Floating University Facility

Training-through-Research Programme

Summary of activities of the
UNESCO-MSU Research & Training Centre and the
UNESCO Chair for Marine Geology & Geophysics

Intergovernmental Oceanographic Commission

Annual Report, 2002

Activities described in the present Report represent part of the international 'Training-through-Research' (TTR) programme and its 'Floating University' facility. The Report refers mostly but not exclusively to the activities executed in 2002 by, or with the participation of, researchers and students from the UNESCO-MSU Centre in Marine Geology and Geophysics and the UNESCO Chair in Marine Geosciences. Most of the TTR activities are inter-linked and inter-dependent. Given the international co-operative nature of the TTR programme, this document reports in fact on projects jointly executed by many partners. The equally important role of all co-operating parties from many countries in the implementation of the TTR programme is fully recognized and highly appreciated.

TTR (Floating University) is registered by the Union of International Associations (www. uia.org) under #F3418 (see the Yearbook of International Organizations Guide for Global Civil Society Networks and http://db.uia.org/scripts/sweb.dll/uiaf?DD=OR&DR=F3418).

TTR web site: http://www.ioc.unesco.org/ttr

Contributors: S. Agibalov, G. Akhmanov, A. Akhmetzhanov, I. Belenkaia, V. Blinova, S. Bouriak, J.-P. Henriet, M. Ivanov, L. Pinheiro, A. Sautkin, S. Shkarinov, A. Stadnitskaia, A. Volkonskaia

Editors: P. Bernal (Intergovernmental Oceanographic Commission of UNESCO)
A. Suzyumov (UNESCO)
V. Trofimov (Moscow State University)

Photo credits: E. Kozlova, P. Shashkin

TTR Co-ordinator: Dr. Neil Kenyon
Challenger Division,
Southampton Oceanography Centre,
Empress Dock,
Southampton SO14 3ZH,
United Kingdom
Tel. +44 1 703 596570/55
Fax +44 1 703 596554
E-mail: NHK@SOC.SOTON.AC.UK

UNESCO Chairholder: Prof. Michael Ivanov
Director,
UNESCO-MSU Centre for Marine Geology and Geophysics,
Geology Faculty, Moscow State University,
Moscow 119899,
Russian Federation
Tel. +7095 939 3022
Tel/fax +7095 939 4917
E-mail: FU@GEOL.MSU.RU

Cover design: Andrey Akhmetzhanov

Published in 2003 by the United Nations Educational,
Scientific and Cultural Organization
7, place de Fontenoy, 75352 Paris 07 SP France

Printed in the UNESCO's workshops

(SC-2003/WS/12)

Table of contents

TRAINING-THROUGH-RESEARCH PROGRAMME

SUMMARY

The Training-through-Research (TTR) programme employs an innovative concept that directly interlinks two major components: science and education. TTR provides a dual but complementary function: (i) shipboard training of young scientists (including advanced students) specializing in ocean geosciences and (ii) research, providing for the advancement of general scientific knowledge concerning the sea-bottom processes, structure and geological history. After each cruise, the participants start analyzing the new data obtained – in their respective universities as well as by way of exchanges. Thus, onboard training has an ongoing impact in research laboratories.

Launched in 1991 and carried out during recent years under Intergovernmental Oceanographic Commission's (IOC) crosscutting TEMA (Training, Education and Mutual Assistance) in marine sciences programme, TTR's research component has now become part of the new IOC Ocean Science Programme.

TTR has undertaken pioneering studies of gas hydrates – a potential energy source of the future – and underwater mud volcanism, diapirism and related phenomena of mass input from the geosphere into hydrosphere and biosphere, in the Mediterranean-Black Sea Region and on the Atlantic European Margin. The programme was among the first to investigate in detail giant carbonate mounds on continental slopes and has contributed substantively to studies of yet poorly known ecosystems of deep-water coral 'reefs'. This work leads to the establishment of deep-water protected areas with the aim of safeguarding the world's natural heritage. It also contributes to studies of neotectonics of continental margins, as well as of deep-sea sedimentary depositional systems and their processes of formation on continental margins.

The above-mentioned studies have been carried out through international networking, which forms the backbone of TTR.

MANAGEMENT AND FUNDING

The Executive Committee manages the TTR programme. It meets twice a year to discuss the programme's operations, results and to plan for future activities, including setting targets for the TTR cruises. Dr. Neil Kenyon (Southampton Oceanography Centre, UK) is the programme's Coordinator. IOC provides the programme's secretariat and assists at various stages.

Co-funding is the basis of the programme's underlying successes. Field operations have been financed by national funding sources of participating countries, as well as by European research projects: thus funds available to the programme are always targeted towards investigating particular underwater features or phenomena that are of specific interest to various research groups. Funds for offshore operations have also come from oil companies and national geological surveys with a direct interest in research results from particular geographical areas. A small but indispensable contribution comes from the IOC. These funds enable TTR not only to survey targets selected by the Executive Committee, but also to organize training and to involve students in research, thus providing a platform for sharing know-how between many countries. As funds for international travel of the participants in the TTR cruises are normally raised from national sources, the above arrangements limit the flexibility of TTR to invite a sufficient number of participants from countries that are not directly concerned with specific research targets.

ACCOUNT OF TTR ACTIVITIES

Between 1991 and 2002, twelve ocean-going cruises and ten research conferences were organized within the TTR programme. The TTR conferences are of particular value to students and scientists involved in the programme as they enable participants to present and discuss results of studies. It is also an opportunity to present the results obtained during the cruise to the international scientific community within the space of just a few months, and also to facilitate co-

ordination with other relevant national or international research initiatives. In addition, TTR presents an opportunity for long-term and short-term exchanges of students and researchers, mostly through bilateral arrangements.

The TTR research results have been reported in more than fifty peer-reviewed publications, including special issues of international journals such as *Geomarine Letters* (1998) and two special issues of *Marine Geology* (one published in 1996 and another to appear in early 2003), as well as in several hundred other types of publications (UNESCO and IOC reports, abstracts of papers presented at international meetings, etc.). In 2002, over forty research papers were prepared on subjects relating to TTR investigations. The TTR web site summarizes the results (http://www.ioc.unesco.org/ttr).

TOWARDS THE GEOSPHERE-BIOSPHERE COUPLING PROGRAMME

For over ten years, TTR has concentrated its research on, *inter alia*, focused fluid and gas discharge from the seafloor into the hydrosphere, the composition of organic matter and hydrocarbon gases trapped in sediments and carbonate crusts associated with fluid seeps on the sea floor, as well as microbial activity and its relation with focused fluid inflow. These studies seek to define probable sources of such fluids as well as to gain a better understanding of the interaction between deep-formed hydrocarbons and subsurface sediments, which leads to diagenetic changes, gas hydrate accumulation and the formation of deep-water specific environments and ecosystems. Fluids discharging from the geosphere contribute to the global carbon cycle, as well as to climate change. TTR has organized a number of international meetings devoted to the above problems, for example 'Gas and Fluids in Marine Sediments' (1997), 'Geosphere-Biosphere Coupling' (1998) and 'Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges' (2002); these subjects have also been discussed at other annual TTR conferences.

At the 21st Session of the IOC Assembly (2001) and the 35th Session of the IOC Executive Council (2002), guest lectures were given on TTR research related to coupling processes between the geosphere, hydrosphere and biosphere. It is on the basis of the TTR research results that IOC, after restructuring its Ocean Sciences Programme, decided to invite TTR to consider becoming a core element for future research programme on Geosphere-Biosphere Coupling.

UNESCO-MSU CENTRE IN 2002

MISSION

Established in 1993 to specifically promote the TTR programme, the UNESCO-MSU Research and Training Centre for Marine Geology and Geophysics is affiliated with the MSU Geology Faculty. It hosts the UNESCO Chair in Marine Geosciences, which was established in 1994. This chair acts as the training 'arm' of the Centre and aims to support research projects of undergraduate and post-graduate students. Within MSU, the Centre ensures the necessary marine science-related training of students.

The scientific and educational activities are based on international co-operative programmes involving universities and research institutions from many countries. In 2002, co-operation was fostered with over twenty institutions from outside Russia in addition to several institutions inside its borders (Annex I).

STRUCTURE AND SERVICES

The Centre is organized into three departments:
(i) Marine Geology and Sedimentology (including Micropaleontology);
(ii) Seismics and Geoacoustics; and
(iii) Geochemistry.

It provides students with various facilities and is supported by the MSU central services, such as libraries, analytical laboratories, Science Park, etc.

FUNDING

The Centre receives most of its funding from extrabudgetary sources. In 2002, funds for research and training were provided, in addition to MSU staff costs, by Russia's Ministries of Natural Resources, Industry, Science and Technologies and also by the Flemish Government, in Belgium, through the bilateral 'Floating University Phase 2' project. Some other countries supported individual activities of the MSU researchers and students, such as the Netherlands (through the MSU-NIOZ Agreement for co-operation), France (through the MSU-University Paris-VI Agreement) and Germany (through various arrangements). This support is sincerely acknowledged.

OPERATION

The Centre is the principal organizer of the TTR cruises: for the TTR-12 international cruise in 2002, as previously, it negotiated with Russia's Ministry of Natural Resources (the ship-owner) all the conditions for the use of the ship R/V *Professor Logachev* including its equipment and technical support staff. It also ensured training of some thirty MSU students and hosted six Ph.D. projects (including two international ones, from Portugal and the UK) within its laboratories at the Geology Faculty and Science Park. In addition to promoting research and training projects, it offers – either directly or through various arrangements – a considerable number of fellowships for research and training abroad to MSU scientists and students.

R/V Professor Logachev, *the TTR 'floating university' ship: most of its heavy geological and geophysical equipment is operated from a specially designed stern*

RESEARCH PROJECTS

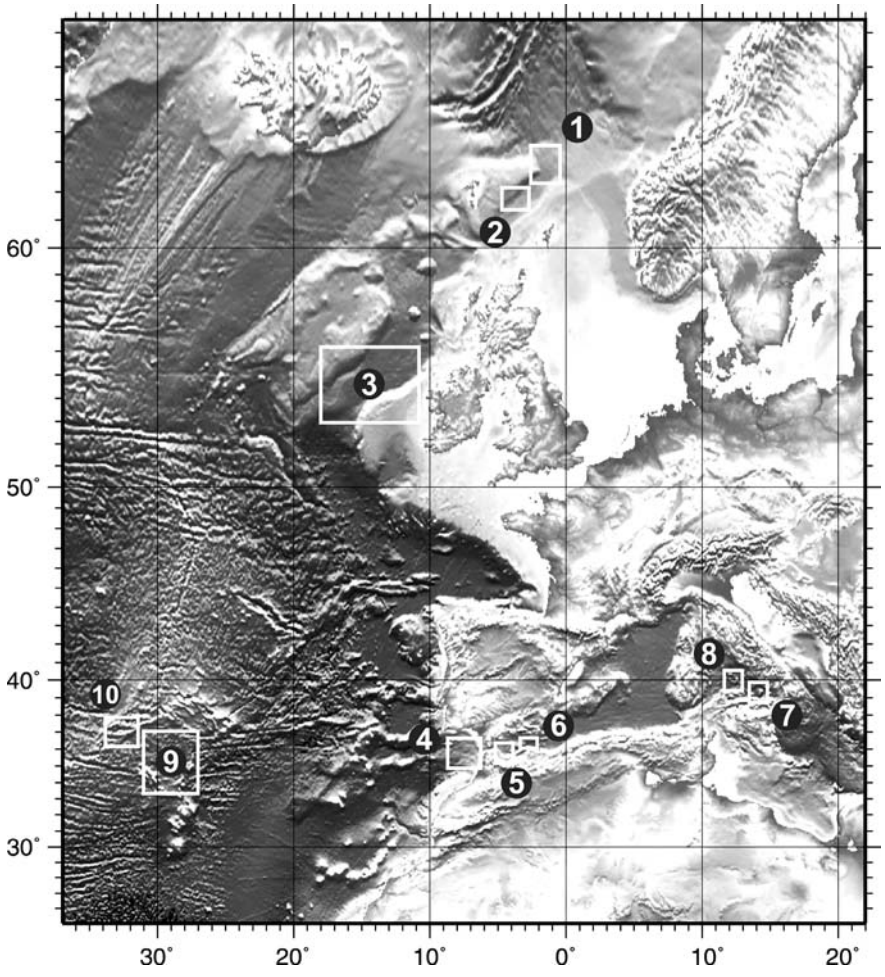
A number of previously reported (for example, in the 2001 Annual Report) research projects were pursued in 2002 at the Centre and a few new ones were launched. They included topics such as:

1. Deep-sea depositional system in the NE Atlantic;
2. Hydrocarbon gas composition in cold vents;
3. Acoustic anomalies in the uppermost section of deep-sea basins;
4. Calibration of sidescan sonar records with sampling data;

5. Digital processing of seismic and acoustic images;
6. Gas hydrates accumulation and related phenomena;
7. Pore water composition from bottom sediments;
8. Carbonate chimneys in the Gulf of Cadiz: distribution, mineralogical and chemical composition;
9. Biomarkers in organic matter of mud volcano deposits;
10. Advanced processing of 3.5 kHz digital record;
11. Authigenic carbonate mineralization due to methane oxidation in anoxic environment;
12. Reconstruction of geology sections through study of the lithology and fossils in mud volcanic deposits;
13. Composition of organic matter in recent sediments and mud volcano breccia;
14. Composition and maturity of organic matter in sedimentary rock clasts of mud volcano breccia.
15. Geosphere-Biosphere coupling processes reflected in the distribution of hemosynthetic communities in areas of cold seeps.

FIELD OPERATIONS

In 2002, the Training-through-Research strategy was applied during the major international TTR-12 cruise that took place on board the R/V *Professor Logachev* (Russia). This cruise's itinerary included the Mediterranean Sea, the North-East Atlantic margin and the Azores region. Students and scientists from MSU also participated in other international cruises, for example aboard the French *Le Nadir* and German *Meteor* research vessels. These cruises have provided additional opportunities for students and young scientists in on-the-job shipboard training and research.



TTR-12 operations (1 to 10 - studied areas)

TTR-12 CRUISE

The TTR-12 cruise was carried out from 9 June to 31 August, departing from St. Petersburg (Russia) and terminating in Ponta Delgada (Azores, Portugal). The first group of non-Russian participants embarked in Kalundborg (Denmark) on 14 June. The cruise was sub-divided into five legs separated by port calls, where partial exchange of the scientific party was made: in Foynes (Ireland) on 2–3 July, in Porto (Portugal) on 6–7 July, in Cadiz (Spain) on 18 July, in Cartagena (Spain) on 28 July and in Civitavecchia (Italy) on 12 August.

The Co-Chief Scientists of the cruise were:
Leg 1: Tove Nielsen and Mikhail Ivanov
Leg 2: Neil Kenyon, Luis Pinheiro and Mikhail Ivanov
Leg 3: Menchu Comas and Mikhail Ivanov
Leg 4: Michael Marani and Mikhail Ivanov
Leg 5: Jose Monteiro and Mikhail Ivanov.

In addition to a group of twenty-one Russian technicians who had been working with the *Logachev* geological and geophysical equipment, an international team of seventy-seven scientists, post- and undergraduate students from the following twelve countries participated: Bangladesh, Belgium, Denmark, Georgia, Ireland, Italy, Morocco, Portugal, Russia, Spain, Sweden and the UK (Annex II).

CRUISE OBJECTIVES

The objectives of the cruise were two-fold: interdisciplinary investigations of geological processes on continental margins of Europe and North Africa as well as students training in marine geoscience research.

N. Kenyon (UK), TTR Co-ordinator and Leg-2 Co-chief Scientist, with M. Rachidi, a post -graduate student from the University of Rabat (Morocco)

T. Nielsen (Denmark), Leg-1 Co-chief Scientist, lecturing on board the Logachev, *TTR-12 cruise*

TV-grab on board the Logachev

The following themes were investigated:

1. Focused fluid escapes and related mud volcanism, gas hydrates, carbonate and sulphide structures, hemosynthetic communities, etc.;
2. Neotectonic and down-slope processes on continental margins;
3. Sand lobes in deep-water sedimentary units;
4. Underwater volcanism, hydrothermal activity and related mineralization;
5. Geosphere-Biosphere coupling processes manifested in specific fauna communities, hemogerms growing and deep-water coral 'reefs'.

EQUIPMENT

Equipment used for conducting the above investigations included a single-channel high-resolution seismic system with airgun sources, an OKEAN long-range sidescan sonar, a hull-mounted 3.5 kHz profiler, a MAK deep-towed

system containing a high- to middle-resolution sidescan sonar and a 5.1 kHz sub-bottom profiler. For more detailed studies, a 6-m gravity corer, a box corer, a kasten corer, a CTD system, an underwater digital TV camera, a TV-controlled grab and a dredge were also used.

PRINCIPAL RESULTS

(provided by the shipboard party)

Area 1: Eastern flank of the Fugloy Ridge at the northern entrance of the Faeroe-Shetland Channel

Seamounts of unknown origin were mapped to a basinward continuation of the Fugloy Ridge (to the east of the Faeroe Islands) using seismic and two types of sidescan sonars and samples were collected. Geophysical records indicated the presence of at least two separated groups of diapirs piercing and – as demonstrated by underwater TV – outcropping at the sea floor. Bottom sampling data suggest that diapirs mainly consist of semi-lithified diatom ooze of the Miocene age with some admixture of glauconite and foraminifera. No evidence of coral settlements or recent fluid venting was reported.

Area 2: GEM Raft at the central Faeroese slope of the Faeroe-Shetland Channel

The raft was first observed on a TOBI sidescan record a few years ago, but other types of investigations had yet to be carried out. The aim was thus to confirm the existence of the GEM Raft and to gain information on its most recent episode of instability. In the study area, a deep-towed sidescan sonar MAK line and bottom sampling were performed. The existence and location of the GEM Raft were confirmed and its morphology was studied. The GEM Raft seemed to consist of an upper part and a lower part separated by a 15 km-wide plateau. The upper part of the raft was found to be the smallest and possibly the youngest. There was no indication that sediments cover the latest slump deposits and this was confirmed by bottom sampling. Buried slump deposits indicated that this upper part was previously prone to instability. The lower part of the raft showed a variety of down-slope processes, for example detached blocks, pressure ridges, slumps and debris flows. This lower part seemed to be covered by a more recent sedimentary layer, and there was no clear indication that bottom processes are still active. This was confirmed by bottom sampling.

Area 3: Rockall Trough

Intensive bottom sampling was performed in the Rockall Trough area. Sampling was mainly related to environmental studies, but with also the objective of calibrating acoustic facies for interpretation of multibeam reflectivity data. Undisturbed sediments from different parts of the area were collected and subsampled for chemical, biological and physical properties investigations. However the depth of penetration of a box corer was not always sufficient for calibration of acoustic signals with a frequency of about 10 kHz.

Area 4: Gulf of Cadiz

In the Gulf of Cadiz, a broad range of investigations were carried out, resulting in the localization in the northern part of the Gulf of a new field of carbonate chimneys, complementary to those discovered by the Anastasia-2000 and TTR-11 cruises. In the central part of the Gulf, two new, active mud volcanoes (named Captain Arutjunov and Tangier) were also studied in detail and heavy hydrocarbon gases and gas hydrates were sampled from this structure. On the Moroccan margin, a detailed study and sampling were performed on a mud volcanic field, which had been discovered earlier in 2002 by the Gent University (Belgium) group during the *Belgica* cruise and was mapped using seismic and multibeam methods. The investigations also led to the mapping and

L. Pinheiro (left, Portugal) with M. Ivanov (Russia), Leg-2 Co-chief Scientists, planning bottom stations

Students describing sedimentary columns

sampling of deep-water coral settlements in different locations, the discovery of exotic blocks of sandstones, igneous and metamorphic rocks on tops of some shallow-water mud volcanoes, and the mapping of the Jil Janesh deep-water sandy system using the 100 kHz side scan sonar and 5.1 kHz profiler.

Area 5: Western Alboran Sea

Four new mud volcanoes and large fields of pockmarks were found in the Western Alboran Sea. Two mud volcanoes named Kalinin and Perejill were located in the Spanish part of the basin. Both structures are covered with relatively thick hemipelagic sediments and they appear dormant at present. Samples of hydrocarbon gas and clasts of ancient rocks in mud volcanic breccia were collected and will probably be of value in defining the source formation of these two volcanoes.

Area 6: Eastern Alboran Sea

Investigations in the Eastern Alboran basin focused mostly on the study of basinward continuation of the Almeria turbidite system. Its upper part was mapped ten years ago with the deep-towed sidescan sonar MAK-1M during the TTR-2 cruise. Mapping of the distal part of the system was carried out with the same instrument and revealed a very complex structure consisting of overlapping channels and sedimentary lobes.

M. Marani (centre, Italy), Leg-4 Co-chief Scientist, preparing geological equipment with E. Poludetkina (left) and G. Akhmanov (Russia)

Areas 7 and 8: Tyrrhenian Sea

In the Tyrrhenian Sea, the morphology and volcano-tectonic processes at the three biggest submarine volcanos, Marsili, Palinuro and Vavilov were studied. Mapping of the northern side of the Marsili volcano with the deep-towed sidescan sonar yielded significant information regarding its morphology and recent activity. Many small-scale features corresponding to recent activity of the volcano could be seen on acoustic records. Several areas of low-temperature hydrothermal activities were observed at the summits of the Marsili and Palinuro volcanoes using an underwater TV system.

J. Monteiro (left, Portugal) at the Leg-5 planning meeting on board the Logachev

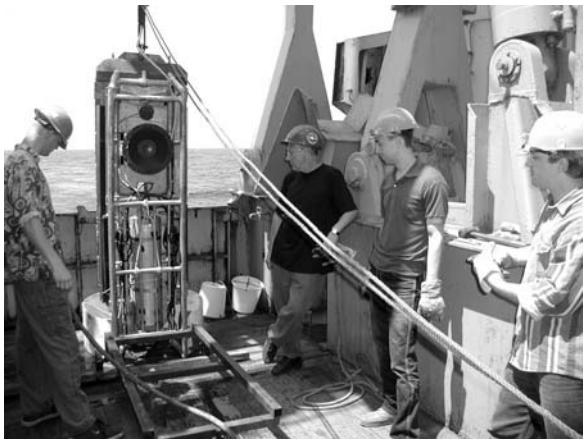
Areas 9 and 10: Sedimentary basin to the south of the Azores plateau and the Lucky Strike field

A long seismic line was performed with two 3-litre airguns across a young sedimentary basin, which is located to the south of the Azores plateau. Seismic records demonstrated a surprisingly thick (more than 1 km) sedimentary cover. TV observations and sampling of different types of igneous rocks in the Lucky Strike segment were also carried out.

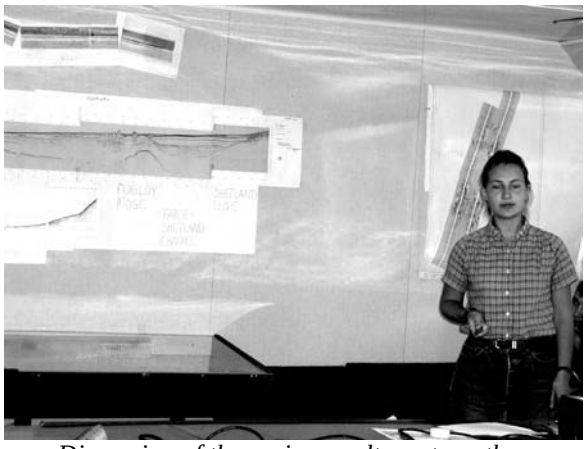
FOCUS ON EDUCATION

UNESCO CHAIR IN MARINE GEOLOGY AND GEOPHYSICS

The UNESCO Chair in Marine Geology and Geophysics (established at the Geology Faculty, MSU in 1994) continues to function as part of the UNESCO-MSU Centre for Marine Geosciences, providing educational support for its research projects. As was previously the case, particular attention was paid in 2002 to supervision of undergraduate, M.Sc. and Ph.D. projects based on data collected during the TTR expeditions. An important component of the Chair's activities was also the group training given to students selected for the participation in the TTR-12 cruise. Lectures and seminars, given on board the 'Floating University' by an international group of professional researchers (Annex III), contributed substantively to the overall success of the training programme.



Training in equipment handling



Discussion of the cruise results: yet another important aspect of students' training

Following a number of exchanges, such as the end-January visit of Prof. Dr. C. Dullo (Germany) to the Centre, a bilateral agreement was signed in March 2002 between the UNESCO Chair in Marine Geology and Coastal Management at the University of Kiel, Germany and the UNESCO Chair in Marine Geology and Geophysics, MSU. Both Prof. M. Ivanov and Prof. C. Dullo attended the World Forum of UNESCO Chairs (13–15 November, UNESCO, Paris) in their capacity as Chairholders. M. Ivanov also attended the pre-Forum meeting of the UNESCO/IOC Chairholders (12 November).

Other details of activities of the UNESCO Chair which represent an integral part of the Centre's operations, are given in the previous and following chapters of the present Report.

MSU CO-OPERATION IN RESEARCH AND TRAINING WITHIN TTR

International networking within TTR resulted, *inter alia*, in 2002 in over forty publications with the involvement of researchers and students of the UNESCO-MSU Centre (Annex IV). A sample of bilateral activities within TTR is given below.

... WITH BELGIUM

Collaboration between MSU and universities in Belgium, beginning in 1997 with the signature of a co-operation agreement between MSU and the University of Ghent, has continued to enjoy success. The second phase of the project entitled 'Floating University', supported by the Department of Education of the Ministry of the Flemish Community, was carried out between Ghent University and the Catholic University of Leuven, on one side, and MSU, on the other. The project aimed to produce, under the supervision of Prof. J. P. Henriet (Ghent University), a practical handbook on geological and ecological surveying in areas of exploration of natural resources.

The resulting handbook is designed as an interactive CD-ROM package. The first part (2000) is entitled 'Gas and fluids in marine sediments and related phenomena'. The second part was realized in 2002 by a MSU scientist, S. Shkarinov, with the assistance of a Ph.D. student, S. Vandendriessche (Ghent University). It focuses on cold-water coral ecosystems and ecological sampling techniques. Frequently-used methods in the study of biodiversity and community structure are briefly introduced and clarified with examples. Then the user can apply these methods in the exercises given at the end of each chapter. All the exercises are based on photographs and video footage collected in cold-water coral reefs off Norway and Ireland and provided by the Norwegian oil company STATOIL and the French Institute for Exploitation of the Sea (IFREMER). The handbook will be issued in 2003.

One lecturer and three students from Ghent University participated in the TTR-12 cruise. The University was instrumental in both obtaining work permits for the expedition to the Exclusive Economic Zone of Morocco and enabling the participation in the cruise of two Moroccan specialists.

In June 2002, Prof. Henriet presented to the 35th Session of the IOC Executive Council a guest lecture on the excellent results obtained during the R/V *Belgica* (Belgium) cruise to the Gulf of Cadiz (2002), where a new field of giant mud volcanoes and carbonate mounds was discovered. Comparing these results (used the same year to target the TTR-12 cruise) with those of previous TTR cruises, he convinced the Council of the importance of international co-operation in studies of the geosphere-biosphere coupling processes for a better understanding of the geosphere input to deep-water ecosystem functioning and climate change.

Five presentations made by researchers and students from Belgium at the 'Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges' International Conference and Tenth TTR Post-Cruise Meeting (30 January-2 February, Aveiro, Portugal) were mostly based on data obtained during the TTR cruises, thus fostering the established collaboration with MSU and other research groups within TTR.

... WITH FRANCE

A long-term collaboration between MSU and the University Paris-VI and specifically the Geosciences-Azur (Villefranche/Mer) group commenced in 1991. Within this framework, Sergey Shkarinov, a young researcher from MSU, took part in the French research expedition on board the R/V *Le Nadir*, 25 June–15 July. The cruise recorded a series of regional profiles, based on the use of a modern digital Multichannel Seismic Reflection system (including an array of 12 air guns, a 360 channels, 4.5 km long, digital streamer, and a Sercel acquisition laboratory) operated by IFREMER-Genavir. S. Shkarinov was involved in pre-processing the data using the Geovector processing package. The aims of this project, called 'Medisis', are to better investigate and image the deep geological structures of the eastern Mediterranean Sea between its African Mesozoic passive margins to the south and its Northern active margins. The MSU interests in this research lie in both training in the modern technique used by the French researchers, and in fostering earlier TTR investigations (1993, 1995–1996) of the Mediterranean Ridge.

Results of joint research projects with the French scientists were presented at the 'Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges' International Conference and Tenth TTR Post-Cruise Meeting (30 January–2 February, Aveiro, Portugal). E. Kozlova presented on this occasion the results of studies (co-authored with C. Largeau, S. Derenne and F. Baudin) on 'Biomarkers of possible source rocks for hydrocarbons in cold vents of the gulf of Cadiz'. Her Ph.D. project is scheduled to finish in 2003. The French specialists who supervised her project during 2000–2001 are affiliated with the Laboratoire d'Océanographie Dynamique et de Climatologie, Département de Géologie Sédimentaire (Université Pierre et Marie Curie, Paris) and Laboratoire de Chimie Bioorganique et Organique Physique (ENSCP, France).

Dr. M. Sibuet (IFREMER, Centre de Brest, Département Environnement Profond) presented at this conference the most recent results of the IFREMER studies in a guest lecture entitled 'Peculiar benthic ecosystems of continental margins and recent discoveries: major ecological patterns of methane seeps and coral communities from submersible observations' – a subject of direct relevance to TTR activities.

... WITH GERMANY

As a result of fruitful exchanges between the Federal Ministry of Education, Scientific Research and Technology (BMBF), Germany, and the UNESCO-MSU Centre (reported in the 'Floating University Facility' Annual Report for 2001), co-operation began in 2002 with a number of German research institutions. Prof. Dr. M. Ivanov, a post-graduate student, V. Blinova, and a Ph.D. student, A. Volkonskaya, participated in the M52/1 MARGASCH cruise of the R/V *Meteor* in January 2002. The cruise focused on investigating environmental conditions required for the formation of gas hydrates in the central Black Sea and in the Sorokin Trough southeast of the Crimea peninsula. The studies brought together an international group of scientists from French, German, Russian and Ukrainian institutions. The research included high-resolution geoacoustic investigations of the seafloor and subbottom using a wide range of frequencies and techniques, video mapping of the seafloor, analysis of the water column, and sampling of gas hydrates in order to determine the detailed distribution and the amount of gas hydrates in a selected area (Sevastopol mud volcano). An additional objective was the study of the relationship between gas migration through the sediments and gas fluxes. The latter affect the bottom environment over considerable distances. The cruise and the research programme were planned, co-ordinated and carried out by the GEOMAR Research Center for Marine Geosciences at the Christian-Albrechts University of Kiel. The project was financed by the Deutsche Forschungsgemeinschaft (German community of research, DFG).

For the follow-up to the cruise, Anna Volkonskaya visited GEOMAR between 2 April–20 November. Under the supervision of Professor J. Bialas, she processed and interpreted the OBS/H data collected during the *Meteor* cruise. Her work consisted mainly of analyzing the high-resolution investigations carried out across the Kazakov and Odessa mud volcanoes in order to resolve not only the trace of conduit, but also to study physical parameters of the surrounding sediments.

R/V Meteor *in the Black Sea*

Sergey Agibalov, an MSU post-graduate student, visited the Department of Geoscience, University of Bremen, from 3 October to 20 December for processing high-resolution seismic data from the Central part of the Black Sea and getting experience in 3D seismic exploration. Under the supervision of Prof. V. Spiess and Dr. S. Krastel, he processed seismic data collected during the *Meteor* cruise.

M. Ivanov participated in the Terra Nostra Conference on 'Climate Drivers of the North' (8–11 May, Kiel) with a talk on 'Hydrocarbon gases and gas hydrates in the mud volcanic deposits of the Black Sea, their composition and possible sources of formation'.

The Max-Planck Institute for Marine Microbiology (Bremen) supported the participation of I. Belenkaia (MSU) and A. Stadnitskaia (MSU and NIOZ) in the Workshop on methane fluxes (Bremen, 11 December) organized within the European project on 'Methane Fluxes in Ocean Margin Sediments: Microbiological and Geochemical Control'.

Later in the year, M. Ivanov, P. Shashkin, V. Blinova and S. Agibalov participated in the M56 MARGASCH cruise of the R/V *Meteor* (December 2002). The cruise and the research program were planned, co-ordinated and carried out by Bremen University. The M56 cruise was partly based on results obtained during the preceding cruise, which provided specific information about fluid migration, venting and near-surface gas hydrate formation within an active venting area north of the Congo canyon near 5°S. The main goals of the M56 cruise included the characterization of structural anomalies within the gas hydrate zone and below it using reflection and refraction seismic methods at high and very high resolutions, identification of first order changes of sediments' physical properties along transects across structural anomalies, integration of seismic and geological information, and quantification or modeling of fluid flow on the basis of various data, such as gas hydrate volume and the nature of the related structural anomalies. Geological, geochemical and biological evidences of focused venting and formation of gas hydrates were found.

...WITH THE NETHERLANDS

In 2002, the Royal Netherlands Institute for Sea Research (NIOZ) continued providing TTR with indispensable administrative assistance, including financial co-ordination from donors inputs for the TTR-12 cruise. This support is highly appreciated by all those involved in TTR.

In line with the established collaboration with NIOZ, A. Stadnitskaia, a former MSU student, pursued her work at this institution under the supervision of Dr. J. S. Sinninghe Damsté and Prof. Dr. T. C. E. van Weering, and concluded a series of laboratory studies on specific biomarkers from sediments and carbonate crusts related to the modern cold vents (mud volcanoes) in the NE Black Sea. In June 2002, she was awarded a Huygens grant from Nuffic (Netherlands organization for international co-operation in higher education) for the academic year 2002– 2003, which enabled her to continue her studies. She submitted a research article on 'Novel archaeal macrocyclic diether core membrane lipids in a methane-derived carbonate crust from a mud volcano in the Sorokin Trough, NE Black Sea' to *Archaea*, an international microbiological journal (to be published in early 2003). This work is co-authored with Marianne Baas, Michael K. Ivanov, Tjeerd C. E. van Weering and Jaap S. Sinninghe Damsté. She also attended the European workshop on 'Methane fluxes in ocean margin sediments: microbiological and geochemical control' (Max Planck Institute for Marine Microbiology, Bremen, Germany) where she presented her recent results on 'Hydrocarbon gases and lipids from sediments related to submarine fluid discharge, the Sorokin Trough, NE Black Sea'.

...WITH PORTUGAL

The Portuguese involvement with the TTR programme was initiated in 1998 with the participation of a group of researchers from the Marine Geology Department of the Geological and Mining Institute (IGM/DGM), Lisbon, in studies of sedimentation patterns off West Iberia. Every year since then, due to the support of the Portuguese Foundation for Science and Technology (INGMAR Project of IGM/DGM) and the University of Aveiro (in 2001), Portuguese scientists, young researchers and students from IGM/DGM and the University of Aveiro have participated in the TTR cruises (TTR-8 through TTR-12). Students and researchers from other Portuguese Universities (University of Lisbon, University of Porto) have also been invited and joined the cruises or – as in the case of the University of Algarve – participated in TTR data processing.

The main scientific objectives upon which this collaboration focused were: (1) to study the deep-sea sedimentation and active tectonic processes off West and South Iberia; (2) to study mud volcanism, gas hydrates and the associated ecosystems in the Gulf of Cadiz; (3) to investigate the geology, magmatism, chemosynthetic communities and the occurrence of massive sulphides in the Mid Atlantic Ridge, near the Azores (Lucky Strike segment) and (4) to investigate the occurrence of polymetallic crusts in the Madeira EEZ.

In January–February 2002, the University of Aveiro, together with the Geological and Mining Institute, and with the support from the Portuguese National Committee for IOC, organized and hosted the International Conference on the 'Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges'. This conference focused on the latest developments in multidisciplinary research on complex processes of matter transformation and interactions on the world continental margins and in the deep ocean. In his welcoming address to the participants, Prof. M. Ruivo, Chairman of the IOC National Committee, indicated that 'co-operation with scientists and students from Moscow State University… as well as from many other European and American academic and research institutions, fostered by the TTR programme, has been of great value for the progress of marine sciences in Portugal'[1].

Indeed, out of thirteen papers presented at the Conference by Portuguese specialists, four have been co-authored with the MSU researchers and the majority of others prepared in co-operation with scientists from Belgium, Spain, the UK and USA.

As the result of the mutually beneficial collaboration established between Portuguese and Russian scientists within TTR, Dr. Serguei Bouriak (MSU) obtained a post-doctoral position in June 2002 at the Geological and Mining Institute, Portugal, funded by the Portuguese Foundation for Science and Technology. This position deals with processing of marine reflection seismic data and geophysical software development and is supervised by Prof.

[1] IOC Workshop Report No. 183, UNESCO, 2002

Luis Menezes Pinheiro (University of Aveiro). The interchange of Ph.D. students over short periods, with the aim of carrying out research work in laboratories from the two countries, has enabled Anna Volkonskaya to visit IGM/DGM and the University of Aveiro, and Vitor Magalhães to visit Moscow State University. One PhD thesis (Vitor Magalhães, IGM/ University of Aveiro) is currently being co-supervised by scientists from the two countries (Michael Ivanov and Luis Menezes Pinheiro).

The TTR-12 cruise continued investigating areas of high importance for Portugal, such as the Gulf of Cadiz and the Azores region. Altogether, seventeen scientists and students from Portugal participated in its legs 2 (Co-chief Scientist Prof. L. Pinheiro) and 5 (Co-chief Scientist Dr. J. Monteiro). Portugal contributed towards the financial support of TTR-12 with regards to its objectives in the Gulf of Cadiz and the Azores region.

... WITH SPAIN

Co-operation with Spanish institutions was pursued at different levels. Research groups from the Institute of Marine Sciences (Barcelona) and the University of Granada participated in the TTR-12 cruise and the definition of its aims. Spain contributed towards the financial support of TTR-12 with regards to its training and research programme in the Western Mediterranean. Co-operation with the Geological Survey of Spain resulted in the drafting of a few research articles on the recently discovered fields of carbonate chimneys in the Gulf of Cadiz.

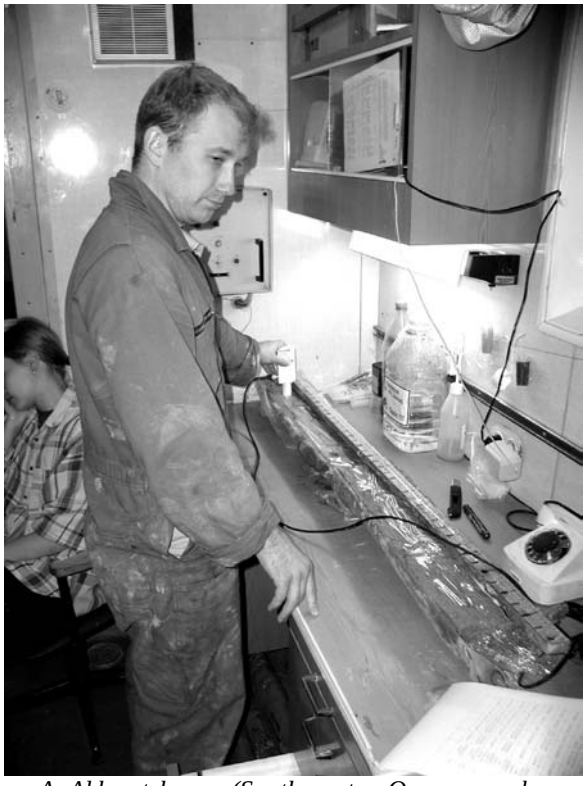
In March 2002, an MSU Ph.D. student, A. Sautkin, successfully concluded his studies at the Instituto Andaluz de Ciencias de la Tierra (University of Granada). This research visit was funded by a fellowship granted by the President of the Russian Federation to the best Russian students. His investigations were carried out within the Department of Geodynamics under the supervision of Prof. Maria Carmen Comas Minondo. The main goal of his studies was to determine sources and origin of mud volcanic deposits in the Alboran Sea. A. Sautkin later pursued these investigations at MSU. His Ph.D. project is scheduled to be completed in May 2003.

... WITH THE UNITED KINGDOM

Dr. Neil Kenyon's (Southampton Oceanography Centre, SOC) efficient co-ordination of the TTR programme continues to represent a major contribution towards the success of this international endeavour. His leading role in international training and in formulating the TTR research goals, data collection and interpretation is highly appreciated. He also participated in setting the targets of the TTR-12 cruise and was a Co-chief Scientist of its leg 2, which he attended together with former MSU student A. Akhmetzhanov (now with SOC). The latter, under the supervision of Dr. N. Kenyon and Prof. M. Ivanov, is finalizing his Ph.D. project.

Adriano Mazzini (University of Aberdeen) visited MSU for one week in October 2002. The purpose of this visit was to discuss his TTR-related research results and to prepare joint publication on diagenetic carbonate nodules and crusts collected during the TTR-11 cruise in 2001 in the Black Sea.

At the 'Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean



A. Akhmetzhanov (Southampton Oceanography Centre) making measurements of magnetic susceptibility along a sedimentary core, TTR-12 cruise

Ridges' International Conference and tenth TTR Post-Cruise Meeting (30 January-2 February, Aveiro, Portugal) eight research papers – mostly based on the TTR results but also complementary to the TTR studies – were presented, authored or co-authored by specialists from the UK. These were concerned with the problematics of cold seeps on the deep-sea European margins, gas hydrates, sedimentary architecture along the European continental slope and its specific significance as clastic reservoirs for hydrocarbon accumulation, carbonate crusts, tectonics, ecology, etc.

The UK partners came from the University of Southampton and the Southampton Oceanography Centre, the University of Aberdeen, the Dunstalfnage Marine Laboratory (Oban) and the University of Bath.

TTR CONFERENCES AND MEETINGS

ANNUAL CONFERENCE IN AVEIRO[2]

The 'Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges' International Conference and Tenth Training Through Research Post-Cruise Meeting, took place from 30 January to 2 February 2002 in the University of Aveiro (Portugal), and was hosted by the University of Aveiro together with the Portuguese Geological and Mining Institute (IGM, Lisbon). Scientists involved in active research on cold seeps and hydrothermal systems met to promote international collaboration within the framework of a new IOC Programme on Geosphere/Biosphere Coupling Processes.

The meeting brought together over sixty researchers and students from ten countries (Belgium, France, Germany, Italy, Norway, Portugal, Russia, Spain, Turkey, and the UK) with different specialities (sedimentology, geophysics, geochemistry, microbiology, biology, palaeontology, structural geology) and research interests related to the Conference theme. A total of forty oral communications, as well as a number of posters were presented, arranged in thematic sessions that reflect the main research activities of TTR:

- Mud volcanism, diapirism and gas hydrates;
- Deep-sea depositional systems and modern analogues;
- Hydrothermalism and hydrogenous supply of elements to the sea floor;
- Biosphere-geosphere interaction;
- Tectonics.

During the scientific sessions of the Conference the main results of the research carried out during TTR cruises in the Black and Mediterranean Seas, the Gulf of Cadiz and other areas in the North Atlantic were highlighted. The book of abstracts was compiled by the Conference Organizing Committee headed by Prof. L. Pinheiro and Dr. M. Cunha (University of Aveiro), and was published later in the year by IOC as the Workshop Report No. 183 (2002).

On the 31st of January, an Open Session with the TTR Executive and Scientific Committee, convened by Prof. J. P. Henriet (Ghent University), was organized to discuss with the participants the launching of the new IOC programme on Geosphere-Biosphere Coupling Processes.

In his message to participants of the Conference, P. Bernal, IOC Executive Secretary, commented on the TTR's sustained efforts over the past years and its recognition throughout the world as a successful international undertaking: the programme has made a considerable contribution to a number of important international research projects and even triggered some of the recent European undertakings, thus improving multi-disciplinary knowledge on processes in the world's oceans. TTR is unique in providing training in core

[2] Extract from the Preface, Message to the participants of the Conference and Welcoming address. IOC Workshop Report No. 183, UNESCO, 2002, p. 1-4.

science at both undergraduate and post-graduate levels and in involving young researchers from many countries in all steps of data collection, interpretation and dissemination of the research findings. He also indicated that the topic selected for the conference in Aveiro was highly relevant to the IOC Ocean Science Programme that had been adopted by the twenty-first session of the Commission's Assembly (2001).

In his welcoming address, M. Ruivo, Chairman of the Portuguese Committee for IOC indicated that the Conference represented an important step forward in the development of the Ocean Science Programme of the Commission. Its theme highlights the latest developments in multidisciplinary research on complex processes of matter transformation and various kinds of interactions on the world continental margins and in the deep ocean.

All the participants expressed great satisfaction with the Conference as having fully accomplished its objectives and facilitated fruitful contacts between the attendees. Prizes for the best student presentations were awarded to Susana Muinos (IGM, Portugal), Olga Kovalenko (MSU, Russia) and Rien Deschamps (University of Ghent, Belgium).

EXECUTIVE COMMITTEE MEETINGS

Two meetings of the TTR Executive Committee (January 2002, Aveiro and November 2002, Paris) worked on planning the TTR-12 cruise and subsequently summarized the results. The November meeting concluded that the TTR-12 cruise met indeed its objectives. Proposals for research targets for the 2003 cruise, which had been submitted by various partners, were also discussed. It was reported that a collection of the TTR-related papers prepared by various authors had finally been accepted by *Marine Geology* (to be published early in 2003).

M. Comas (Spain), TTR-12 Leg 3 Co-chief Scientist and member, TTR-EC presenting the cruise results at a meeting in Paris

Annex I

LIST OF INSTITUTIONS THAT COLLABORATED IN THE EXECUTION OF THE TTR PROGRAMME IN 2002

Belgium
University of Ghent, Ghent
University of Leuven, Leuven

France
University Paris-VI:
Laboratoire de géodynamique sous-marine, Villefranche-sur-mer
Laboratoire de Stratigraphie, Paris

Denmark
Geological Survey of Denmark and Greenland, Copenhagen
University of Copenhagen, Copenhagen

Georgia
Tbilisi State University, Tbilisi

Ireland
Geological Survey of Ireland, Dublin

Germany
Research Center for Marine Geosciences (GEOMAR), Christian-Albrechts University of Kiel, Kiel
University of Bremen, Bremen
Max Planck Institute for Marine Microbiology, Bremen

Italy
Institute for Marine Geology, Bologna

Morocco
Mohammed V University, Rabat
Institute for National Research, Nador

The Netherlands
Royal Netherlands Institute for Sea Research, Den Burg

Portugal
Geological and Mining Institute, Lisbon
University of Aveiro, Aveiro

Russia
Ministry of Natural Resources
Ministry of Industry, Science and Technology
Polar Marine Geophysical Expedition, St. Petersburg
St. Petersburg State University, St. Petersburg
VNIIOkeangeologiya Co., St. Petersburg
NIPIOkeangeofizika, Gelendzhik

Spain
Geological Survey of Spain, Madrid
Instituto Andaluz de Ciencias de la Tierra (C.S.I.C. – Universidad de Granada), Granada
Instituto de Ciencias del Mar de Barcelona, Barcelona

Sweden
University of Göteborg

Switzerland
Commission for Oceanography and Limnology, Geneva

United Kingdom
Southampton Oceanography Centre, Southampton
University of Aberdeen, Aberdeen

Annex II

LIST OF PARTICIPANTS
TTR-12 Cruise
R/V *Professor Logachev*

Bangladesh
Asrarur Rahaman Talukder

Belgium
Pieter Van Rensbergen
Kasper Moureaux
Davy Depreiter
Hendrik Gheerardun

Brazil
Crisogono Vasconcelos

Denmark
Tove Nelson (Co-chief Scientist, Leg 1)
Mette Kruse
Henrik Sulsbruck Moeller

Georgia
Nodar Usupashvili

Italy
Michael Marani
(Co-chief Scientist, Leg 4)
Adriano Mazzini
Fabiano Gamberi
Daniela Penitenti
Alessandro Rivalta
Alessandro Bonazzi
Giulia Amadori
Nico Martinelli
Chiara Consolaro

Ireland
Thomas McKenzie Furey

Morocco
Benyounes Abdellaoui
Merouane Rachidi

Portugal
Luis Menezes Pinheiro
(Co-chief Scientist, Leg 2)
Jose Hipolito Monteiro
(Co-chief Scientist, Leg 5)
Marina Ribeiro da Cunha
Luis Serrano Pinto
Mary Torres
Ines Lampreia
Carlos Fillpe Moura
Sergey Bouriak
Celia Ribeiro
Jose Vicente
Pedro Ferreira
Filipa Marques
Silvia Nave
Cristina Roque
Nelson Ricardo Peralta
Maria do Amaral
Tiago Alves

Russia
Researchers and students:
Mikhail Ivanov
(Co-chief Scientist), MSU
Pasha Shashkin
Sergey Agibalov
Mikhail Osipenko
Alexandra Kostinenkova
Anna Volkonskaya
Igor Kuvaev
Vladimir Tarasov
Igor Uvarov
Ekaterina Spungina
Grigory Akhmanov
Igor Fedorov
Inna Mardanyan
Vladislav Torlov
Alexandr Samoilov
Eugene Sarantsev
Elena Kozlova
Valentina Blinova
Elena Poludetkina
Olga Barvalina
Eugene Bileva
Alexey Sadekov

The Logachev *technical support staff:*
Mikhail Maslov
(chief staff scientist), PMGE
Aleksandr Shagin
Alexandr Machulin
Eugene Samsonov
Nikolay Volkov
Gennady Antipov
Roman Safronov
Sergey Zheleznyak

Alexander Kyrilovich
Dmitry Gagarin
Irina Antipova
Maxim Kuryshkin
Victor Sheremet
Alexander Ayupov
Anatoly Chudinov
Sergey Panteleev
Alexander Plakhotnik
Sergey Lyubimov
Konstantin Plakhotnik
Vladislav Malin
Alexey Ivanov

Spain
Menchu Comas
(Co-chief Scientist, Leg 3)
Ferran Estrada Liacer
Ricardo Leon-Buendia
Maria Jose Jurado Rodriguez
Marta Molinos Solsona
Fermin Fernandez Ibauez
Francisca Martinez-Ruiz
Juan-Ignacio Soto
Francisco J. Rodriguez-Tovar
Francisco J. Jimenez Espejo
Guillermo Marro
Manuel-J. Roman-Alpiste

Sweden
Jenny Levander
Nina Tuomikoski

United Kingdom
Neil Kenyon
(Co-chief Scientist, Leg 2)
Andrey Akhmetzhanov

Annex III

LIST OF SEMINAR PRESENTATIONS
TTR-12 Cruise
R/V *Professor Logachev*

Leg 1

15 June	Tove Nielsen. Targets of the Leg 1 (Faeroe Margin)
16 June	Mette Kruse. Sedimentation around Bill Bailley Bank, SW of the Faeroe Islands
17 June	Henric S. Moller. Modern sedimentation in Kvannersuit Sullvat, a fjord on Disko, West Greenland - a result of a glacier surge
18 June	Inna Mardanyan. Hemipelagic sedimentation and mass-vasting on the NE Faeroe Margin
19 June	Andrey Akhmetzhanov. Strong bottom current in NE Atlantic deep water: seafloor records
20 June	Sergey Agibalov. Attenuation and time-frequency analysis
21 June	Chiara Consolaro. Enhancement of the Northern hemisphere glaciation (middle-late Pliocene): a Mediterranean perspective
23 June	Igor Kuvaev. Processing and interpretation of the 3-D seismic data from the Eastern Rockall Bank area
24 June	Thomy Furey. Mound distribution offshore Ireland. Results of Irish National Seabed Survey
28 June	Anna Volkonskaya. Preliminary results of the OBS/H data processing and interpretation in the Sorokin Trough
30 June	Andrey Akhmetzanov. Giant carbonate mounds on the southern Rockall Trough margin
1 July	Preliminary results of Leg 1

Leg 2

7 July	Meeting of the participants: introduction to the TTR objectives
8 July	Luis Pinheiro, Neil Kenyon and Pieter van Rensbergen. Main targets of Leg 2
9 July	Neil Kenyon and Andrey Akhmetzhanov. Sandlobes in the Gulf of Cadiz: high-resolution architecture of sand reservoirs (part 1)
10 July	Andrey Akhmetzhanov. Sandlobes in the Gulf of Cadiz: high-resolution architecture of sand reservoirs (part 2)
12 July	Grigorii Akhmanov. Benefits of studying mud volcanic deposits: an example from the Eastern Mediterranean
13 July	Crisogono Vasconcelos. Geomicrobiological approach to study sediments and chimneys collected during TTR-12
16 July	Marina Cunha. Faunal communities associated to carbonate chimneys in the Gulf of Cadiz
17 July	Preliminary results of Leg 2

Leg 3

21 July	Menchu Comas. Main objectives and preliminary plans for Leg 3
22 July	Francisca Martinez-Ruiz. Climatic changes during last 20 000 years
24 July	Maria Jose Jurado. Deep wells in the Northern Alboran Sea: some clues on the origin of mud volcanoes
25 July	Asrarur R. Talukder. Mud diapirism evolution and active mud volcanism in the Alboran Sea (Western Mediterranean)
26 July	Juan Ignacio Soto. Recent tectonics in the Northeastern Margin of the Alboran Sea
27 July	Preliminary results of Leg 3

Leg 4

31 July	Michael Marani. Main objectives and preliminary plans for Leg 4
1 August	Michael Marani. Formation of the Tyrrhenian Sea: special emphasis on the Marsili volcano
3 August	Kasper Moureaux. Belgian Phanerozoic evolution in a nutshell
4 August	Fabiano Gamberi. Sedimentary, tectonic and volcanic processes of the base of the Marsili seamount (TTR-4 MAK data)
5 August	Anna Volkonskaya. Preliminary results of the OBS/H data processing and interpretation in the Sorokin Trough
6 August	Alexey Sadekov. Mediterranean sapropels: general overview
7 August	Adriano Mazzini. Hydrocarbon escape from reservoir: implications from cold seeps and injected sands
9 August	Vlad Torlov. Fe-Mn crusts from the seamounts of the NE Atlantic
10 August	Fabiano Gamberi. Depositional systems in and around the Marsili Basin Michael Marani. A few remarks on volcano stability
11 August	Preliminary results of Leg 4

Leg 5

21 August	Jose Monteiro. Main targets and objectives of Leg 5
22 August	Tiago Alves. Insights on TTR-12
25 August	Pedro Ferreira. Geological survey of Lucky Strike, Menez Gwen and Saldanha Filipa Marques. Rainbow hydrothermal field. Brief description of the geology of Menez Gwen

Annex IV

LIST OF PUBLICATIONS
with the involvement of the MSU researchers and students, 2002

Agibalov S.V., Almendinguer A.M.: Application of time-frequency analysis of seismic data to shallow gas study. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 11

Agibalov SV, Almendinguer AM: Posibilities of time-frequency representations for determination of media absorption features. Scientific conference "GEOMODEL 2002". Central Geophysical Expedition, Moscow, Russia 15-16 April, 2002, p. 16 (in Russian).

Akhmanov G.G., Premoli Silva I., Erba E., and Cita M.B. Sedimentary succession and evolution of the Mediterranean Ridge western sector as derived from lithology of mud breccia clasts. *Marine Geology* (in press), 2002.

Akhmetzhanov A.M., Kenyon N.H., Habgood E.L., Gardner J., Ivanov M.K. and Shashkin P.: Sand lobes in the gulf of Cadiz: Towards better understanding of clastic reservoir high resolution architecture. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 23.

Akhmetzhanov, A.M., Kenyon, N.H., Ivanov, M.K. and Cronin, B.T.. The continental rise west of Porcupine Seabight, northeast Atlantic. In: J. Mienert and P. Weaver (Editors), European margin sediment dynamics: Side-scan sonar and seismic images. Springer-Verlag Berlin Heidelberg (in press).

Akhmetzhanov, A.M., Kenyon, N.H., Ivanov, M.K., Wheeler, A.J., Shashkin, P.V. and van Weering, T.C.E.. Giant carbonate mounds and current swept seafloors on the slopes of the southern Rockall Trough. In: J. Mienert and P. Weaver (Editors), European margin sediment dynamics: Side-scan sonar and seismic images. Springer-Verlag Berlin Heidelberg (in press).

Alves T., Bouriak S., Volkonskaya A., Monteiro J., Ivanov M. Surveying the flanks of the Mid-Atlantic Ridge, *EOS* (submitted)

Belenkaia I. Influence of hydrocarbon gases on autigenic mineralization in sediments in areas of cold seeps. *Vestnik moskovskogo universiteta,Geologia*, 2002 (in press) (in Russian)

Blinova V., Stadnitskaia A., I.J.S. Sinninghe Damsté, Bass M, van Weering Tj.: Lipid composition from gas-related sediments and mud volcanic deposits of the Sorokin Through, NE Black Sea. Preliminary results. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 8.

Bohrmann G., Abegg F., Aloisi G., Artemov Y., Bialas J., Broser A., Drews M., Fouchet J-P., Greinert J., Heidersdorf F., Ivanov M., Blinova V., Klaucke I., Krastel S., Leder T., Polikarpov I., Saburova M., Schellig F., Schmale O., Spiess V., Volconskaya A., Weinrebe W., Zillmer M.: Mud volcanoes and gas hydrates in the Black Sea - an important linkage to the methane cycle. In: *Gas hydrate im Geosystem.* Kiel, Germany, 6-7 May, 2002, p. 21-22.

Fernandez-Puga M.C., Somoza L., Pinheiro L.M., Vazquez J.T., Diaz-del-Rio V. and Ivanov M. The Guadalquivir diapiric ridge: deep tectonics and related gas seepage. In: *Geosphere/ Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p.50.

Ivanov, M., Stadnitskaia, A., van Weering, T., Blinova, V., Kozlova, E. Hydrocarbon gases and gas hydrates in the mud volcanic deposits of the deep Black Sea, their composition and possible sources of Formation. – Workshop *Climate Drivers of the North* . Kiel, May 8-11, 2002

Kenyon, N.H., Akhmetzhanov, A., Nielsen, T., Kuipers, A., Ivanov, M. and Shashkin, P. Sandy contourites and pathways of the Norwegian Sea overflow water, west of the Faeroe Bank Channel. In: J. Mienert and P. Weaver (Editors), European margin sediment dynamics: Side-scan sonar and seismic images. Springer-Verlag Berlin Heidelberg (in press).

Kenyon N.H., Akhmetzhanov A.M., Wheeler A.J., van Weering Tj. C. E., de Haas H. and Ivanov M.K. Giant carbonate mud mounds in the southern Rockall Trough, *Marine Geology* (in press).

Kenyon N.H., Ivanov M.K., Akhmetzhanov A.M., and Akhmanov G.G.(Eds): Geological processes in the Mediterranean and Black Seas and North East Atlantic. Preliminary results of investigations during the TTR-11 cruise of RV *Professor Logachev,* July-September 2001. *IOC Technical Series No 62.* UNESCO, 2002.

Kenyon, N.H., Monteiro, J.H., Alves, T., Pinheiro, L., Akhmetzanov, A.M. and Shashkin, P. Reassessment of sedimentary evidence for deep contour currents west of Iberia. In: J. Mienert and P. Weaver (Editors), European margin sediment dynamics: Side-scan sonar and seismic images. Springer-Verlag Berlin Heidelberg (in press).

Kovalenko O. Autigenic mineralization in zones of outflow of hydrocarbon fluids from mud volcanoes of the Black Sea. *Oil and Gas.* 56th interuniversity students' research conference. Moscow, 2002. Abstracts, p.25 (in Russian).

Kovalenko O., Belenkaia I.: Metane-induced precipitation of autigenic carbonates in mud volcano deposits of the Black sea. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 14.

Kozlova E., Largeau C., Derenne S. and Baudin F.: Biomarkers of possible source rocks for hydrocarbons in cold vents of the gulf of Cadiz. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 35.

Kuijpers, A., Troelstra, S., Prins, M., Linthout, K., Akhmetzhanov, A., Bouryak, S., Bachmann, M., Lassen, S., Rasmussen S., and Jensen B. Late Quaternary sedimentary processes and ocean circulation changes at the Southeast Greenland margin, *Marine Geology* (in press).

Kuvaev I.: Geological structure and development of the branching channel system situated on western margin of Ireland according to seismic data. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 22.

Magalhaes V.H., Bobos J., Gaspar L., Pinheiro L.M., Monteiro J.H., Ivanov M.K.: Mineralogy and geochemistry of carbonate chimneys from the gulf of Cadiz: Preliminary results. In: *Geosphere/ Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 18.

Mazurenko L., Soloviov V.A., Belenkaia I., Ivanov M. K. and Pinheiro L.M.: Mud volcano and gas hydrates in the Gulf of Cadiz. *TerraNova,* № 14, 2002, p. 321-329.

Mazurenko L. L., Soloviev V. A., Gardner J. M. and Ivanov M. K. Gas hydrates in the Ginsburg and Yuma mud volcano sediments (Moroccan Margin): results of chemical and isotopic studies of pore water, *Marine Geology* (in press).

McNeill L.C., Mille A., Manshull T., Bull J., Kenyon N.H., Ivanov M.K. Extension of the North Anatolian Fault into the North Aegean Trough: Evidence for transtenstion, strait partitioning and analogues for Sea of Marmara basin models, *Marine Geology* (submitted)

Modin D.: Nature of enigmatic strong reflector on MAK-1M subbottom profiler records from the Black sea. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 12.

Ovsiannikov D., Sadekov A., Kozlova E. Particularities of lithological composition of big clasts from the Yuma mud volcano (Gulf of Cadiz). *Vestnik moskovskogo universiteta, Geologia,* No 26, 2002, pp.25-32 (in Russian).

Pinheiro L.M., Magalhaes V., Fernandez-Puga M.C., Somoza L., Monteiro J.H., Gardner J. and Ivanov M. Structural control of mud volcanism in the Gulf of Cadiz. In: *Geosphere/ Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 49.

Pinheiro L.M., Ivanov M.K., Sautkin A., Akhmanov G., Magalhaes V.H., Volkonskaya A., Monteiro J.H., Somoza L., Gardner J., Hamouni N., Cunha M.R. and the TTR10 Leg 2 Scientific Party: A new mud-volcano field discovered off S. Iberia, in the Gulf of Cadiz: Results from the TTR-10 cruise. *Marine Geology* (in press), 2002.

Poludetkina E., Stadnitskaia A., Blinova V.: Composition and origin of hydrocarbon gases from mud volcanoes of the Black Sea. *Oil and Gas.* 56th interuniversity students' research conference. Moscow, 2002. Abstracts, p.26 (in Russian).

Poludetkina E., Stadnitskaia A., Blinova V.: Composition and origin of hydrocarbon gases from mud volcanoes of the Black Sea. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 7

Prasolov E., Lokhov K., Belenkaia I., Ivanov M., Soloviev V., Blinova V., Mazurenko L. Isotopic composition of carbon and oxygen in areas of underwater mud volcanism. In: *Earth Degasation: geodynamics, geofluids, oil and gas.* International Conference, Moscow, 20-24 May 2002, Abstracts, p. 23 (in Russian)

Prasolov E., Lokhov K., Belenkaia I., Ivanov M., Soloviev V., Blinova V., Mazurenko L. Isotopic composition of carbon and oxygen in carbonate chimneys in areas of underwater outflow of fluids (Gulf of Cadiz, Atlantic Ocean). In: *Earth Degasation: geodynamics, geofluids, oil and gas.* International Conference, Moscow, 20-24 May 2002, Abstracts, p. 32 (in Russian)

Sadekov A.Yu.: Planctonic foraminiferal zonation of a sapropelic bed from the late quaternary sediments of the western Balearic sea. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 41.

Shkarinov S.: Vector visualization of seismic sections. Automation of preliminary seismic interpretation. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 13.

Somoza L., Díaz-del-Río V., León R., Ivanov M., Fernández-Puga M. C., Gardner J. M., Hernández-Molina F. J., Pinheiro L. M., Rodero J., Lobato A. et al. Seabed morphology and hydrocarbon seepage in the Gulf of Cádiz mud volcano area: Acoustic imagery, multibeam and ultra-high resolution seismic data, *Marine Geology* (in press).

Stadnitskaia A., Baas, M., Ivanov, M.K., Weering, T.C.E. van, Sinninghe Damsté, J.S. Novel archaeal macrocyclic diether core membrane lipids in a methane-derived carbonate crust from a mud volcano in the Sorokin Trough, NE Black Sea. *Archaea* 1, 2002 (in press).

Stadnitaskaia A., Sinninghe Damsté J.S., Belenkaia I., Pierre C., Werne J.P., Ivanov M. and van Weering Tj.: Metane-related authigenic carbonate formation: molecular, mineralogical and isotopic evidence.

Mineralogical and isotopic evidence. Gulf of Cadiz, NE Atlantic. In: *Geosphere/Biosphere/*

Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges. Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 18.

Stadnitaskaia A., Werne J.P., Sinninghe Damste J.S., Baas M., Hopmans E.C., Ivanov M. and van Weering T.: Distribution and stable carbon isotopic composition of biomarkers in metane related carbonate crusts. Sorokin through, NE Black sea. Preliminary results. In: *Geosphere/Biosphere/*

Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges. Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 37.

Stepanov A.: Geochemical investigations of the hydrothermal activity products from the lucky strike ore field. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 32.

Terrinha P., Pinheiro L. M., Henriet J. -P., Matias L., Ivanov M. K., Monteiro J. H., Akhmetzhanov A., Volkonskaya A., Cunha T., Shaskin P. and Rovere M. Tsunamigenic-seismogenic structures, neotectonics, sedimentary processes and slope instability on the southwest Portuguese Margin, *Marine Geology* (in press).

Torlov V.: Internal structure and distribution of the elements in the ferromanganese crusts from the nameless seamount. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 30.

Torlov V.: General features of the internal structure and composition of the Ferromanganese deposits from the Nameless Seamount (NE Atlantic). Abstracts book. International Conference “Minerals of the ocean”. VNII “Okeangeologia”, Saint Petersburg, 19-24 April 2002, c. 25

Trofimov V., Glumov I., Ivanov M., Suzyumov A., Karlin L., Akhmanov G., Kozlova E., Plink N., Eremina T., Gogoberidze G., Beliaeva V. Floating University: training-through-research. *Vestnik moskovskogo universiteta, Geologia,* 2002 (in press) (in Russian)

Tyrina N., Belenkaia I.: Pore water chemistry in gas hydrate-bearing mud volcano deposits of the Black sea. In: *Geosphere/Biosphere/Hydrosphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges.* Post-Cruise Meeting and International Conference, Aveiro, Portugal, 30 January - 2 February 2002. IOC Workshop Report No. 183, UNESCO, 2002, p. 9.

Van Rooij D., De Mol B., Huvenne V., Ivanov M. and Henriet J. -P. Seismic evidence of current-controlled sedimentation in the Belgica mound province, upper Porcupine slope, southwest of Ireland, *Marine Geology* (in press).

van Weering, T.C.E., de Haas, H., Akhmetzhanov, A.M. and Kenyon, N.H. Giant carbonate mounds along the Porcupine and SW Rockall Trough Margins. In: J. Mienert and P.E. Weaver (Editors), European margin sediment dynamics: Side-scan sonar and seismic images. Springer-Verlag Berlin Heidelberg (in press).

Wheeler, A.J., Kenyon, N.H., Ivanov, M.K., Cronin, B.T., McDonnell, A., Schenke, H.W., Akhmetzhanov, A.M., Satur, N. and Zaragosi, S. Canyon heads and channel architecture of the Gollum Channel, Porcupine Seabight. In: J. Mienert and P. Weaver (Editors), European margin sediment dynamics: Side-scan sonar and seismic images. Springer-Verlag Berlin Heidelberg (in press).

Woodside J., Mascle J., Zitter T., Limonov A., Ergun M., Volkonskaia A., *et al*. The Florence Rise, the Western Bend of the Cyprus Arc. *Marine Geology*, No. 185, 2002, pp. 177-194

Annex V

LIST OF ACRONYMS

CTD	Conductivity-Temperature-Depth probe
ENSCP	L'Ecole Nationale Supérieure de Chimie de Paris
GEOMAR	Forschungszentrum für marine Geowissenschaften der Christian-Albrechts-Universität zu Kiel (Germany)
IOC	Intergovernmental Oceanographic Commission (UNESCO)
MAK	deep-towed sidescan sonar system
MSU	Moscow State University (Russia)
NIOZ	Netherlands Institute for Sea Research
OBS	ocean bottom seismic stations
OKEAN	long-range sidescan sonar system
RAS	Russian Academy of Science
R/V	Research Vessel
SOC	Southampton Oceanography Centre (U.K.)
TEMA	Training, Education and Mutual Assistance (IOC)
TOBI	sidescan sonar system
TTR	Training-through-Research
TTR-EC	Executive Committee, TTR programme
UNESCO	United Nations Educational, Scientific and Cultural Organization