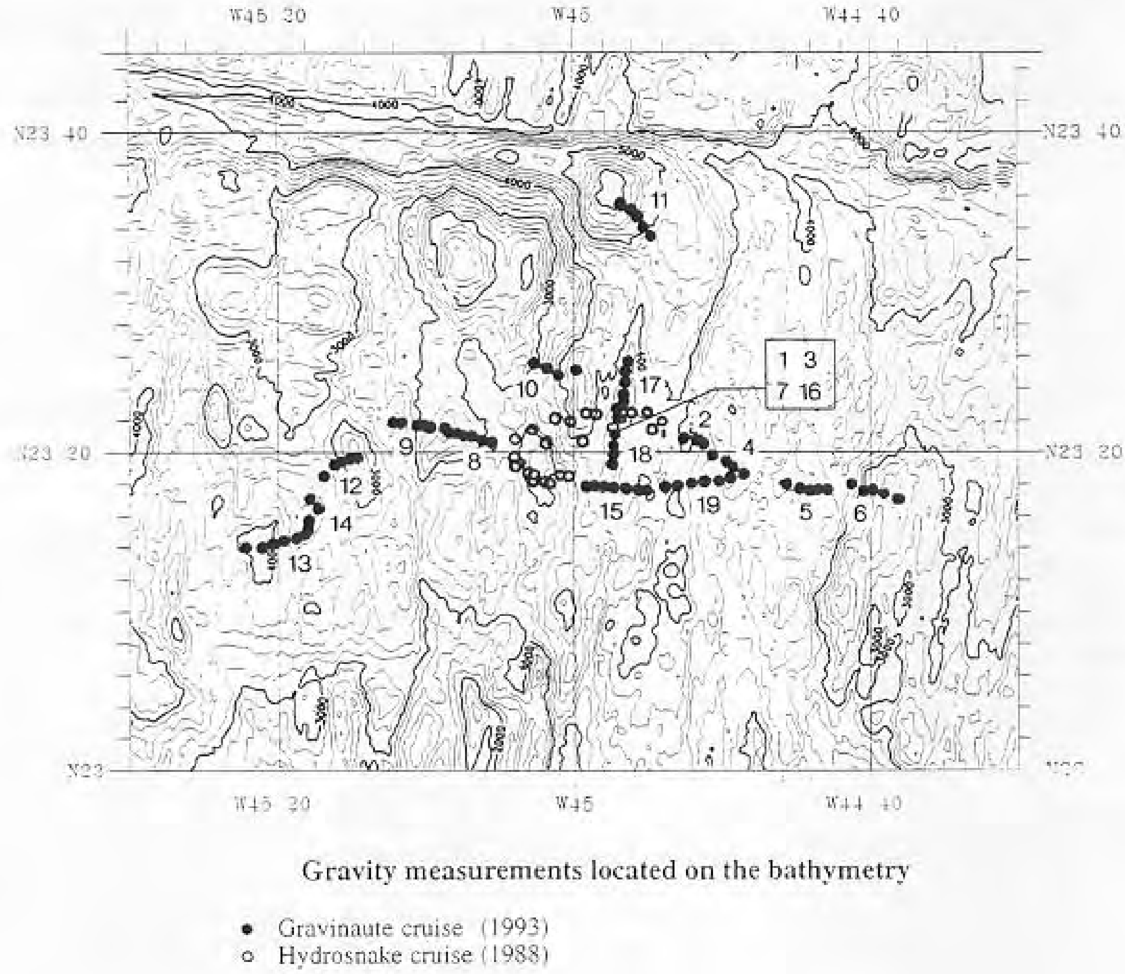

***Figure 2.** Gravity Measurements shown on the bathymetry map. Numbers identify the Gravinaut dives.*
● Gravinaut Cruise (1993) ❍ Hydrosnake Cruise (1988)

area is now available making it possible to accurately model the effect of topographic roughness on the gravity measurements. Furthermore, surface gravity data coverage has since been extended over a large part of the MARK zone and may be used to better constrain the modelling method first developed for processing gravity data from the Kaïko cruise (Dubois and Deplus, 1989).

Another objective of the Gravinaut cruise was to carry out a magneto-telluric (MT) survey on the Snake Pit hydrothermal site. Two MT instrument packages were deployed at the beginning and recovered at the end of the survey. This experiment was coupled with an electrofiltration study on the hydrothermal field, by simultaneously recording with an electrometer. Four dives were devoted to this part of the survey programme.

To complete the survey geological observations (structural geology, petrography, sedimentology) were made using photography, video recording, and rock sampling. Finally, biological observations were collected according to instruction provided by biologists at IFREMER.

The Gravinaut Cruise

Thanks to good weather, it was possible to complete a dive on each of the 19 days spent at the MARK site. Four of the dives (GRN 01, 03, 07 and 16) were to the Snake Pit hydrothermal field to deploy and recover the two magneto-telluric and electrometer instrument packages and to carry out hydrothermal fluid flow measurements. The remaining 15 dives followed an east-west profile and a north-south profile which intersect at the Snake Pit hydrothermal site (figure 2). The gravity survey includes 78 gravity measurement stations which complement the existing Hydrosnake network of 39 stations. The gravity base station, named "La Roue", 150 m north of the Snake Pit site, is the same one used during the Hydrosnake survey. This base station was revisited 4 times during the Gravinaut cruise (GRN 10, 07, 16 and 18). Three "free water gradient" measurements were made during the Nautile's transit from the seafloor to the surface.

East-West Profile:

Central leg: The northern branch of this profile crosses the Snake Pit area. Data coverage was obtained in the axial valley and on the western wall during the Hydrosnake survey. Two dives (GRN 02 and 04) extended the profile towards the eastern wall. The southern branch crosses the southern termination of the neo-volcanic ridge. Dives GRN 15 and 19 cross the axial valley and the eastern wall.

Eastern leg: Two dives (GRN 05 and 06) extend the profile eastward to 44°38' W.

Western leg: Five dives (GRN 08, 09, 12, 13 and 14) extended the profile westward to 45°22' W. The last three crossed a positive mantle Bouguer anomaly in a zone from which peridotites had been dredged during the SEADMA 2 cruise (see Canat et al. this issue).

North-South Profile:

Two dives (GRN 17 and 18) followed the crest of the neo-volcanic ridge north and south of the Snake Pit hydrothermal field. A third dive (GRN 11) covered the northern extremity of the neo-volcanic ridge at its junction with the nodal basin.

Preliminary Results

The accuracy of the 82 gravity measurements made with the Scintrex gravimeter strongly dependent on the character of the substrait (sediment, basalt pillows, ocean bottom currents, etc.) at the deployment site. The standard diviation varies from 0.130 mGal to 5.0 mGal but the average is less than 1 mGal, which corresponds to an uncertainty of ± 0.1 mGal (the Scintrex repeat function makes 120 successive automatic measurements at each station). The gravimeter was reset regularly (7 times in all) at the "La Roue" base station in order to obtain constraints on shift of the instrument after automatic correction for the effect of tides. The bathymetry data is currently being processed to be used to correct for the effect of topography in gravity model of the low density bodies.

Two MT stations were sited in the Snake Pit area. They remained on the seafloor for a period of 14 days, at a depth of approximately 3500 m, recording measurements of the electric and magnetic fields once every minute. Data downloaded from MT1 revealed some problems with the electric field measurements. MT2 worked correctly.

One of the most interesting preliminary results is the high value (400 mvolts) recorded by the electrical components. This signal indicates the presence of spontaneous electrical potential whose origin may be attributed to electrochemical effect of sulphides in the sediment or the electrokinetic effect of hydrothermal circulation, or a combination of the two. These data are currently being modelled and interpreted.

The electrometer, a prototype developed at the University of Cambridge, was deployed in the same area at a depth of approximately 3400 m during dive GRN 16. During the 13 days it remained on the bottom it collected continuous records of the electric field, functioning well and loosing no data. The dominant signal in this data is a quasi periodic oscillation with a fundamental period of 1 cycle per day, a very strong first harmonic (semi diurnal) and a visible second harmonic (4 cycles per day). A number of sources of diurnal and semi diurnal signals are know on the seafloor including the Sq ionospheric signal and ocean tidal motion. Comparisons will be made between the electronic and magnetic field measurements made by MT1 and those made by MT2. These data will be evaluated for signals of oceanographic origin, self-potential, and then for magnetotelluric sounding.

A second generation hydrothermal heat flux density meter designed to detect the velocity and temperature of diffusely percolating effluent rising from the surfaces of sulphide constructions and basement basalt was modified for use with the Nautile submersible and installed on the Nautile for dives GRN 07 and 16. A set of spot measurements of diffuse effluent velocity and temperature were taken at sites on and immediately adjacent to the L'Elan and Les Ruches vent complexes and also at a site to the west in the vicinity of Sapin. A total of 14 successful heat flux density measurements were made during GRN 07 and 5 during the more exploratory GRN 16. Preliminary calculations indicate that the flux density in areas of diffuse hydrothermal percolation and in areas immediately adjacent to the main vent centers range from 1 to 12 MW/m2.

The petrological portion of the survey collected 55 rock samples, mostly basalt. Three of the rock samples are of particular interest: during GRN 06 samples of metabasalt and green schist were collected from a site to the east of the ridge; the same rock types were also sampled during GRN 10 from the western wall; serpentinized perodotite was sampled from the western edge of the survey area during GRN 12.

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Summary and Preliminary Results of the R/V Hakuho-maru KH93-3 Rodriguez Triple Junction Cruise

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The KH93-3 Research Cruise of the R/V Hakuho-maru of Ocean Research Institute (ORI), University of Tokyo, is the first intensive seagoing research at mid-oceanic ridge to be conducted by the Japanese ridge sciences group. The ship-time for this cruise was funded by the Ocean Research Institute, University of Tokyo, the owner of the vessel, on behalf of the InterRidge Project. The target survey area was the Rodriguez Triple Junction (RTJ) in the Indian Ocean. The ports call for the 1993 cruise programme were as follows: The R/V Hakuho-maru set sail from Tokyo on July 8, docking in Singapore from July 17-21, docking in Mauritius from August 10-14, docking in Penang September 2-6, and returning to Tokyo on September 17. Co-chief scientists were K. Tamaki and H. Fujimoto of the Ocean Research Institute. The forty five members of the on board scientific party were drawn from five research groups; mapping geophysics, seismology, petrology, water chemistry, and benthic biology. The mapping geophysics group was directed by K. Tamaki and H. Fujimoto; the seismology group by Kasahara and N. Hirata, both at the Earthquake Research Institute (ERI), University of Tokyo; the petrology group by N. Fujii (ERI), T. Ishii (ORI), C. Langmuir of Lamont-Doherty Earth Observatory; and S. Nakada of Kyushu University; the water chemistry group by T. Gamo (ORI); and biology group by S. Ohta (ORI). The R/V Hakuho-maru weighing 3,980 ton, is well suited to facilitate such full multi-disciplinary research programs.

The Rodriguez Triple Junction was previously surveyed by UK GLORIA system (Mitchell, 1991; Michell and Parson, 1993) and by the R/V Jean Charcot Sea Beam system (Munschy and Schlich, 1989). We planned to conduct the principal part of the survey in the area previously mapped by the R/V Jean Charcot. This approach saved time which would have been required for the R/V Hakuho-maru to execute a full-scale bathymetric mapping survey and allowed us to allocate more time to multi-channel seismics, OBS related work, rock sampling, water sampling, and deep-sea TV observation of the seafloor.

The data collected and methods employed during the KH93-3 cruise at the RTJ were as follows:

1) Geophysical mapping of swath bathymetry, gravity, magnetics (total intensity and three component) for the Souteast Indian Ridge (SEIR) outside the box surveyed by R/V Jean Charcot (figure 1).

2) Seismic refraction studies at the RTJ using OBS and large air gun sound sources. Eighteen OBSs were deployed in the grid configuration shown in figure 1. Seventeen OBSs were recovered.

3) Crustal structure studies at the RTJ by multi-channel seismics (MCS). Eight MCS tracks in a grid pattern were accomplished as shown in figure 1.

4) Seismic tomographic studies at the RTJ by OBSs and large air gun sound sources.

5) Observation of natural earthquake activity at RTJ by OBSs (figure 1). Duration of observations was more than 15 days.

6) Detailed bottom rock sampling at 41 sites (27 dredges and 14 rock cores) along three axes of spreading centers at the RTJ (figure 1).

7) Water sampling by CTD-rosette hydrocasts (13 sites, one site is northeast of the RTJ box area) and tow-yo surveys (5 sites; figure 1).

8) Observation of the sea bottom and benthic biological community by Deep Sea Monitoring System (DESMOS) at 5 sites (figure 1, one site is at north of the RTJ box area).

The survey outlined above was accomplished during the two working legs of the cruise in a total of 19 days and 8 hours (10 days and 4 hours for Leg 2 and 9 days and 4 hours for Leg 3). While on site, all aspects of the research programme operated on a 24 hours a day schedule during the entire survey. The sea state and weather conditions at the RTJ area were fairly good throughout the duration of the survey and did not contribute to instruments being abandoned. Research objectives were accomplished keeping very close to the scheduled program.

Preliminary Results

1) A topographic map around the triple junction has been compiled from the observed Sea Beam data com-

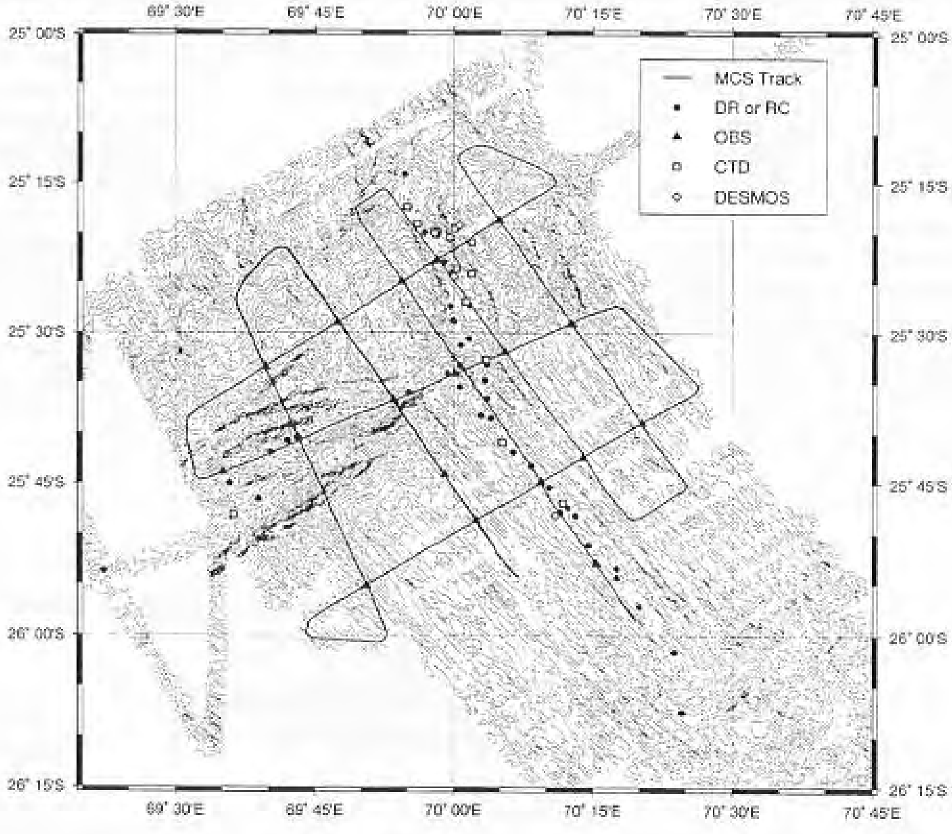

Figure 1. Hakuho-maru Rodriguez Triple Junction Site Summary. MCS: Multi-Chanel Seismic line; DR or RC: Dredge or Rock Core; OBS: Ocean Bottom Seismometer; CTD: Hydrocast; DESMOS: Deep Sea TV Observation.

bined with the data obtained by the French R/V Jean Charcot (figure 1).
2) Bouguer gravity anomalies show "bull's eye" negative anomalies on the SEIR and Central Indian Ridge (CIR), indicating focused accretion in these segments. The source of the negative gravity anomalies will be clarified by the results of the seismic experiments.
3) Preliminary analysis of the OBS data show high seismic activities in the area, earthquake swarms occurring near the RTJ.
4) Several teleseismic events including a large earthquake which occurred near Guam Island, were observed by the OBSs.
5) High-density rock sampling was carried out along the entire length of a single segment on each of the three spreading ridges. Fresh glassy basalts were recovered from 23 sites on the SEIR and CIR. Relatively old basaltic rocks with relatively thick Mn coating were recovered from the southern part of the Southwest Indian Ridge (SWIR). Highly altered (weakly metamorphosed) basalts, dolerites, and gabbros were found along steep fault scarps in the SWIR and RTJ.
6) Preliminary analysis of basalt glasses indicate compositions ranging from 7.2 to 8.8 wt. % in MgO. Basalt in RTJ have differentiated composition in comparison with those in the CIR and SEIR. Slightly older basalt glasses from the SWIR have the composition similar to fresh glasses in the CIR and SEIR.
7) A distinct hydrothermal plume was detected close in the CIR. The center of the plume was located at a depth of approximately 2200 m, about 1800m above the floor of the rift valley. The areal distribution of the plume suggests that its source is located off-axis to the east of the area.
8) Visual observations of the seafloor suggest that the volcanism at the Indian Ridges occurred in two stages: sheet lava flow stage followed by volcanic cone stage.
Unfortunately, we were unable to observe any vents or biological colonies in the RTJ box area with the deep-sea TV system although we did detect a substantial chemical anomaly in the water column at the CIR. We finally moved to the Sonne Hydrothermal Plume area at 24°00.3'S, 69°39.6'E (Herzig and Pluger, 1988), 60 nautical miles north of the RTJ box area where the existence of a hydrothermal plume was confirmed by the characteristic anomaly of the transmissometer signal during CTD tow-yo survey (CTD-17). We executed 16 hours of DESMOS deep-sea TV observation at the supposed anomaly area, but did not observe any indication of hydrothermal activity on the seafloor.

Summary

A multi-disciplinary approach to the study of the crustal accretion process of the Rodriguez Triple Junction was successfully executed employing the methods of detailed geophysical mapping, seismic reflection and refraction crustal studies, tomographic crustal studies, dense bottom rock sampling along the spreading axes, tow-yo and hydrocast water sampling at spreading centers, and geological and biological seafloor observation using a deep-sea monitoring system. Further synthetic analyses of geophysical mapping, seismic crustal studies, and dense bottom rock sampling will provide a real three-dimensional picture of seafloor spreading process from the upper mantle through to surface volcanism at three different spreading systems of CIR, SWIR, and SEIR ridges. Although we were unable to find a hydrothermal vent area, the accumulated chemical data from water samples collected will provide a valuable data sets which will enhance our understanding of the chemical flux at the Indian Ocean spreading centers.

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The R/V Professor Logachev Research Cruise 09 to the Reykjanes Ridge near 59°N: Sediment Distribution on the Reykjanes Ridge (August - September 1993)

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Beginning October 1, 1991, the GEOMAR Research Centre for Marine Geosciences, the Institute of Baltic Sea Research and the Geological Department of the University of Greifswald have carried out a joint project dealing with sedimentation processes on mid-ocean ridges. The project is supported by the Federal Ministry for Research and Technology (as part of GEOMAR project no. 03R619A). The scientific program is closely connected to the international ridge research program InterRidge and the German national initiative DeRidge and is the follow-on project from similar investigations in the area of the Kolbeinsey Ridge from 1988 to 1990.

The project's scientific objective is to develop a model for the genetic evolution of the depositional environment of the mid-ocean ridge (MOR). Depositional processes being active at mid-ocean ridges, the spatial and temporal variability of these processes and consequently the various sedimentary facies, are principal objectives of investigation. Main thematic topics attempt to characterise different types of sedimentary facies and their genetic development and particle associations. Moreover, we focus on distribution patterns of distinct sedimentary facies, on the chronological order of facies types, including their genetic processes, and the demarcation of MOR sediments from adjacent basin sediments. The area of investigation is the Reykjanes Ridge between 58° N and 60° N.

During the Cruise SO82 aboard the R/V Sonne in Oct. 92, a segment of the ridge was mapped with the *Hydrosweep* multi-beam echo sounder and the sub-bottom profiler systems *Parasound* and *SEL90* (figure 1). Seven sites were cored with a large box corer, a giant gravity corer and a gravity corer (Endler and Lackschewitz, 1993). The first part of Cruise LO09 was based on the results of the SO82b cruise. Promising site positions were selected with the help of the bathymetric map and acoustic profiles. On this basis sixteen stations were selected. During the second part of the cruise program an additional area was mapped by thirteen SEL90 acoustic tracks. On the basis of these tracks seven sites were selected and cored.

The sedimentation environment in the study area is highly variable. Morphologically, three different sediment covered features are important: the rift valley at the active spreading centre, contains only thin and patchy sedimentary deposits; on the flanks of the ridge, basins are filled with thick sedimentary sequences and some elevated plateaux also show sediment coverage. Some special current controlled conditions have been observed near a seamount at 58°53'N and 30°19'W (Catalonia Seamount). Generally, the thickness of sediments increases with increasing distance from the ridge crest. The lithology of the sediments varies between nannofossil-foraminiferal oozes, foraminiferal sands, sponge spicule rich sediments, clayey sediments, and volcanic ashes. Some deposits, especially in the vicinity of the Catalonia Seamount are strongly influenced by bottom currents. The pelagic input is dominated by plank-

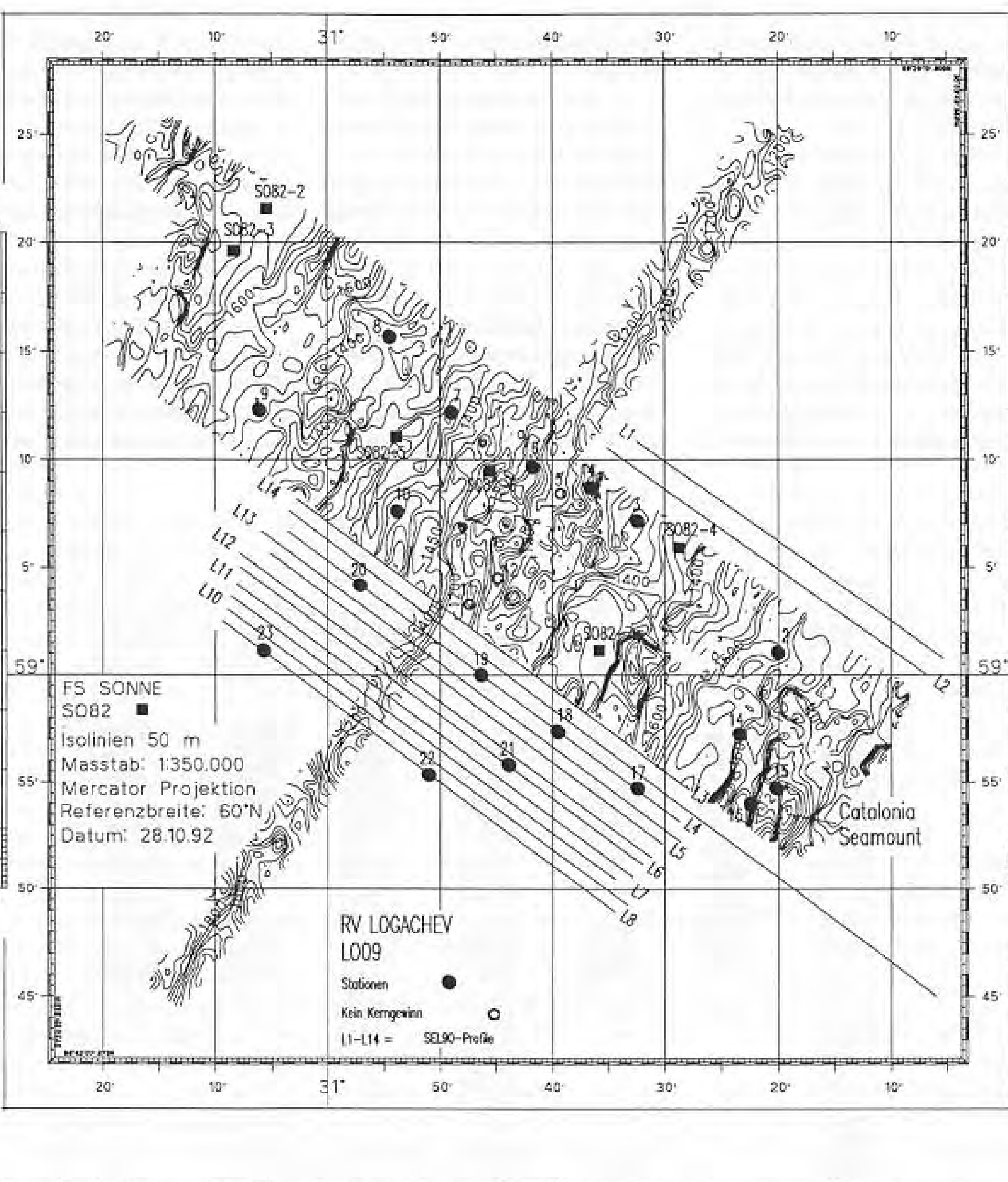

Figure 1. *Study area of LO09 with site positions and SEL90 acoustic tracks (open symbols = no recovery); including SO82 stations from the cruise with R/V Sonne (Endler and Lackschewitz, 1992).*

tonic foraminifers (e.g. *Globigerina bulloides* and *Neogloboquadrina pachyderma*) and calcareous nannoplankton. Sponges and sponge spicules are an important biogenic component. Volcanic material occurs in the sediments from the ridge crest, indicating volcanic activity and in distinct layers of subaerially transported ashes coming from terrestrial sources, e.g. Iceland.

In more detail some results can be concluded as follows:

Surface sediments

The differences in composition of the surface sediments suggest recent changes in the sedimentation processes in the study area. The majority of the surface sediments are marked by the influx of carbonate pelagic particles (planktic foraminifera, coccoliths). The planktonic foraminifera are dominated by the form *Globigerina bulliodes* (D'ORBNIGNY) which in large occurrences indicates the influence of a temperate water mass.

Autochthonous sponge spicules were observed at four stations (7, 8, 14, 17). They often formed dense mats of several centimetre thickness. Similar occurrences have been reported in the areas of the mid-ocean ridge and seamounts at the Kolbeinsey Ridge in the Iceland Sea (Lackschewitz, 1991) as well as on the Jan Mayen Spur and the Vesterisbanken Seamount in the Greenland Sea (Henrich et al., 1992). These spicule mats are formed through the *in situ* decay of dead porifera and the subsequent deposition of the remaining spicules. This process also forms the substrate for the growth of subsequent generations of individual sponges. The resulting spicule mats provide tiny hollows and niches in which fine material and microfossils are collected, e.g. the diatoms seen in the darker sponge mats of Station 14.

The occurrences of microsponge needles (in the sediments of a steep slope east of the central graben, Station 14) suggest a differing oceanographic environment. The exact relationship between autochthonous spicules and marine environment is not yet clear and should be the topic of further study. The occurrence of differing bottom current relationships, as observed by Dietrich & Kontar (1990) on the Reykjanes Ridge, help to explain the wide bathymetric distribution of the spicules.

In contrast to the spicule rich localities, the clay rich stations (LO09-17, -18, -19, and -20) are indicators of depositional areas protected from strong currents. Three of these stations lie in the basin within the ridge (figure 1). Station 18 lies north of the Station SO82-7 (R/V Sonne Cruise 82) in the same basin. Sedimentary studies of this Station also demonstrated a large component of clay. Grain-size and settling velocity analyses characterise this region as an accumulation area for eroded and weathered material (Gehrke et al., in press). Further studies are necessary to determine if this is also the case for Stations 17, 19 and 20.

The foraminiferal sand facies on the slope of the Catalonia Seamount are interpreted as the result of winnowing and reworking by bottom currents. This is similar to results obtained by Gehrke et al. (in press) from surface sediments of the outer western Reykjanes Ridge and of the plateau area in the central ridge. Numerous measurements in the western North Atlantic have

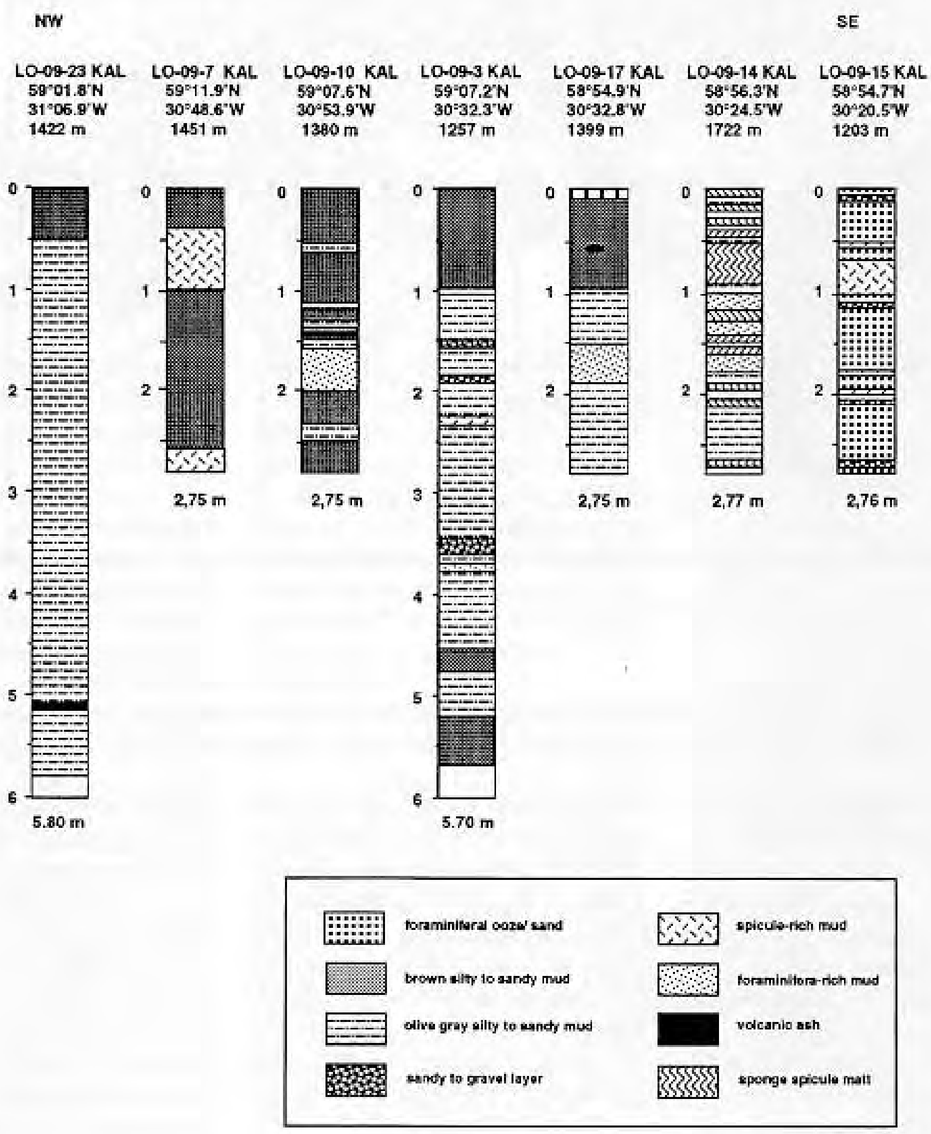

Figure 2. *Lithology of GGC cores of LO09.*

shown persistent westerly and southwesterly currents of 5-20 cm/s (Shor et al., 1984).

An increase in the amount of brown (basaltic) volcanic glass in the central graben (Station 6) provides evidence for submarine volcanic activity along the ridge axis. The free form blocky vesicle of the glasses suggests a hyaloclastic origin. Other stations in the central graben were devoid of volcanogenic sediments. The clear silicic glasses of Station 23 document large, inter-regional subaerial eruptions. There is no clear indicator as to their origin, they could have easily travelled many thousand kilometres.

Benthic fauna

The benthic fauna of the deeper, oceanic regions of the Reykjanes Ridge is still poorly known. First results show that some of the surface samples seem to have a rich benthic fauna. Most of the samples were taken from sites with fine, soft mud bottoms. Especially, the surface sediments from the stations LO-09-7, -8 and -17 have a rich epifauna and are characterised by an abundance of sponges. At these sites the spicule meshwork provides an ideal substratum for fixosessile benthic organisms like bryozoans. Branched bryozoans are often attached to the sediment surface. Concentrations of brachiopods and pteropods were also observed in the spicule meshwork. Besides the sponges there are gastropods (e.g. *Conus* sp., *Turitella* sp.) and molluscs (e.g. *Pecten* sp.) on the sediments of these stations. Other stations such as LO-09-15, -19, -22 and -23 also exhibited some sponges.

On the surface sediment of the station LO-09-9 fragments of basalt form the substratum for smaller types of sponges. The surface sediments of the stations LO-09-3 and -4 reveal some brittle stars of the species *Ophiura textura*. Abundant coral fragments were observed in the subsurface sediments of station 3. The red corals are several centimetres in length and of *Lophelia* type including L. pertusa (Linne) (pers. comm. A. Freiwald).

Subsurface sediments

The cores are characterised by brown and olive coloured pelagic sediments often intercalated by spicule rich layers. In addition, some cores reveal tephra layers of different composition and texture. Simplified lithologic profiles from the cores are shown in figure 2.

A basaltic ash layer were observed in core 10. This ash layer is the only indicator in the cores of volcanic activity in the Late Quaternary. The ash layer in the sediments of core 23 matches the widespread Ash Zone II in the North Atlantic both in form and position in the core. This zone is dated at 57,500 yr B.P. by Ruddiman and McIntyre (1984). These tephra layers can provide important local stratigraphic markers.

Disperse coarse-grained (> 100 µm) terrigenous material was observed spread throughout most of the cores recovered. Previous studies of marine sediments from the North Atlantic have shown that coarse terrigenous particles (> 63 µm) can be interpreted as ice-rafted material (Ruddiman, 1977, Bond et al., 1992). This indicates occasional melting of the icebergs in the region.

The common change from foraminifera-rich sand layers and fine-grained sponge needle-rich sections in core LO-09-15 on the Catalonia Seamount indicates changes in the energy level of the sea-floor water mass with time. This is probably related to the complex physiographic conditions and the effect of latitude dependent climatic changes on the properties of the sea-floor water mass.

These results indicate that mid-ocean ridges are a highly diverse sedimentary environment with strong changes in depositional process in time and space. In contrast to the more unique and widespread facies types of the deep-sea basin sediments deposits of mid-ocean ridges are highly influenced by the ridge topography and local bottom current systems.

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A note from the editor:

The discovery of hydrothermal vent biota several years ago generated enormous interest in the eco-biological aspects of the mid-ocean ridge system within all sectors of the ridge science community. Hydrothermal vent sites and their associated biota are most often found by non-biologists who, recognising what may be a unique opportunity, take the time and effort to bring back samples of the biology. The methods employed while enthusiastic, are sometimes lacking in technique through want of supplies and information as illustrated in the letter below. Discussion of this problem amongst participants at a recent interdisciplinary BRIDGE workshop focusing on hydrothermal vent eco-systems, led to the idea that something could and should be done to provide any and all willing, sea-going ridge-crest scientific parties with the proper equipment and information necessary for the collection of useful biological samples. Following is an open letter from a concerned biologist with import for all members of the ridge sciences community, biologist and non-biologist alike....

A Letter to The InterRidge Community: What to do with the Slimy Stuff

V. Tunnicliffe, University of Victoria, B.C. Canada

I just received a fax from a geologist friend on board the RV SONNE somewhere off New Guinea. It ended: "It's a good thing the ship isn't dry but a shame no real biologist on board." With their TV dredge, the expedition had pulled up hydrothermal vent animals from a new site near Lihar Island. The descriptions were most intriguing and excited several biologists I spoke to. But neither I nor any other biologist had sent preservatives and the SONNE is at sea for another two years. The message continued: "I have been able to use a gallon of methanol blended with Russian vodka but the big, ugly stuff in the Bloody Mary mix doesn't look so good." We will figure out how to rescue this material and my enterprising friend will receive due recompense.

In the meantime, it is clear that interested biologists should make the effort to provide a preservation kit for even unlikely cruises. Perhaps a Bio Box should sail with each ship. That box should contain a 2 l box of full formaldehyde which goes a long way when diluted to 7%. Dilution with seawater will take care of the buffering problem in the short term. However that seawater must be filtered or we will be picking oceanic copepods! In addition, 95% ethanol is important for calcified animals. It is possible to extract DNA from alcohol specimens but formalin gives poor return. Small plastic containers and a couple of larger ones with lots of ziploc bags to divide samples within a bucket are useful. Don't forget convenient labels, pencils, tape and a contact number, fax and e-mail address for retrieval.

I take this opportunity to make suggestions on collection and handling to those who are unfamiliar with biological methods and procedures but recognise unusual opportunities.

Collection: Specimens often lose their value without collection information: date, location, depth, dive/dredge time. I would rather see time spent collecting ecological information (water temperature, chemistry, pictures) than time on lots of replicated specimens. Please do not mix samples. You probably have only one collection device or container - make it one good sample. Two mixed samples, however interesting, make interpretation very difficult.

Immediate treatment: Animals die and decay quickly. Treat as soon as possible. If your own work has priority, have cold seawater ready (bucket cooled in a freezer) and keep the animals as cold as possible. Do not freeze.

Preservation: Many people can work from a few samples if preserved well. If you see different animals, pick out examples of each and preserve one lot in 70% ethanol and one lot in 7% formalin. All the animals can go in one container if it is the same collection and the same preservative. Put the rest in the preservative of which you have the most - they should sit loosely. Overcrowding means poor fixation for them all; any extras can go in the ship's freezer.

Information: Do write a label for each container: ship, location, date, unique station identification and either your name or the chief scientist's name. Throw in a note if any contamination may have occurred: rocks thrown in during collection, unfiltered seawater used, etc. I had puzzling surface barnacles in one hot vent sample: no one told me a sunk running shoe was placed in with my worms!

What to do if there are no preservatives on board: Best choice is overproof liquor and bill the biologist; next best is 70% methanol. Even if there is only a little liquid, a few specimens are better than none. If all else fails, freeze; the colder, the better. Later specimens can be thawed slowly (in fridge) in preservative. Do not mix methods. Good photographs of the animals may help reconstruction.

I greatly appreciate the specimens sent me over the years; grabs of opportunity truly enhance our biological work in the deep-sea. Do not hesitate to contact me if biological collection is a possibility on your cruise; we will find someone to help.

Verena Tunnicliffe,
University of Victoria, Canada.
e-mail tunnshaw@uvvm.uvic.ca;
fax 1-604-721-7135. ◆

International Co-Operative Research Projects

FARA: Along-Axis and Across-Axis Sampling of the Crust at the Mid-Atlantic Ridge: 20°-24° N

Mathilde Cannat[1], Catherine Mével[1] and the Shipboard Party of the SEADMA 2 cruise: Pierre Agrinier[2], Abdel Belarouchi[3], Gilles Dubuisson[4], Cécile Durand[5], Eric Humler[2], Marcia Maia[5] and Jennifer Reynolds[6].

[1] Laboratoire de Pétrologie, URA 736, UPMC, 4 pl. Jussieu, 75252 Paris Cedex 05; [2] Institut de Physique du Globe, Paris; [3] Université d'Aix Marseille; [4] Ecole Normale Supérieure, Paris; [5] Université de Bretagne Occidentale, Brest; [6] Lamont Doherty Earth Observatory, USA.

The SEADMA 2 cruise aboard the N.O. Le Noroit in June and July, 1993, was leg 2 of a mapping and sampling program of the Mid-Atlantic Ridge between 20° and 24° N, part of the French-American Ridge Atlantic (FARA) project. The bathymetry, gravity and magnetic data coverage accomplished during SEADMA 1 (Gente et al., 1991; Deplus et al., 1992) extends off-axis to anomaly 5 (10 Ma; figure 1) and reveals the history of ridge segmentation of the area: along axis depth variations suggest a present-day axis is divided into seven segments, from the Kane Fracture Zone to the southern end of the map at 20°N. The Kane Fracture Zone and the 35 km right lateral ridge offset at 21°21'N (figure 1), represent the only significant offsets of the ridge axis within this zone. The off-axis bathymetric map shows aligned basins which bound rhomboidal domains of shallower average topography. These rhomboidal domains are interpreted as having formed at the center of ridge segments, while aligned basins are thought to have formed at the segment termini (Gente et al., 1991).

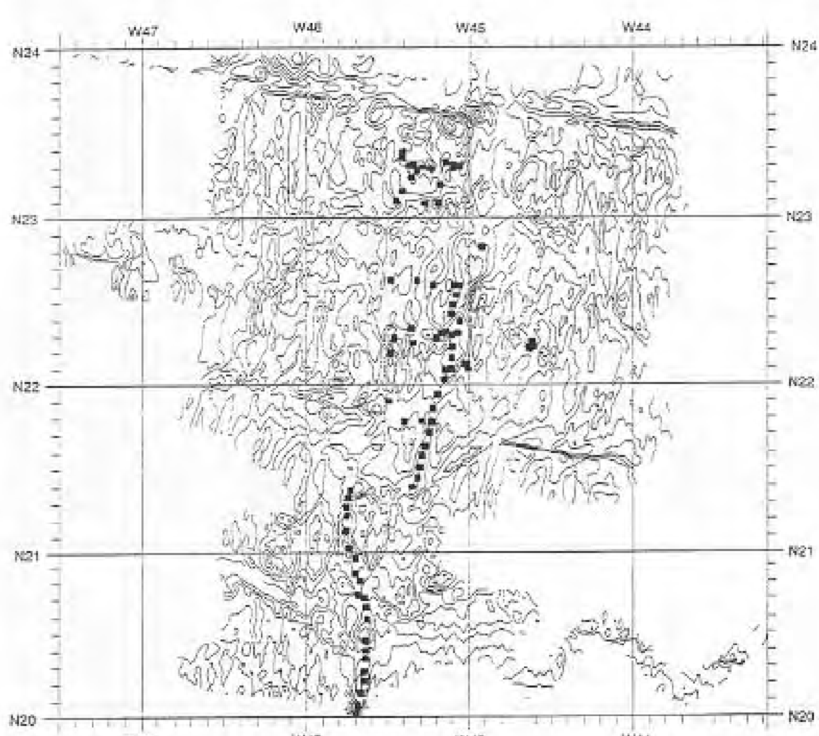

Figure 1. Location of SEADMA 2 cruise dredges (black squares) and rock cores (grey squares) on the SEADMA 1 bathymetric map (Gente et al., 1991). Contours interval: 500 m.

These basins are commonly aligned oblique to flow lines, suggesting that individual ridge segments have propagated, or receded, over time periods of 3 to 7 Ma (Gente et al., 1991). The distribution of residual mantle Bouguer anomalies shows clear affinities with the bathymetric segmentation pattern (Deplus et al., 1992). Minima of -15 to -35 mGal are generally observed in the shallower mid-segment domains, while basins tend to have positive residual mantle Bouguer anomalies of +5 to +20 mGal, suggesting that they are underlain by thinner crust.

Sampling during SEADMA 2 (figure 1) was conducted with two

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World Ridge-Crest Cruises

Country	PI	Institution	Name/Location	Reserach Objectives	Ship	Dates
Canada	Juniper	Univ. of Québec	**BIO-ROBE I:** Endevor Segment, Juan de Fuca Ridge	ROPOS ROV, establishment of a biological observatory	John Tully	June/July 94
Canada	Scott	Univ. of Toronto	**BIO-ROBE II:** Explorer Ridge, Juan de Fuca Ridge	Electromagnetic survey of the hydrothermal vent site with ROPOS	John Tuly	July 94
Canada	Evans/Webb	Univ of Toronto/ SIO	Juan de Fuca Ridge	Magnetomagnetic mapping of shallow crustal structural variability	information unavailable	June 94
France (FARA)	Fouquet	IFREMER/ Brest	**DIVA 1:** 37°10'N MAR (Lucky Strike Segment)	Hydrothermal site submersible sampling: petro. hydrochem.	Nadir/Nautile	May 94
France (FARA)	Désbruyères	IFREMER/ Brest	**DIVA 2:** 37°10'N MAR (Lucky Strike Segment)	Hydrothermal site submersible sampling: biology hydrochem	Nadir/Nautile	June-Aug. 94
France	de Lépinay/ Michaud	CNRS-Sophia Antipolis	**NAUTIMATE:** Middle Americas Trench - EPR	Submersible sampling: petro., hydrochem, photography	Nadir/Nautile	Jan/Feb. 94
France	Lagabrielle/ Reullan	IFREMER/ Brest	**NOFI:** Northern Fijian Basin	Bathymetry (EM12), grav, dredging, magnetics, seismics, hydrology	Atalante	Sept.94
France	Le Pichon	Ecole Normale Supérieure	**JASON:** Eastern Mediterrian	SAR, seismic, deep towed photography, heat flow	Suroit	May/June 94
Germany/ Spain	Dehghani/ Dãnobeitia	Univ Hamburg CSIC Barcelona	East Pacific Rise	Geophysics	Hesperides	Mar./Apr.94
* Germany	Devey	University of Kiel	**Posiden:** Kolbeinsey Ridge 68.5° - 70° N	Bathymetry, rock sampling, geochemistry	Hesperides	July/Aug 94
Germany	Herzig	Berakademie Freiberg	Tabat-Feni Island Arc Manus Back-Arc Basin	Geophys., geochem., mapping, sampling	Sonne	Mar./Apr.94

Germany/ US	Herzig/ Humphries	Berakademie Freiberg/WHOI	**ODP Leg 158:** MAR-TAG	Drilling a hydrothermal system	JOIDES Resolution	Oct./Nov. 94
Japan	Fujimoto/ Bryan	ORI/ JAMSTEC	**WMARK:** Western Kane FZ, MAR	15 dives, geophysics	Yolosuka/ Shinkai 6500	June/July 94
* Japan	Fujika	JAMSTEC	TAG hydrothermal site, MAR	15 dives, geophysics	Yolosuka/ Shinkai 6500	July/Aug. 94
* Japan	Urabe	Geological Survey of Japan	**EPR-1:** East Pacific Rise, 13°-17°S	Hydrothermal observations, 15 dives, geophysics	Yolosuka/ Shinkai 6500	Sept/Oct. 94
* Japan	Fujioka	JAMSTEC	**EPR-2:** East Pacific Rise, 13°-17°S	15 Hydrothermal dive surveys	Yolosuka/ Shinkai 6500	Oct./Nov. 94
United Kingdom	White	University of Cambridge	SWIR	Geophysics	Discovery	Apr/May 94
United Kingdom	Searle	University of Durham	Mid-Atlantic Ridge, 29°N axial segment	Geophysics	Charles Darwin	June/July 94
United Kingdom	McCave	University of Cambridge	Mid-Atlantic Ridge	Geophysics	Charles Darwin	July/Aug. 94
United Kingdom	German	IOSDL	**HEAT:** Mid-Atlantic Ridge: Azores	Geophysics	Charles Darwin	Aug/Sept 94
United Kingdom	Elderfield	University of Cambidge	Mid-Atlantic Ridge, Broken Spur 29°N	Geochemistry	Charles Darwin	Sept. 94
USA (RIDGE)	Castillo	Scripps	Pacific/Antarctic, East Pacific Rise	Swath mapping and dredging	Melville	Feb/Mar 94
USA (RIDGE)	Constable	Scripps	Juan de Fuca Ridge	Deployment and testing of tiltmeters	Wecoma	Summer 94
USA (RIDGE)	Cannon/ Joyce	NOAA/ WHOI	Juan de Fuca Ridge	Hydrodynamic of water circulation at a hydrothermal vent site	Suveyor	No dates available

* See summary on page 16.

Poseidon cruise 201/10b

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Dates: Akureyri 23.7.94 to Akureyri 3.8.94
Objectives: Detailed sampling (dredge, volcanic gravity corer) and mapping (bathymetry, side-scan) of the Spar Fracture Zone and Eggvin Bank regions on the Kolbeinsey Ridge (68.5 - 70N).

Previous work by the Kiel group has shown clear relationships between changes in basalt geochemistry and tectonic structures along the Kolbeinsey Ridge north of Iceland. The boundary between Iceland-type magmas (incompatible-element enriched) and Kolbeinsey MORB (with extreme incompatible depletion), for example, has been shown to coincide with the Tjornes Fracture Zone on the Icelandic north coast. To investigate further the relationships between basalt chemistry and crustal structure, the planned Poseidon cruise will concentrate on the Spar Fracture Zone region. Although named "Fracture Zone", detailed magnetic mapping suggests that the ridge offset in this region is the result of overlapping spreading centres rather than a transform fault. Sparse published geochemical data have shown a clear change in basalt chemistry from north to south of the zone of overlap. The Poseidon cruise will aim to map and sample the overlapping propagators, and, with the help of side-scan sonar, to determine the sites of presently-active volcanism.

North of the Spar region, the Kolbeinsey Ridge becomes very shallow, in an area known as Eggvin Bank (depths as shallow as 40 m have been recorded, south of the Bank the axial depth is >1000 m). Once again, sparse published data suggest that Eggvin Bank has a composition distinct from the adjacent ridge segments. The topography of the transition spreading axis - Eggvin Bank will be studied, and samples will be collected to determine how closely the changes in basalt chemistry are related to the crustal structures. ◆

1994 Shinkai 6500 Atlantic Dive Program

Kantaro Fujioka
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The R/V Yokosuka and Submersible Shinkai 6500 will carry out 15 dives in the TAG area at the Mid-Atlantic Ridge from 30th July to 27th August 1994. The principal investigator for this cruise is Dr. Kanatro Fujioka, Japan Marine Science and Technology Center. Members of the scientific party will include Drs. Von Herzen and M. Kleinrock of the Woods Hole Ocenaographic Institution and Drs. M. Kinoshita and T. Gamo. The principal objective of this cruise are: 1) thermal monitoring of the black smoker with "Giant Kelp" type thermister array, and "Daibutu" type thermal array, to monitor before, during and after drilling by D/V JOIDES Resolution during ODP Leg 158 (P. Herzig and S. Humphris, co-chief scientists); 2) geochemical study of black and white smokers and ambient water to assess chemical changes before and after drilling; 3) OBS network to detect the thermal event and estimation of magma reservoir; 4) Visual monitoring of the smokers with video, still cameras, as well as with other types of sensors (CTD, current meters and nepherisity); 5) tectonic interpretation of the formation of the large ore deposits. Three transponders will be deployed in the TAG area by the Shinkai 6500 to aid in navigation of drilling and submersible program. ◆

Shinkai 6500 Dive Program on Southern East Pacific Rise.

Tetsuro Urabe[1] and Kantaro Fujioka[2]
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A total of 30 Shinkai 6500 dives at the superfast-spreading East Pacific Rise between 13.5° and 18.5°S are planned as legs 3 and 4 (EPR-1 and EPR-2) of the 1994 Yoksuka Cruise Program to the Mid-Atlantic Ridge and the East Pacific Rise. This is the second cruise of the Ridge Flux Project which is funded by Science and Technology Agency of Japan, in co-operation with the NOAA/VENTS Program. The principal objectives of the Ridge Flux project are: 1) to observe and monitor the energy and mass flux from the asthenosphere to the earth's surface environment at the mid-oceanic ridge; and 2) to compare the active ridge crest processes of the mid-oceanic ridge with that of marginal basin systems.

Scientists from NOAA/PMEL, Geological Survey of Japan, JAMSTEC, Hydrographic Department of Japan, and several Japanese Universities completed a site survey of the area using R/V Melville between November 23 and December 30, 1993. Hydrothermal anomalies along the ridge crest were mapped using conductivity-temperature-depth-transmissometer-nephelometer instrument packages. The sensor package was towed at about 2 knots while being cycled continuously in a sawtooth pattern along the southern East Pacific Rise. This tow-yo technique pro-

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News from National Ridge Research Programs

DeRidge

DeRidge and ODP Colloquium, 2-4 March, 1994, Köln, Germany

The 1994 DeRidge Plenary meeting was, as in 1993, held in conjunction with the annual German ODP meeting. One of the major topic of this year's ODP meeting was the origin of the oceanic crust. The program included invited speakers representing three of the countries most actively pursuing ridge research: Roger Searle (UK), Charlie Langmuir (USA), and Catherine Mével (France). Following a brief look at the history and status of DeRidge, given by H.-U. Schmincke, the invited speakers gave an overview of their national programs and the role of InterRidge in ridge research in each of their countries.

The principal topics of the DeRidge meeting (morning of 2 March) were 1) a review of the implementation of the BRIDGE programme in the UK, its research objectives, results, and its role within the British geoscience community (Roger Searle) and 2) the current situation of the InterRidge initiative, especially its global aspect (Charlie Langmuir). The need for international collaboration was emphasised and important aspects in the possible future role of InterRidge were defined as a) keeping the global community informed and integrated through results symposia, workshops and planning meetings, b) facilitating add-on programmes to on-going research , and c) organising data bases (catalogues/archives). All three speakers emphasised the strong interdependence of InterRidge and ODP.

The following discussion focused on how the German ridge research activities could be more active (including raising funds for the InterRidge membership fee). Some promising suggestions were made later during the ODP meeting and - given the wide international support of the InterRidge initiative - most researchers active in DeRidge are optimistic that the 1994 fee will soon be available.

The second part of the meeting concentrated on DeRidge projects including short reports on recent cruises to the Rodriguez Triple Junction, Indian Ocean (P. Halbech) and the Reykjanes Ridge (H.-J. Wallrabe-Adams; see page 8 this issue), reviews of the large amount of work done by the BGR at the East Pacific Rise, 6°-30° S, which will be made available upon personal request (V. Marchig), and on the instrumentation presently in development or planning stages in Germany and Europe (H. Bäcker). Short status reports on the other DeRidge working groups followed and it was agreed that the existing (mini-) white papers would be integrated into an initial science plan. This plan would serve as a basis for proposing further DeRidge projects. Attention should be paid to include all ridge relevant projects into the science plan, in particular those carried out under a different "umbrellas" such as ILP or ODP site surveys. An attempt should be made to integrate ridge biology projects into the DeRidge initiative, and the intent of InterRidge to implement a biological working group was appreciated.

Due to the specifically close relationship of DeRidge to the German ODP program, it was decided to hold the next full DeRidge meeting again in conjunction with the annual ODP meeting, presumably March 1995. In the meantime, DeRidge will convene individual working group meetings during the summer and fall of 1994, eventually leading to a proposal-writing workshop in late 1994.

March, 1994.
Roland Rihm

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duced a 520 km long two-dimensional transect of the distribution of hydrothermal temperature anomalies and the contour of suspended particulate matter concentration. A large number of immense hydrothermal plumes were identified by detection of anomalous concentrations of suspended particulate matter.

The Shinkai dives will explore some of these hydrothermal sites. Sampling of end-member fluid plumes over the hydrothermal sites, chemical precipitates, sulphide/sulphate ores, micro- and macro-organisms, and fresh glass fragments are planned. OBS deployment, heat flow measurement and other geophysical measurement will be also performed. ◆

InterRidge/Japan

The Japanese InterRidge Group joined InterRidge as a Principal Member Nation in 1994. Accompanying this decision, a number of changes have been made in Japanese representation in InterRidge:

National Correspondent:	Hiromi Fujimoto (ORI)	(formerly: K. Tamaki)
Steering Committee Members:	Kensaku Tamaki (ORI) and Tetsuro Urabe (GSJ)	(formerly: K. Tamaki)
Working Group Members:		
Global:	Kensaku Tamaki (ORI) and Takeshi Matsumoto (JAMSTEC)	(formerly: K. Tamaki)
Meso-Scale:	Hiromi Fujimoto (ORI) and Kantaro Fujioka (JAMSTEC)	(formerly: T. Matsumoto)
Active Processes:	Tetsuro Urabe (GSJ) and Makoto Yamano (ERI)	(formerly: H. Hotta)

A number of InterRidge-related Japanese Cruises are planned for 1994, aboard the Japan Marine Science and Technology Center's (JAMSTEC) R.V. Yokosuka and the Shinkai 6500 submersible:

(1) WMARK. Co-chiefs: Hiromi Fujimoto (ORI), Wilfred Bryan (WHOI)
Location: Western Kane F.Z of the Mid-Atlantic Ridge
Dates: 23 June 1994 (San Juan) - 22 July 1994 (Woods Hole)
Objectives: Diving surveys (max 15) and underway geophysics

(2) TAG. Chief: Kantaro Fujioka (JAMSTEC) Location: Hydrothermal observations at the ODP leg 158 drilling site
Dates: 28 July 1994 (Boston) - 26 August 1994 (San Juan)
Objectives: Diving surveys (max 15) and underway geophysics

(3) EPR-1. Chief: Tetsuro Urabe (Geological Survey of Japan) Location: Hydrothermal survey, 13°S - 17°S)
Dates: 13 September 1994 (Panama) - 18 October 1994 (Valparaiso)
Objectives: Diving surveys (max 15) and underway geophysics

(4) EPR-2. Chief: Kantaro Fujioka (JAMSTEC) Location: Hydrothermal survey, 13°S - 17°S
Dates: 24 October 1994 (Valparaiso) - 28 November 1994 (Papeete)
Objectives: Diving surveys (max 15) and underway geophysics.

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objectives: 1) to collect basalt glass from the axial valley floor with a 4 to 5 miles spacing, using a free fall rock core, in order to test the geochemical signature of present-day ridge segments; and 2) to dredge off-axis targets (in crustal domains up to 4 Ma) in order to test the degree of crustal lithology heterogeneity and its relation to segmentation. Off-axis dredges also added a third dimension (time) to our geochemical study. Geochemical work on cored and dredged basalts is still in progress, as is the petrological and geochemical work on the other dredged rock types.

Important results concerning our second objective were, however, available immediately after the cruise (Cannat et al., 1993). Instead of choosing dredging targets based on the bathymetric segmentation alone, we have based our dredging strategy on the map of off-axis residual mantle Bouguer anomalies. We are therefore able to correlate the distribution of dredged rock types with that of density anomalies in the study area, which may be interpreted in terms of varying thickness of the magmatic crust (Deplus et al., 1992). We find that off-axis areas with residual mantle Bouguer anomalies of +5 mGal or more show frequent outcrops of serpentinized mantle-derived peridotites. The magmatic crust of these domains of positive residual mantle Bouguer anomalies is therefore not only thin, as proposed by geophysical models, but also highly discontinuous. We propose that this discontinuous magmatic crust is made of a tectonically disrupted basaltic layer above gabbro intrusions within the uplifted and partly serpentinized mantle peridotites.

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BRIDGE

Since the last issue of InterRidge News (Spring/Summer 93) BRIDGE has been expanding steadily and has seen a number of successes in terms of scientific achievements. Our newsletter is now circulated to over 450 individuals and reached over 100 UK institutions and university departments.

In our first year of funding (1993/94) most of our efforts have been focused on the Reykjanes Ridge, one of the four geographical area selected by BRIDGE, and have included three cruises to carry out oceanographic, petrological and geophysical studies. The first was led by Chris German (IOSDL) on the R/V Bjarni Saemundsson in collaboration with Icelandic scientists from the Marine Research Institute, Reykjavik. The objective was to detect water-column anomalies in order to locate hydrothermal vent sites. Despite a thorough search, none were detected but they did manage to constrain further the Steinah-ll Hydrothermal Plume at 63°10'N. The second cruise, called PETROS, on the RRS Charles Darwin was led by Bramley Murton (IOSDL) and completed over 200 samples stations between 57°-63°N. Martin Sinha and Christine Peirce carried out a detailed geophysical experiment (EM and DOBS) on the RRS Charles Darwin at a single axial volcanic ridge at 57°N and report indications of a significant low velocity zone. Both these cruises on the Darwin used the new SIMRAD multibeam echo-sounder (EM-12) which ran very smoothly, providing complete swath and sidescan coverage of the neovolcanic zone between 57°-63°N. Looking to the future, Roger Searle will lead another geophysical cruise to collect on- and off-axis bathymetry and gravity data in June-July this summer.

Also in 1993, there were several BRIDGE studies in the Kane to Atlantis area of the Mid-Atlantic Ridge. These include the KASP cruise, led by Bramley Murton, which discovered the Broken Spur vent site (29°10'N), and subsequent water-column studies led by Harry Elderfield which detected two plumes in the area, suggesting a further site to the south of Broken Spur. Due to the enormous efforts of Cindy Van Dover and others, BRIDGE managed to secure two dives on ALVIN to the Broken Spur site for Bramley Murton. These dives yielded numerous and varied samples, now being worked up by the BRIDGE community. They have provided a significant boost for the BRIDGE biologists who had previously thought they would have a long wait to obtain such material. This coming year promises still further successes starting with the HEAT cruise to the south of the Azores (funded jointly by BRIDGE and the European Community's MAST programs) which will uses TOBI and ZAPS to explore for hydrothermal sites. At the same time, it has been proposed that a Russian/BRIDGE cruise take place aboard the R/V Akademik Mstislav Kheldysh to dive on the Broken Spur and TAG hydrothermal sites. This will include a monitoring programme on TAG prior to drilling by the ODP in October-November 1994. Harry Elderfield will test the new BRIDGE sensor package (BRIDGET) in this area also in late September.

In the South Atlantic, there will be a joint BAS/BRIDGE cruise to the East Scotia Sea led by Roy Livermore of the British Antarctic Survey, which is likely to take place in either late 1994 or early 1995. This cruise will use the IOSDL's GLORIA device to obtain sidescan and bathymetry data for this previously unmapped region, thus providing a basic data set on which to build for further studies on in the area.

BRIDGE has held a series of workshops on varied subjects including TAG Monitoring; Sidescan Sonar; Instrumentation; Diversity of Vent Ecosystems (DOVE), the reports for which are available from the BRIDGE Co-Ordinator (see address below). Other meetings have included our Annual Open Meeting and the Hydrothermal Vents and Processes Meeting. A report of the proceedings will be published in March 1995, and will be available from the Geological Society of London Publishing House. This summer there will be two further workshops, one on Sonar Processing Workshop and the other on BRIDGE Microbiology, the date for which is soon to be announced.

Finally, BRIDGE would like to welcome the InterRidge Office to the UK where it will be for the next three years, and wish Roger and Heather every success in their new rôles.

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RIDGE

Last year, the RIDGE Steering Committee made the decision to focus efforts within the Global Structure and Fluxes theme on ridges in the Indian Ocean. The Southwest Indian Ridge (SWIR) is the slow-spreading, transform-dominated Mid-Ocean Ridge (MOR) end-member, while the intermediate-spreading SEIR shows morphological and tectonic characteristics that vary from those typical of slow-spreading ridges to those typical of fast-spreading ridges. In addition, nothing is known about the distribution of hydrothermal activity and its associated biological community along the Indian Ocean ridges. Three U.S. mapping and/or sampling programs are now funded, and the first will occur later this year. Two will concentrate on the Southeast Indian Ridge (SEIR) on a section of the ridge near the Australia-Antarctic Discordance; the third will study a section along the western part of the SWIR that, unlike much of the rest of this ridge, is not dominated by transforms. Several additional Indian Ocean studies are planned by British, French and Japanese investigators on both the Southwest and Southeast Indian Ridges. It is expected that these initial cruises will be followed by other programs in order to ensure collection of multi-disciplinary data sets along the same portions of the ridge system in the Indian Ocean. A small, 1-day InterRidge meeting will be held in Baltimore, MD on 22 May 1994 (the day before the Spring AGU Meeting) to facilitate the co-ordination of these various proposed studies and to promote the interdisciplinary objectives of the InterRidge global program. In particular, it is hoped that this meeting will encourage the development of programs for hydrothermal and biological studies that can complement the planned mapping and sampling work in this area.

Another major goal of the U.S. RIDGE Initiative is to develop a better understanding of the pattern of mantle flow beneath mid-ocean ridges and the migration of melt to the ridge axis. The first field component of this study — the MELT (Mantle Electromagnetic and Tomography) Experiment — is now tentatively scheduled to begin in late 1995. The design of the Experiment has been developed over the past several years through a series of workshops, pilot experiments, site surveys, and numerical modelling studies. It involves studies of electromagnetic and seismic wave propagation in the mantle using arrays of ocean-bottom instruments to collect data which through inversion modelling may be used to find horizontal and vertical variations in velocity and conductivity structure. The site selected for this experiment is on a fast-spreading segment of the East Pacific Rise at about 17°S, south of the Garrett transform. This is the longest section of the ridge system with no large fracture zones or other offsets, and consequently it provides the best opportunity for tectonic simplicity and two-dimensionality. In the fall of 1995, a series of 47 OBSs will be deployed in two linear arrays across the ridge axis. Six months later, a second cruise will retrieve the OBSs and deploy 56 EM instruments from five countries — Australia, France, Japan, the U.K., and the U.S. — for one year, primarily, in an array, but with some instruments along-axis. It is expected that data from the experiment will be available to the entire geoscience community two years after retrieval of each set of instruments, and will be used to test passive and dynamic flow models of mantle upwelling and melt generation beneath a mid-ocean ridge.

Additional information about the U.S. RIDGE program can be obtained from:

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Announcements and Notices

SOZ: The Netherlands/Dutch Merge

As of January 1, 1994, the Netherlands Marine Research Foundation (SOZ) will merge with the Dutch foundations responsible for earth and atmospheric sciences to create a new foundation: The Geosciences Foundation. For the time being, there will be no changes in our e-mail address, telephone, fax or telex numbers. We embark on the extension of our working field with confidence and look forward to fruitful co-operation in the future.

Dr. Jan H. Stal
Geosciences Foundation, Laan van Nieuw Oost Indië 131, 2593 BM 's-Gravenhage,
postbus 93120, 2509 AC 's-Gravenhage, The Netherlands
tel: 070-344-0780; fax: 070-383-2173

InterRidge *Active Process Working Group Workshop:*

Event Detection and Response and A Ridge-Crest Observatory

Woods Hole, MA USA
6-8 June, 1994

Convenor: Joe Cann
(Active Processes Working Group Chair)

Active Processes combines two distinct, but related areas of activity: co-operation in the development of ridge-crest observatories and co-operation in mid-ocean ridge event detection and response. The two areas are closely linked through the need to respond to and investigate ridge-crest events in order to improve the siting and instrumentation of ridge-crest observatories. A first-class event detection and response system cannot be accomplished without international co-operation between countries close to mid-ocean ridges and those further away, and between countries able to contribute different instruments for use. It is intended that this workshop build upon previous workshops dealing with event detection and response by broadening the geographic focus to include the Mid-Atlantic Ridge and back-arc basin systems, by considering the problem from the point of view of temporal variability rather than axial segmentation, and by stressing an international collaborative approach.

Prior to the workshop, a position paper covering a number of topic relevant to event detection and response and development and establishment of a ridge-crest observatory will be circulated to all participants. This position paper will serve to focus discussion and as a foundation for a white paper to be produced in the course of the workshop.

Objectives:

- To discuss and design the techniques, instrumentation and methods relevant to the implementation of an event detection and response program and the development and deployment of a ridge-crest observatory.
- To produce a white paper discussing the relevant issues and detailing specific project implementation plans.

Fee: US$ 20.00 This fee will cover the cost of refreshments and a small reception.

Please Note:
In order to maintain an effective working group size, attendance will be limited to 50 people: 25 places will be reserved for invited participants and 25 for interested members of the ridge sciences community. The InterRidge budget does not include travel and accommodation funding for meeting participants. Travel funding should be requested from national funding agencies.

Registration deadline: 6 May, 1994

Contact: Heather Sloan, InterRidge Co-Ordinator
InterRidge Office, Department of Geological Sciences, South Road, Durham, DH1 3LE UK
tel: 44-(0)91-374-2532 fax: 44-(0)91-374-2510 e-mail: intridge@durham.ac.uk

InterRidge Meso-Scale Workshop:

4-D Architecture of the Oceanic Lithosphere

- Hosted and Organised by RIDGE -

Durham, N.C., USA
September 23 &24, 1994

Convenors: Lindsay Parson

In the course of the Meso-scale Segmentation and Fluxes Workshops held in Durham, UK, September 23-27 1993, the following questions were identified as being of particular importance to investigation of the 4-D architecture of the oceanic lithosphere:

- What is the structure of the 3-D magma conduit system?
- What effect does hydrothermal circulation have on the 4-D architecture of the oceanic lithosphere?
- How is extension accommodated within a spreading segment and across non-transform discontinuities?
- How is mantle upwelling related to accretion and deformation?
- What are the fundamental causes of segmentation? (magmatic vs. tectonic)
- What controls temporal variability of spreading segments?

The objectives of this follow-up workshop are, using the criteria and approaches developed in the Segmentation and Fluxes Workshops, further organise international co-operation, to choose a site or sites and design a suite of observational/sampling experiments in parallel with theoretical/modelling experiments which will be programmed into a 5 year integrated investigation of the 4-D architecture of the oceanic lithosphere.

For dates, location and further information concerning this workshop, please contact:
InterRidge Office, Department of Geological Sciences, South Road, Durham, DH1 3LE UK
tel: 44-(0)91-374-2532 fax: 44-(0)91-374-2510 e-mail: intridge@durham.ac.uk

REQUEST FOR PROPOSALS FOR 1995
Hawai'i Undersea Research Laboratory

The Hawai'i Undersea Research Laboratory invites proposals for scientific studies in the vicinity of the Hawaiian Islands, Johnston Island and the Western Pacific in 1995, using HURL's submersible PISCES V, the ROV RCV-150, the deep-towed fiber-optic TV sled, and other equipment carried on the submersible mothership R/V KA'IMIKAI-O-KANALOA.

Details, including instructions for preparation of pre-proposals, are contained in a RFP which will be accessible on the InterRidge Internet Gofer in the third week of April. Further enquiries to paula@iniki.soest.hwaii.edu.

The GEBCO Digital Atlas: General Bathymetric Chart of the Oceans Now Available on CD-ROM

A CD-ROM of the GEBCO Digital Atlas (GDA) has recently been published by BODC on behalf of the Intergovernmental Oceanographic Commission (IOC) of UNESCO and the International Hydrographic Organisation (IHO). Funding for the work was provided by NERC's Marine and Atmospheric Sciences Directorate.

Contents of the CD-ROM

- Bathymetric contours, coastlines and trackline control from the GEBCO Fifth Edition published at a scale of 1:10 million.
- Bathymetric contours and coastlines from the First Edition of the International Bathymetric Chart of the Mediterranean published at a scale of 1:1 million.
- A set of digital global coastlines, based on the US Defence Mapping Agency's World Vector Shoreline, as a range of scales from 1:43 million to 1:250,000.
- A trackline inventory of the digital echo-sounding data held at the IHO Data Centre for Digital Bathymetry as of December 1993.
- A digital set of geographically referenced feature names including the IHO/IOC Gazetteer of Geographical Names of Undersea Features and specially prepared list of oceanic islands.
- A digital version of the Third Edition of the Echo-sounding Correction Tables.

To Run the Digital Atlas You Will Need:

An IBM PC (or compatible) with a VGA colour display, a CD-ROM drive, a 3.5" floppy disk drive and a hard disk with at least one Megabyte of free space in which to install and run the software. The software is designed to run under DOS 3.0 or later, and requires about 450K of free RAM. A mouse (Microsoft compatible) is highly desirable but not essential.

To Obtain Your Copy of the Atlas

The First Release of the GEBCO Digital Atlas is in three parts: a CD-ROM containing the Atlas data sets; a 3.5" floppy disk containing the GDA Software Interface; and an extensive Supporting Volume describing the activities of GEBCO and including a User Guide to the GDA Software Interface.
The complete package is available at a price of £230, inclusive of postage and packing. A special discount price of £99 is available to educational and academic establishments and to those organisations routinely supplying their echo-sounding data to the IHO Data Centre for Digital Bathymetry. To obtain your copy, please send a cheque with order to:

GEBCO Orders
British Oceanographic Data Centre
Proudman Oceanographic Laboratory
Bidston Observatory Birkenhead,
Merseyside, L43 7RA, United Kingdom
(fax: 44-51-652-3950)

Cheques should be in pounds sterling (clear of bank charges) and made payable to the Natural Environmental Research Council.

The Oceanography Society
Pacific Basin Meeting

Honolulu, Hawaii
July 19-22, 1994

The Oceanography Society announces its 1994 Pacific Basin Meeting. The purpose of this meeting is to provide an international science and policy forum for major international Global Change programs occurring in the Pacific Basin. The Programs to be highlighted at this meeting are: JGOFS, WOCE, TOGA/TOGA COARE and RIDGE/ODP. Major talks will link the inherently interdisciplinary science and policy benefits of the programs.

Seafloor Mapping in the West and Southwest Pacific

Results and Applications

Lifou-Noumea, New Caledonia
4-9 November 1994

Jean-Marie Auzande, Chairman
IFREMER-ORSTOM, New Caledonia
e-mail: auzende@noumia.orstom.fr

The workshop will focus on the results and applications of the Seafloor mapping surveys carried out with all existing modern swath mapping systems. The major part of the workshop will be devoted to the morphological and geological studies but biological applications and data acquisition and processing will also be considered.

Topics:

1. Overview of the W and SW Pacific from Altimetric Data
2. Data Acquisition and Processing
3. Continental Margins: Structure Vertical Evolution and Deformation
4. Back-Arc Basins: Accretion and Geodynamics
5. Subduction-Collision Zones: Deformation and Vertical Evolution
6. Use of Swath-Mapping for Biology and Physical Oceanograph
7. Economical Potentials: Mineral and Biological Resources

Announcing the Publication of
Economic Geology Special Issue
(vol. 88, no. 8)
December 1993

Sea-Floor Hydrothermal Mineralization: New Perspectives

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Active Processes ☐ **Biological Studies** ☐

Global ☐ **Meso-Scale** ☐

Name of your national ridge-crest research organisation:

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Herzig, Hanningtom, Fouquet, von Stackelberg and Petersen

Geology and Mineralogy of Massive Sulfide Ores from the Central Okinawa Trough, Japan
Halbach, Pracejus and Märten

SCIENTIFIC COMMUNICATIONS

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InterRidge Internet Gopher.

Bulletins, workshop reports, announcements and information about upcoming InterRidge Workshops and meetings will soon be available via an Internet Gopher.

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