Annual Report, 2001

Floating University Facility

Training-through-Research Programme

Intergovernmental Oceanographic Commission

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

Intergovernmental Oceanographic Commission

Annual Report, 2001

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 2001 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, its training 'arm'. 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

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(SC-2002/WS/40)

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Training-through-Research Programme (over 10 years in operation)

About TTR:

"Training-through-Research" (TTR) is an innovative concept of direct interlink between the above two sides of science education. The TTR programme provides a dual but complementary function: (a) shipboard training of young scientists (including advanced students) specializing in ocean sciences and (b) providing for the advancement, through research, of general scientific knowledge concerning the sea-bottom processes, structure and history.

It was launched in 1991 under the auspices of UNESCO and the European Science Foundation. As of 1996, it has been executed under the sponsorship of the Intergovernmental Oceanographic Commission of UNESCO.

The recognized flexibility of the TTR programme in selecting the research targets is of direct assistance to a number of important international undertakings, including ODP, EC-MAST, etc. It also answers the needs of the offshore oil industry for preliminary geotechnical and environmental investigations.

TTR 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 leading to the establishment of deep-water protected areas in view of safe-guarding the world natural heritage.

TTR represents an important contribution to the new IOC sub-programme on Geosphere-Biosphere Coupling. It has undertaken pioneering studies of gas hydrates – a potential energy source of the future – and under-water 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. It contributes to studies of deep-sea sedimentary depositional systems and their processes of formation on continental margins.

International networking is indeed the backbone of the TTR programme.

…its management and funding

The Executive Committee (Co-ordinator: Dr. Neil Kenyon, Southampton Oceanography Centre, U.K.) manages the TTR programme. IOC assists the programme at its various stages.

Co-funding is the basic principal and the basis of the programme's successes. A small but indispensable contribution comes from IOC. Most of research activities and field operations however have been covered from national funding sources of the participating countries, as well as from European research projects. Funds for offshore operations have also come from oil companies with a direct interest in research results from specific geographical areas.

Members of the TTR Executive Committee and invited guests at a planning meeting in UNESCO (November, 2001). From left to right: J. Woodside, M. Marani, M. Ivanov, M. Comas, N. Kenyon, P. Bernal, A. Suzyumov, M. Hood, C. Dullo, J-P. Henriet, U. Unluata

… its account

Between 1991-2001, eleven ocean-going cruises and nine research conferences were organized, for students and scientists to discuss results of their studies and co-ordinate with other relevant national or international research initiatives, this in addition to a few smaller cruises, a series of training workshops (shipboard and land-based) for students, long-term and short-term exchanges of students and researchers.

As of the end of 2001, over 600 scientists and students (coming from Europe, Africa, North and South America, and Asia) had taken part in shipboard training and research activities.

The TTR research results have been reported in some 50 peer-reviewed publications, including two special issues of the *Marine Geology* (1996) and *Geomarine Letters* (1998) international journals (the third one is being finalized), as well as in several hundred other types of publications (UNESCO and IOC reports, abstracts of papers presented at international meetings, etc.).

In 2001, the TTR web site was established (http://www.ioc.unesco.org/ttr).

Logo of the TTR-11 cruise, 2001

UNESCO-MSU Centre in 2001

…its mission

Established in 1993 to specifically develop 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 to serve as its training 'arm'. It aims to support research projects of undergraduate and post-graduate students. The scientific and educational activities are based on international co-operative programmes involving universities and research institutions from many countries. Within MSU, it co-operates with the majority of the Geology Faculty Departments and ensures the necessary marine science-related training. At the national and international levels, co-operation was established with many institutions. In 2001 only, co-operation was fostered with over 20 institutions from outside Russia plus with over ten in Russia (Annex I).

…its structure and services

The Centre has three branches:
(i) Marine Geology and Sedimentology (including Micropaleontology);
(ii) Seismics and Geo-acoustics; and
(iii) Geochemistry.
It provides various laboratory and compu-ting facilities to the staff and students and is supported by the MSU central services, such as auditoria for lectures, libraries, analytical laboratories, Science Park, etc.

…its funding

Most of the funds have come to the Centre from the outside, or extrabudgetary sources. In 2001, such funds for research and training were provided, in addition to MSU (staff costs), by Russia's Ministries of Natural Resources, and Industry, Science and Technologies, but also by the Flemish Government, Belgium (through the bilateral 'Floating University. Phase 2' project, funded by Flandres), the Netherlands (through the bilateral agreement with NIOZ), France (through the MSU-University Paris-VI Agreement), the IOC and some other sources. The joint field operations were also funded in 2001 by several more sources (see next Chapter). This support is sincerely acknowledged.

…its operation

The Centre is the principal organizer of the TTR cruises: in 2001, as was before, it negotiated with Russia's Ministry of Natural Resources (the ship-owner) all the conditions for the use of the R/V *Professor Logachev* with its equipment and technical support staff for the TTR-11 international cruise. In its laboratories at the Geology Faculty and Science Park, it ensured, in 2001, advanced training of some 20 MSU students and hosted five Ph.D. projects. In addition to the promotion of research and training projects, it provides – directly or through various arrangements - a considerable number of research and training fellowships to MSU scientists and students for their research and advanced studies abroad.

V. Blinova and A. Stadnitskaia subsampling on board the Logachev, *TTR-11 cruise*

Research and Training Activities: UNESCO-MSU Centre, year 2001

Research projects

In 2001, 20 undergraduate five post-graduate students from various Departments of the MSU Geology Faculty were involved in the research projects and training activities of the Centre. A number of research projects, mostly of regional nature, were continued and a few new ones launched. They were carried out in co-operation with national and foreign universities and research institutions, and included such topics as:

- Deep-sea depositional system in the NE Atlantic;
- Hydrocarbon gas composition in cold vents;
- Acoustic anomalies in the uppermost sediments of deep sea basins;
- Dependence of backscattering on lithology from sidescan sonar data;
- Digital processing of seismic and acoustic images;
- Gas hydrates accumulation and related phenomena;
- Pore water composition from bottom sediments;
- Carbonate chimneys in the Gulf of Cadiz: distribution, mineralogical and chemical composition;
- Biomarkers in organic matter of mud volcano deposits;
- Advanced processing of 3.5 kHz digital record;
- Authigenic carbonate mineralization due to CH_4 oxidation in anoxic environment;
- Reconstruction of geology sections through study of the lithology and fossils in mud volcanic deposits;
- Composition of organic matter in recent sediments and mud volcano breccia;
- Composition and maturity of organic matter in sedimentary rock clasts of mud volcano breccia.

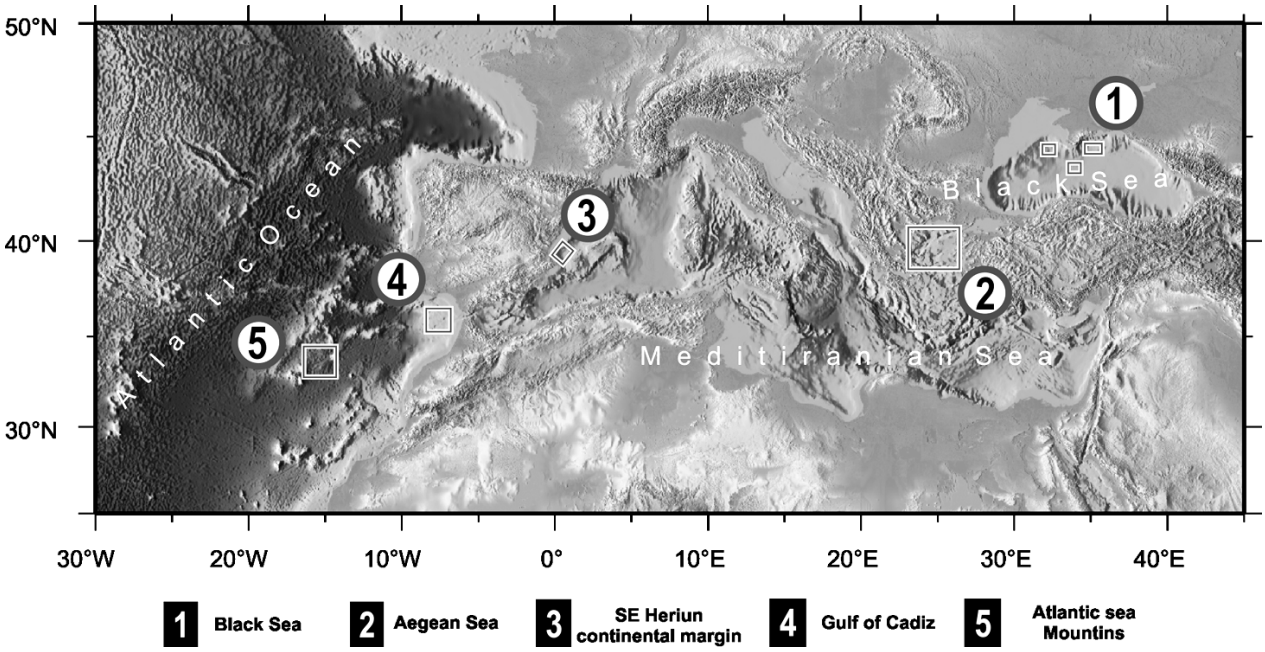
Field operations

In 2001, the Training-through-Research strategy was applied during the major international TTR-11 cruise on board the R/V *Professor Logachev* (Russia) which was carried out in the Black and Mediterranean Seas and on the North-East Atlantic margin.

The MSU students and scientists also participated in some other international cruises like a short 'equipment-testing' cruise with the *Logachev* in the Gulf of Cadiz (2-9 June), the *Belgica* (Belgium) and the *Pelagia* (the Netherlands) cruises in the North-East Atlantic. These cruises have provided additional opportunities for students and young scientists in on-the-job shipboard training and research.

R/V Professor Logachev,
the 'Floating University'

TTR-11 'Floating University' cruise: studies in the Mediterranean-Black Sea Region and on the European continental margin



TTR-11 cruise map

The TTR-11 cruise was carried out on board the R/V *Professor Logachev* (Russia, captain Alexander Arutyunov) from 25 July – 3 September. The cruise got underway from Constanța (Romania) and terminated in Funchal, Madeira (Portugal). It was subdivided into three legs separated by two port calls, where partial exchange of the scientific party was made: in Istanbul (Turkey) on 6-7 August and in Valencia (Spain) on 20-21 August. In addition, partial exchange of the scientific party was performed in the middle of the 2nd Leg at a roadstead stop in Valencia (Spain) on 15 August.

The Co-Chief Scientists of the cruise were:
Leg 1: Alina Stadnitskaia and Mikhail Ivanov
Leg 2: Lisa McNeill, Neil Kenyon, Roger Urgeles Esclasans and Mikhail Ivanov
Leg 3: Jose Monteiro, Luis Pinheiro and Mikhail Ivanov.

An international team of 67 scientists, post- and undergraduate students (in addition to a group of Russian technicians who had been working with the *Logachev* geological and geophysical equipment) from 13 countries participated (Belgium, Brazil, Georgia, Greece, France, the Netherlands, Portugal, Russia, Spain, Turkey, U.K., Ukraine and U.S.A.) (Annex II).

Cruise objectives

The objectives were to study processes (such as bottom current activity, slope processes, mud volcanism, neotectonics, manifestations of shallow gas, etc.) in the Black and Mediterranean Seas and on the North East Atlantic margin, and to train students in marine geoscience research. The expedition operated in the: Black Sea, Aegean Sea, Gulf of Valencia, Gulf of Cadiz and in the NE Atlantic. Daily seminars, lectures and discussions (Annex III) on the data, that had been collected, facilitated high-level on-the-job training of students and young scientists.

TTR-11 participants, Leg 3

Equipment

The equipment used included: a single-channel high-resolution seismic system with airgun sources, an OKEAN long-range side-scan sonar, a hull-mounted 3.5 kHz profiler, an O.R.E.tech deep-towed system containing a high- to middle-resolution side-scan sonar and a 7 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 and a TV-controlled grab and a dredge were all used.

Cruise principal results[1]

In the Black Sea:

In the western part, acoustic investigations revealed a set of structures that control fluid discharge on the continental margin. The structures, represented by fault systems and cracks, expressed in the seafloor relief, were mapped with the seismics, hull-mounted profiler and sidescan sonars (10 kHz OKEAN and 30/ 100 kHz MAK-1). Massive methane hydrates were recovered in the uppermost layers of stratified sedimentary column in the areas of fluid venting.

In the central part, a detailed study of (possibly active) Vassoevich, Kovalevskiy and TREDMAR mud volcanoes was performed with high-resolution sidescan sonar survey, underwater TV and bottom sampling. For the first time gas hydrates were sampled from the Kovalevskiy mud volcano. Extensive collection of various types of authigenic carbonates, reflecting different biogeochemical processes of methane oxidation under anoxic conditions, and rock clasts from mud breccia were obtained.

Gas hydrates from the Kovalevskiy mud volcano (Black Sea)

[1] Provided by the shipboard party

Neil Kenyon and Lisa McNeill discussing the North Aegean Sea data, with students

In the area of the Sorokin Trough, four new mud volcanoes were discovered and named as Odessa, Tbilisi, Istanbul and NIOZ. Two previously unknown gas hydrate accumulations were found. Existence of bacterial mats in deep water anoxic conditions, associated with active gas vents, first reported in the area by TTR-6, was confirmed. Underwater TV run across the Kazakov mud volcano revealed the presence of carbonate build-ups associated with zones of active fluid discharge.

In the North Aegean Sea:

The aim was to investigate the westward extension and propagation of the North Anatolian Fault into the North Aegean Sea, and in particular, its transition from strike-slip to extensional deformation from western Turkey towards central Greece. The Fault was responsible for two destructive earthquakes in 1999, east of Istanbul, and shows significant seismic activity westward into the North Aegean. The study included 10 and 30 kHz sidescan sonar surveys and 5 kHz profiling. Active deformation in the form of large vertical displacement faults (with potential strike-slip component) on the basin margins and en echelon strike-slip fractures in the basin centre were observed. This study allowed us to identify active fault traces and propose a model for the distribution of transtensional deformation within the eastern North Aegean.

In the Gulf of Valencia:

The principle scientific task was to map in detail a large debris flow on the Ebro continental slope and rise by means of high-resolution sidescan

Subsampling from a box corer, TTR-11 cruise

survey and underwater video transects. Few cores were collected to groundtruth acoustic and video data. The analysis of new data provides better understanding of main pathways and processes of sediment transport to the deep-water part of the Balearic Basin.

In the Gulf of Cadiz:

This area was intensively studied during the TTR-9 and 10 cruises. Research activity during TTR-11 was focused on detailed investigations of structures related to gas seepage. The most impressive result of the survey is the recognition of the fact that carbonate build-ups, which existence is known in the area from limited dredging data obtained by Spanish scientists in 2000, are very widespread in this region and form extensive fields rather than focused accumulations. The build-ups are represented by massive carbonate crusts and chimneys and seem to be related to a defluidisation of the sedimentary cover. The diameter of the chimneys varies from several centimeters to one meter. The origin of these build-ups is not completely understood by now. Their comprehensive analytical examinations and possibly further field studies are required.

Students looking at chimneys from the Gulf of Cadiz on board the Logachev, *TTR-11 cruise*

Variety of forms of carbonate build-ups, Gulf of Cadiz

A newly discovered and investigated mud volcano in the deep-water area of the Gulf of Cadiz has been named ‘Aveiro’. Other two mud volcanoes, discovered during previous TTR expeditions (Olenin and Carlos Ribeiro) were investigated with high-resolution sidescan sonar and bottom sampling.

An issue of sand transport and deposition in the deep sea was addressed during a short high-resolution sidescan sonar study of a sand lobe associated with a contourite channel. The study revealed that the lobe morphology is much more complex than it had been though before and that the channelised sediment transport plays an important role in the lobe formation.

Nameless and Seine seamounts:

The final part of the cruise was devoted to investigations of the Nameless and Seine seamounts in the vicinity of the Madeira Islands. A number of underwater TV observations, CTD and bottom sampling stations were conducted. A large field of Fe-Mn nodules was discovered on the top of the Nameless seamount. The nodules

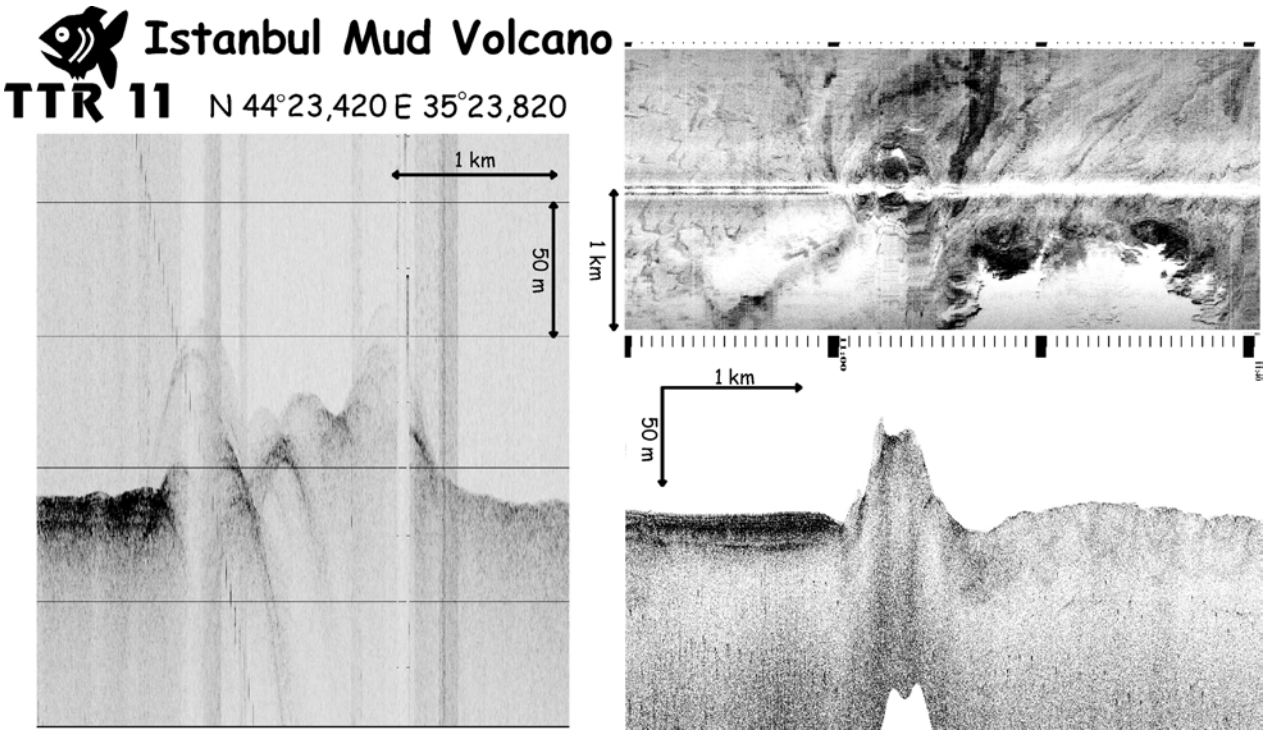
are located at the unusual depth of 1700-1900 m and come in various sizes and shapes. Beside common isometric nodules of about 10 cm in diameter, some very large crusts or their fragments were observed and recovered. They have an irregular morphology and are up to several meters across and dozens of centimeters thick. Neither the origin of this huge accumulation of Fe-Mn deposits, nor their chemical composition is clear by now and further laboratory analyses are required.

Cruise funding and logistic support

Besides IOC sponsorship, financial support for the cruise was provided by the University of Barcelona (Spain), Netherlands Institute for Sea Research (the Netherlands), Institute for Geology and Mineralogy (Portugal), University of Aveiro (Portugal), Southampton Oceanography Centre (U.K.), this in addition to national funding from Russia's Ministries of Natural Resources, and Industry, Science and Technologies.

The Turkish Government contributed with the provision of free passage through the Strait of Bosporus and free port call in Istanbul, which is sincerely acknowledged. Logistic support was provided by the Netherlands Institute for Sea Research (NIOZ), which co-ordinated the financial input from the co-operating partners and provided administrative assistance to the expedition. In this respect, sincere gratitude is due to Prof. J. de Leuw, the NIOZ Director, Dr. M. Rietveld and Dr. M. van Arkel.

The overall conclusion by the TTR-11 cruise participants is that, in 2001, the Training-through-Research programme carried out very successful field operations in its traditional research areas in the Mediterranean-Black Sea Region, on the NE European continental margins, as well as, for the first time, in the area of development of seamounts in the region of the Madeira Islands.



One of mud volcanoes discovered in the Black Sea during the TTR-11 cruise was given the name 'Istanbul' in the recognition of input of Turkey in TTR

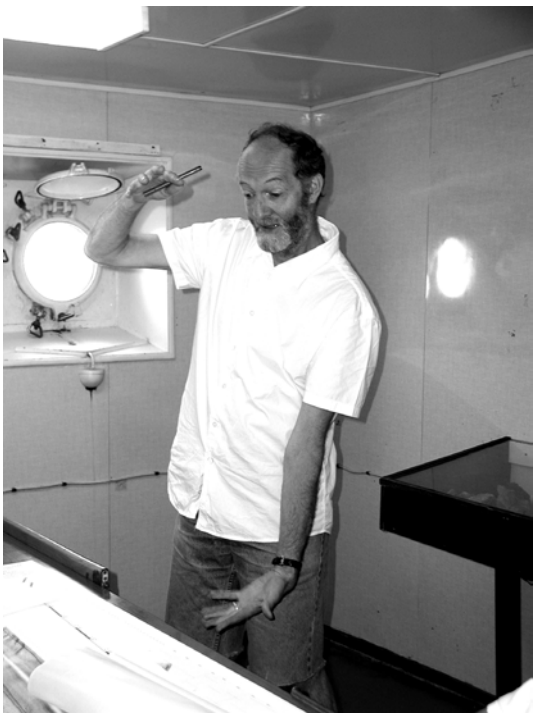
UNESCO Chair: focus on training and education

In accordance with the UNESCO-MSU Agreement (signed in 1994), the UNESCO Chair in Marine Geology and Geophysics continues to function as part of the UNESCO-MSU Centre for Marine Geosciences, providing educational support to its research projects (Chair holder Prof. Mikhail Ivanov). Particular attention has been paid to group training and supervision of Ph.D. and undergraduate projects. Students who have been carrying out their research in the MSU laboratories, as well as in a number of research institutions in Russia and abroad (through bilateral co-operation agreements), use data obtained during the TTR expeditions.

Lectures and seminars, provided on board the 'Floating University' by an international group of professional researchers contribute substantively to the overall success of the training programme.

Mikhail Ivanov presenting certificates to the TTR-11 cruise participants

Group training



Neil Kenyon lecturing to the students, TTR-11 cruise

The selection of students for participation in the TTR-11 cruise was based, as before, on candidate submissions from the various Departments of the Geology Faculty (such as Geology and Geochemistry of Fuel Minerals, Geophysics, Lithology and Marine Geology, Paleontology, etc.) and on the students' personal achievements during the preparatory phase. The selection of the best candidates is necessary in view of the limited number of places on board and to implement, in the best possible way, the research programme.

Those selected were given a series of lectures and seminars related to the subject of the cruise (March–May). Another series of seminar presentations took place on board the *Professor Logachev* during the cruise (see Annex II) and yet another was given in December, in preparation for the TTR-11 Post-cruise conference (30 January – 2 February 2002, Aveiro, Portugal).

Individual training and research activities

Irina Belenkaia in the analytical laboratory, University Paris-VI

I. Belenkaia continued (until March 2001) her Ph.D. project, supervised by Dr. C. Pierre, at the 'Laboratoire d'Océanographie Dynamique et de Climatologie', University Paris-VI, which she started in May 2000. This research was supported by a grant from President of the Russian Federation. She studied carbonate crusts formed in deep-sea cold venting sites as the result of microbial oxidation of hydro-carbon gases. Other research units like 'Laboratoire de Biologie des Invertébrés Marins et Malacologie' and 'Laboratoire de Pétrographie' (both at the National Museum of Natural History) and 'Laboratoire de Chimie Bioorganique et Organique Physique', CNRS, were involved and assisted her in the research.

In October 2000, an MSU Ph.D. student **A. Stadnitskaia** started her one-year 'training-through-research' visit to the Netherlands Institute for Sea Research (NIOZ). This visit was funded through a fellowship granted by the President of the Russian Federation to the best Russian Ph.D. students. The investigations at NIOZ took part within the Departments of Marine Chemistry and Geology and Marine Biogeochemistry and Toxicology under the supervision of Dr. Tj. van Weering and Dr. Jaap S. Sinninghe Damsté. The main purpose was to study molecular and isotopic composition of organic matter and hydrocarbon gases in sediments and carbonate crusts associated with fluid (methane) seeps on the sea floor. This work was based on samples obtained during several TTR cruises, carried out in the NE Atlantic Ocean and the Black Sea.

Her Ph.D. project is dedicated to the combined study of molecular and isotopic characteristics of hydrocarbon gases, or-ganic matter from gas-related sediments, mud breccia matrix and autigenic carbon-ates. During 2001, A. Stadnitskaia analysed organic matter in order to identify specific biomarkers for vital microbial activity and its relation with focused fluid inflow, especially with migrated methane. Another aspect for organic matter study was to define probable source of fluids and relations between the hosting organic matter and hydrocarbon gases, which is one of the main subjects directed to a better understanding of deep-formed hydrocarbons' interaction with subsurface sediments leading to global diagenetic changes and formation of deep-water specific environments.

V. Blinova, an MSU undergraduate stu-dent, studied (September to December) under the supervision of Dr. Tj. van Weering sediments recovered during the TTR-11 cruise from mud volcanoes of the Sorokin Through (Black Sea). The most representative cores were analysed in detail in view of determining the source of the organic matter and geochemical environments in which it was formed. This was done through a study of the organic matter from gas-saturated pelagic sediments and mud volcanic deposits. The analyses were done at the NIOZ Department of Marine Biogeochemistry and Toxicology headed by Dr. Jaap S. Sinninghe Damsté. M. Baas and A. Stadnitskaia also provided valuable assistance.

Intercultural exchange: A. Stadnitskaia (left) and V. Blinova in traditional Dutch dress

I. Kouvaev, an MSU undergraduate student, was granted a fellowship to work (July to September) at NIOZ in the frame-work of the MSU-NIOZ co-operation agreement. His work was done under the supervision of Dr. Tj. van Weering and included participation in the R/V *Pelagia* international cruise (25 June to 17 July) to the Porcupine Basin, Rockall Bank and Faeroe Margin (NE Atlantic). After the cruise he processed and reinterpreted seismic data obtained by NIOZ, in the same region, in the years 1999-2001.

Between 15 November – 14 December, **E. Kozlova**, a researcher from the Centre, visited the 'Laboratoire Stratigraphie' (Department of Sedimentary Geology, University Paris-VI), and 'Laboratoire de Chimie Bioorganique et Organique Physique, Ecole normale supérieure de chimie' (Paris, France). In co-operation with Prof. F. Baudin, Dr. C. Largeau and Dr. S. Derenne she continued geochemical investigations (started in the same labora-tories in 1999) of organic matter in the rock clasts from mud volcanic breccia collected during the TTR-10 and 11 cruises in the mud volcano areas of the Gulf of Cadiz and Black Sea (its central part and the Sorokin Trough). This visit was supported by the French side through the co-operation agreement with MSU.

In March 2001, an MSU Ph.D. student **A. Sautkin** started his visit to the 'Instituto Andaluz de Ciencias de la Tierra (Consejo Superior de Investigaciones Científicas, Universidad de Granada)', Spain. This visit has been funded by a fellowship granted by the President of the Russian Federation. His investigations have been carried out within the Department of Geodynamics under the supervision of Dr. Maria del Carmen Comas Minondo.

The main goal is to undertake micro-paleontological (based on calcareous nannofossils) analyses of the Miocene-Pliocene pelagic sediments and mud volcanic breccia from the Alboran Sea. The primary objective is to determine time when sediments (including those exposed in mud breccia) were deposited, and their sources and origin, for further biostratigraphic and paleo-climatic-paleoecological reconstructions for the Miocene and Pliocene time. For that, samples from the TTR-9 cruise and ODP samples from the Alboran Sea (Sites 977A, 976B) are used. Moreover, samples from outcrops in the southern Spain have been used for comparative analyses. This Ph.D. project is directed to a better understanding of links between climatic, biological and geological evolution of the Western Mediterranean.

P. Shashkin, a researcher from the Centre, was invited to take part in a research cruise with the *Belgica* (May) to the Porcupine Basin. He participated in seismic data collection and interpretation.

Visits to the Chair

In February-March, Vitor Magalhaes, a Ph.D. student from Aveiro University, Portugal, processed data of the TTR-10 cruise related to mud volcanism in the Gulf of Cadiz, under the supervision of Prof. M. Ivanov, the co-supervisor of his research project.

A delegation from the Federal Ministry of Education, Scientific Research and Technology (BMBF, Germany) and some other German institutions, headed by Dr. R. Ollig, met on 5 November with the Chair staff and students. On the agenda was an open discussion on the work being undertaken by the Chair. Potential co-operation between the two parties was also considered.

Between 7-14 November, Dr. Gerhard Bohrmann (GEOMAR, Germany) was visiting the Centre. He was shown data earlier obtained by TTR in the Black Sea related to gas hydrates accumulations. This visit was in the preparation of the German R/V *Meteor* cruise to the Black Sea in January 2002 and was considered as the opening for the bilateral co-operation. He presented to the students and staff of the Chair a lecture (also attended by the teaching staff of the MSU Geology Faculty) on the GEOMAR gas hydrates studies at the Hydrate Ridge, the Cascadia Margin (NE Pacific). A video-film on the “Hydrate Ridge at Cascadia Margin – an accretionary ridge, highly influenced by gas hydrates” was demonstrated specifying the GEOMAR project in the area.

MSU co-operation in research and training within TTR

International networking within TTR resulted in 2001, *inter alia*, in some 50 publications with the involvement of researchers and students of the UNESCO-MSU Centre (Annex III). A few examples of cooperation are given below.

With Belgium

Collaboration between MSU and Gent University started in 1997. The second phase of the joint project 'Floating University' between Gent University and the Catholic University of Leuven, on one side, and MSU, on the other, has been supported by the Department of Education of the Ministry of the Flemish Community. The focus is on the preparation of a practical handbook on 'Geological and Ecological Surveying in areas of Exploitation of Natural Resources'. The handbook is fully constructed as an inter-active package on CD-ROM. The first part focuses on gas and fluids in marine sediments and related phenomena. The advanced draft has been realized (principal scientist Pavel Shashkin, MSU, working under the supervision of Prof. J.-P. Henriet, Gent University), built upon data and images collected during several TTR cruises.

With France

University Paris-VI was among the founder-institutions of the TTR programme. A co-operation agreement with MSU provides the background, through which several MSU students and researchers participated in 2001 (as was the case before) in various joint projects.

With the Netherlands

The Netherlands Institute for Sea Research (NIOZ) was among the founder-institutions of the TTR programme. The MSU-NIOZ co-operation agreement (first established in 1990 and regularly renewed) has created opportunities for collaborative research and training for MSU students, as well as for strong administrative support, which has been provided by NIOZ to TTR. In 2001, NIOZ provided financial contribution to TTR-11. Three Dutch researchers were involved in field operations.

With Portugal

Portuguese researchers from the Department of Marine Geology, 'Instituto de Geologico e Mineiro' joined TTR in 1998. Success in this co-operation facilitated other institutions to join the programme later on, like Aveiro University (Departments of Geosciences and of Biology), Universities of Porto and Lisbon. National Oceanographic Committee of Portugal provided assistance to TTR at various stages.

Professor L. Pinheiro with students looking at a ferro-manganese nodule, TTR-11 cruise

Scientific exploration of the Portuguese continental margin, its neotectonic and depositional processes, active mud volcanism and the associated processes were among the main interests of the Portuguese researchers and students and the principal goals of the TTR-11 (to which Portugal provided financial contribution) and a few previous cruises. A number of joint research projects have been launched.

TTR also visited in 2001, on the proposal of Portuguese researchers, an area of seamounts in

the vicinity of the Madeira Islands to study ferro-manganese deposits. Eleven scientists and students from Portugal participated in the TTR-11 cruise.

With Spain

From 1992, Spanish researchers have been actively involved in the TTR investigations. In 2001, Barcelona University provided financial contribution to and participated in the TTR-11 cruise, this in addition to joint research projects which have been executed with Granada University.

With Turkey

Dokuz Eylul University (Izmir) was among the founder-institutions of the TTR programme. Its researchers and students have taken part in many TTR cruises, carried out in the Mediterranean-Black Sea Region. Useful exchanges have taken place, resulted in a number of joint projects focused on tectonic and other geological processes in the Black Sea and Eastern Mediterranean. Four researchers participated in the TTR-11 cruise.

With United Kingdom

Dr. Neil Kenyon of the Southampton Oceanography Centre (SOC) provides efficient co-ordination to TTR, which represents the major contribution to the international success of the programme. His leading role in formulating research goals, selecting targets, data collection and interpretation, and training students within TTR is highly appreciated.

In addition to SOC, some other U.K. institutions have become involved in TTR. In 2001, seven researchers and students from U.K. participated in the TTR-11 cruise.

With NIS countries

Odessa University (Ukraine) participated in the Network on Advanced Study Workshops on Mediterranean Marine Geosciences of the European Science Foundation (1992-1994) through which TTR was supported. Other institutions, like the Ukrainian State Institute for Mineral Resources (Simferopol) also participated in the TTR training campaigns. In 2001, when after some time TTR returned to the Black Sea, Odessa University came back onboard: one researcher participated in the TTR-11 cruise.

Tbilisi University (Georgia) became interested in the TTR research and training and for the first time participated in the TTR cruise in 1996. In 1999, a group of MSU researchers and Ph.D. students visited Tbilisi University to provide guidance on marine geological research, focused on the Black Sea. Since 1999, Georgian students participate in field operations (two students took part in the TTR-11 cruise) and post-cruise research conferences.

TTR and other meetings

TTR annual conference

"Geological Processes on Deep-Water European Margins" - International Conference and 10th Anniversary of the Training Through Research Post-Cruise Meeting was held from 28 January to 2 February, 2001 hosted by Moscow State University.

The Conference, being devoted to the 10th Anniversary of TTR, was focussed on all aspects of marine geosciences that have been studied by the TTR cruises for the last ten years. The intent was to obtain an overview of what has been done and also to outline directions for future activities.

The meeting brought together over 70 participants from 13 countries (Belgium, Brazil, Bulgaria, Georgia, Greece, France, Italy, the Netherlands, Portugal, Russia, Spain, Turkey, and the United Kingdom). Attending were researchers and students with different specialities (sedimentology, geophysics, geochemistry, microbiology, biology, palaeontology, structural geology) and research interests falling in the area of the Conference theme.

Reflecting main research activities of TTR, the Conference was divided into seven scientific sections:

- Deep-sea depositional systems and modern analogues of hydrocarbon reservoirs;
- Geomorphology and neotectonics;
- Diapirism, mud volcanism and hydrocarbon potential of deep sedimentary basins;
- Shallow gas, cold seeps and gas hydrates;
- Biosphere – geosphere interaction;
- Pelagic and hemipelagic sedimentation;
- Special session: Volcanism and hydrothermal venting at the Mid-Atlantic Ridge.

In total, 52 oral presentations and eight poster presentations were made. Geological processes in areas of the Black and Mediterranean Seas and North Atlantic studied by TTR (but also by other research programmes) were highlighted.

IOC, the Russian Foundation of Fundamental Research, the Ministry of Natural Resources and the Ministry of Industry, Science and Technology of the Russian Federation, and the Flemish Government, Belgium supported the conference.

The IOC Certificates of Appreciation were presented to several colleagues, namely Dr. N. Kenyon (TTR Co-ordinator, SOC), Dr. J. Woodside (TTR past Co-ordinator, Free University of Amsterdam), Prof. I. Glumov (Deputy Minister, Ministry of Natural Resources of the Russian Federation), Prof. M. Ivanov (Chair holder, MSU) and Prof. Victor Trofimov (Vice-Rector, MSU), in recognition for their outstanding contributions to IOC through TTR.

The Conference Abstracts were published (2001) as the IOC Workshop Report No. 175.

Meetings of the TTR Executive Committee

TTR-EC meeting in Moscow

The first year 2001 meeting of the TTR Executive Committee took place during the TTR Annual conference on 31 January. It considered the publication policy of TTR (including preparation of a Special Issue of the *Marine Geology* international journal), plans for the TTR-11 cruise in summer 2001, as well as various TTR activities during the intersessional period.

The participants agreed to devote the TTR-11 cruise to studies of geological processes on the European continental margins (in the Black Sea-Mediterranean Sea Region and in NE Atlantic), and for the first time, to visit seamounts in the region around the Madeira Islands.

TTR-EC meeting in Paris

On 17 November, IOC hosted the TTR-EC meeting at UNESCO, Paris. On the state were discussions of intersessional activities (February–October) and planning of forthcoming events. Discussed were (i) results of the TTR-11 cruise and (ii) presentation of the TTR programme - specifically, related to the geosphere-biosphere coupling processes - made at the XXIth IOC Assembly by Prof. L. Pinheiro (5 July).

The meeting further concentrated on planning the TTR-12 cruise in the year 2002. Research proposals submitted by scientists from Belgium, Denmark, Italy, Portugal, Russia, Spain and UK were considered. Planned activities included the TTR-11 post-cruise conference on 'Geosphere/Biosphere/Hydro-sphere Coupling Processes, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges', 30 January- 2 February 2002, University of Aveiro, Portugal.

Michael Marani presenting his research proposal for the TTR-12 cruise.

One of the major subjects of the meeting was on launching, on the IOC invitation and within the IOC Ocean Science Sect-ion, a new sub-programme on Geosphere-Biosphere Coupling Processes (GBCP), based on the TTR experiences. Prof. J-P. Henriet made a presentation of the overall GBCP concept. In seeking a wider support to this initiative from the scientific community, it was recommended to further discuss the subject at the Aveiro (2002) annual TTR conference.

Samples of other meetings attended by MSU researchers and students

Margins Meeting- 2001

M. Ivanov and V. Blinova (MSU, Russia) participated in the above meeting (2-6 October, Kiel, Germany) to which they presented the results of the TTR-11 cruise. 'New data on hydrocarbon vents in the deep Black Sea (preliminary results of TTR-11 Cruise, Leg 1)' and 'Underwater TV observations of gas escape structures in the Gulf of Cadiz (preliminary results of TTR-11 Cruise, Leg 3)' were the titles of the talks.

Ireland's Deepwater Frontier

The above international conference was organized (12-13 September, Dublin) by the Petroleum Infrastructure Programme and the Department of the Marine and Natural Resources of Ireland. TTR with its five-year experience of geological-geophysical-biological investigations on the Irish margin was represented by Dr. N. Kenyon (SOC, U.K.) and Dr. G.G. Akhmanov (MSU, Russia). Among the conference goals were to highlight areas where further geological and environmental data gathering are required, providing a forum for co-operation amongst explorationists and researchers. Topics presented at the conference (on environmental aspects, results of deep structure investigations and tectonic development of the Porcupine and Rockall Basins, sedimentary processes, shallow stratigraphy and geohazards in the region) and information exchange between organizations working in the area were of direct interest to the TTR programme.

EUG Conference in Strasbourg

M. Ivanov and A. Stadnitskaia participated in the conference of European Union of Geosciences (8-12 April), where they presented results of the TTR-10 cruise and summary of hydrocarbon gas data obtained by the TTR expeditions between 1995-2000. As an outcome of co-operation between NIOZ and MSU, the results on carbonate mud mounds study were also demonstrated.

Annex I

LIST OF INSTITUTIONS
THAT CO-OPERATED IN THE EXECUTION OF THE TTR PROGRAMME
in 2001

Belgium
University of Gent
University of Leuven

Brazil
PETROBRAS Co., Rio de Janeiro
University of Bahia

Georgia
Tbilisi University

Greece
Hellenic Fish Farming Sa.

France
University Paris-VI: 'Laboratoire de Stratigraphie' and 'Laboratoire d'Océanographie Dynamique et de Climatologie'
'Laboratoire de Chimie Bioorganique et Organique Physique' ('Ecole de Chimie', CNRS), Paris

The Netherlands
The Netherlands Institute for Sea Research, Texel

Portugal
Abel Salasar Institute of Biomedical Sciences, Oporto
'Instituto de Geologico e Mineiro', Lisbon
University of Aveiro
University of Lisbon

Russian Federation
Ministry of Natural Resources
Ministry of Industry, Science and Technologies
Moscow State University
National Commission for UNESCO of the Russian Federation
National Oceanographic Committee of the Russian Federation
Paleontological Institute, RAS
Polar Marine Geological Expedition
P.P. Shirshov Institute of Oceanology, RAS
Research Institute for Geology and Mineral Resources of the Ocean
St. Petersburg University
V.I. Vernadsky Institute of Geochemistry and Analytical Chemistry, RAS

Spain
Barcelona University
Geological Survey of Spain, Madrid
Granada University

Turkey
Dokuz Eylul University, Izmir

Ukraine
Ukrainian Academy of Science, Kiev
Odessa University

United Kingdom
Southampton Oceanography Centre (SOC)
University of Aberdeen
University of Birmengem

USA
Missouri University, State of Columbia

Annex II

LIST OF PARTICIPANTS

TTR-11 "Floating University" Cruise, 25 July – 3 September 2001
R/V *Professor Logachev*

Belgium
Peter Staelens
Peggy Vermeesch
Rien Descamps
Sofie L.M. Vandendriessche

Brazil
Simone Schreiner
Viviane Testa

Georgia
Tea Mumladze
Avtandil Maglakelidze

Greece
Marianthi Lavrentaki

France
Arnauld Mille

The Netherlands
Alina Stadnitskaia
(Co-chief Scientist, Leg 1)
Marianne Baas
Tiphaine Zitter

Portugal
Luis Pinheiro
(Co-chief Scientist, Leg 3)
Jose Monteiro
(Co-chief Scientist, Leg 3)
Joao Rego
Tiago Cunha
Vitor Magalhaes
Susana Muinos
Teresa Rodrigues
Marina Cunha
Dulce Subida
Ines Lima
Henrique Duarte

Russia
Technical Support Staff
Alexei Krotov (Chief Staff Scientist)
Vladimir Markov
Alexander Machulin
Evgeny Samsonov
Nikolay Volkov
Gennady Antipov
Irina Antipova
Roman Safronov
Sergey Zheleznyak
Alexander Kurilovich
Maxim Kuryschkin
Dmitry Gagarin
Victor Sheremet
Valentin Konfetkin
Alexander Plakhotnik
Sergey Lyubimov
Konstantin Plakhotnik
Alexander Ivanov
Vladislav Malin
Alexei Ivanov
Alexander Nescheretov
Andrey Rumjancev
Vladimir Tarasov
Researchers and students
Mikhail Ivanov (Co-chief Scientist)
Pavel Shashkin
Anna Volkonskaya
Sergey Shkarinov
Dmitry Modin
Sergey Buryak
Roman Repin
Sergey Agibalov
Anna Korneva
Grigorii Akhmanov
Elena Kozlova
Dmitrii Ovsyannikov
Alexei Sadekov
Tatiana Bespalova
Vladislav Torlov
Valentina Blinova
Elena Poludetkina
Natalia Tyrina
Olga Kovalenko
Oleg Krylov
Leonid Mazurenko
Leonid Meisner

Spain
Roger Urgeles Esclasans
(Co-chief Scientist, Leg 2b)
Antonio Calafat

Jose Luis Casamor
Galderic Lastras
Jaime Frigola
David Amblas
Veronica Willmott
Carmen Fernandez-Puga

Turkey
Gunay Cifci
Sebnem Onder
Derman Dondurur
Omer Faruk Elbek

Ukraine
Eugeny Larchenkov

United Kingdom
Neil Kenyon (Co-chief Scientist)
Lisa McNeill
(Co-chief Scientist, Leg 2a)
Jeffry Priest
Adriano Mazzini
Rebecca Fenwick
Andrey Akhmetjanov
Helen Fergunson

USA
Tim Lyons

Annex III

LIST OF SEMINAR PRESENTATIONS

TTR-11 "Floating University" Cruise, 25 July – 3 September 2001
R/V *Professor Logachev*

26 July	*Mikhail Ivanov*	Discussion of Leg 1 plans
27 July	*Alina Stadnitskaia, I. Belenkaia*	Hydrocarbon gas venting and associated authigenic carbonates. Sorokin Trough, NE Black Sea.
28 July	*Tim Lyons*	Geochemistry of anoxic marine basins – Part 1: Background
29 July	*Tim Lyons*	Part 2: Black Sea and Cariano Basin
30 July	*Sergey Bouriak*	Seismic indicators of shallow gas in the central part of the Black Sea and the Sorokin Trough area
1 August	*Marianne Baas*	Organic geochemistry, the biomarker concept
3 August	*Tiphaine Zitter*	Tectonic setting of mud volcanism along the western branch of the Cyprus Arc
4 August	*Gunay Cifci*	Gas-saturated sediments in the Southern part of the Eastern Black Sea
5 August		Primary results: discussion of the TTR11 Leg 1 data
9 August	*Lisa McNeill*	Extension and strike-slip faulting in Greece and Turkey – background to Leg 2, North Aegean targets
10 August	*Simone Schreiner*	Campos Basin (Brazil), a modern turbidite system
11 August	*Adriano Mazzini*	Carbonate crusts. Where, when, why, how?
12 August	*Alina Stadnitskaia*	Fluid escape structures of the Northern and Central Black Sea. Preliminary results of TTR-11 Leg 1
13 August	*Grigorii Akhmanov*	The Mediterranean Ridge and its mud volcanism: why it is shame we did not stop
14 August	*Lisa McNeill*	Preliminary results of Leg 2a
16 August	*Roger Urgeles*	Esclasans and Galderic Lastras. A large sediment slide on the Ebro continental slope, Western Mediterranean
17 August	*Roger Urgeles*	Esclasans, the Saquenay Fjord, Quebec, Canada: Integrating marine geotechnical and geophysical data for spatial slope stability and hazard analysis
18 August	*Antonio Calafat*	Preliminary results of Leg 2b
23 August	*Luis Pinheiro, Jose Monteiro*	Objectives of TTR-11 Leg 3
24 August	*Marina Cunha*	Faunal communities associated with the mud volcanoes of the Gulf of Cadiz
25 August	*Neil Kenyon*	Looking for sand bodies in the contour current, Gulf of Cadiz

26 August	*Alina Stadnitskaia*	Hydrocarbon gases associated with flow escape structures. Gulf of Cadiz, NE Atlantic. Part I: Source, composition and distribution patter in the sedimentary column
27 August	*Alina Stadnitskaia*	Part II: Diagenetic alterations related to organic matter and bacterial activity
28 August	*Viviane Testa*	An overview on the tropical Large Marine Ecosystem
30 August	*Leonid Mazurenko*	Composition of gas hydrate-forming fluids in the Gulf of Cadiz
31 August	*Dmitry Ovsjannikov*	Rock fragments from mud volcanic deposits of the Gulf of Cadiz, TTR-9 and 10 cruises data report
1 September	*Susana Muinos*	Ferromanganese deposits from the Lion Seamount
	Henrique Duarte	Structural control of fluid circulation. An example from the Iberian Variscan Orogen
2 September	*General discussion*	Preliminary results of TTR-11 Leg 3

Annex IV

LIST OF PUBLICATIONS WITH THE INVOLVEMENT OF RESEARCHERS AND STUDENTS OF THE UNESCO-MSU CENTRE, 2001

Akhmanov G., Ivanov M., Woodside J., and Cita M.B. Lithology of deep-sea mud volcanic deposits: general assessment of current knowledge and future research needs. "Geological processes on deep-sea European margins" International Conference and Ninth Post-Cruise Meeting of the Training-Through-Research Programme. Moscow/Mozhenka, Russia, 28 January - 3 February 2001. UNESCO/ Intergovernmental Oceanographic Commission, Workshop Report No.175, p. 29-35

Akhmanov G., Premoli Silva I., and Cita M.B. Lithology of mud breccia clasts from the Mediterranean Ridge Western Sector. Special Issue of *Marine Geology*, 2001 (submitted)

Akhmetzhanov A., Kenyon N.H., Nielsen T., Habgood E., Ivanov M., Henriet J.-P., and Shashkin P. Deep-sea bottom current depositional systems with active sand transport on the North-Eastern Atlantic Margin. "Geological processes on deep-sea European margins" International Conference and Ninth Post-Cruise Meeting of the Training-Through-Research Programme. Moscow/Mozhenka, Russia, 28 January - 3 February 2001. UNESCO/Intergovernmental Oceanographic Commission, Workshop Report No.175, p. 11-13

Bazhenova O., Arefiev O., Blinova V., Lein A. Organic geochemistry of sulfide ores from rainbow, Mid Atlantic Ridge Mar. 20th International Meeting on Organic Geochemistry, Vandoeuvre, Cedex, France, 2001

Blinova V. and Stadnitskaia A. Composition and origin of the hydrocarbon gases from the Gulf of Cadiz mud volcanic area. "Geological processes on deep-sea European margins" International Conference and Ninth Post-Cruise Meeting of the Training-Through-Research Programme. Moscow/Mozhenka, Russia, 28 January - 3 February 2001. UNESCO/Intergovernmental Oceanographic Commission, Workshop Report No.175, p. 45-46

Blinova V., Pinheiro L., Ivanov M., and Scientific Party of TTR-11 cruise, Leg 3. Underwater TV observations of gas escape structures in the Gulf of Cadiz (preliminary results of TTR-11 cruise, Leg 3). Abstracts, "Margins Meeting 2001" Kiel, Germany; October 2-6, 2001

Blinova V., Stadnitskaia A. Geochemical composition of hydrocarbon gases (Gulf of Cadiz, NE Atlantic). 55th students scientific conference “Oil and Gas, 2001”, Moscow, Russia, 2001, in Russian

Blinova V., Stadnitskaia A. Composition and origin of hydrocarbon gases from the mud volcanic areas of the Gulf of Cadiz (NE Atlantic). 8 International meeting of students “Lomonosov”, Moscow, Russia, 2001, in Russian

Bouriak S. ‘Split’ BSR at the Vøring Plateau and below the Storegga Slide deposits – new data of the TTR10 cruise, August 2000. "Geological processes on deep-sea European margins" International Conference and Ninth Post-Cruise Meeting of the Training-Through-Research Programme. Moscow/Mozhenka, Russia, 28 January - 3 February 2001. UNESCO/Intergovernmental Oceanographic Commission, Workshop Report No.175, p. 55-56

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De Mol B., Van Rensebergen P., Pillen S., Van Herreweghe K., Van Rooij D., McDonnell A., Huvenne V., Ivanov M., Swennen R., and Henriet J.P. Large deep-water coral banks in the Porcupine Basin, Southwest of Ireland. Special Issue of *Marine Geology,* 2001 (submitted)

Fadeeva, N.P., Kozlova,E.V. and Ponomareva E.A.. Organic matter of Maykopean rocks from Sorokin Trough, the Black sea. "New ideas of geology and geochemistry of oil and gas." Materials of the fifth International Conference "Petroleum Geology in XXI century". Part 2, MSU, 2001, p. 463-466

Ferreira P., Pinto A., Murton B., Monteiro H., Magalhães V., Salgueiro E., Lopes C., Quartau R., and Stepanov A. Hydrothermal geological material from the Lucky Strike field collected during TTR-10/Leg 2, Azores, Mid-Atlantic Ridge. "Geological processes on deep-sea European margins" International Conference and Ninth Post-Cruise Meeting of the Training-Through-Research Programme. Moscow/Mozhenka, Russia, 28 January - 3 February 2001. UNESCO/Intergovernmental Oceanographic Commission, Workshop Report No.175, p. 74-76

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Ivanov M., Pinheiro L., Henriet J.-P., Gardner J., Akhmanov G. Some evidence of the relationship between carbonate mound formation and cold seepage in the Gulf of Cadiz. 2000 Fall Meeting, December 15-19, 2000, San Francisco, California, Published as a supplement to Eos, Transactions, American Geophysical Union, Vol. 81, No. 48, November 28, 2000, p. 635

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Kuvaev I.. Geological structure and main stages of sedimentary strata formation on western continental margin of Ireland according to seismic data. "Geological processes on deep-sea European margins" International Conference and Ninth Post-Cruise Meeting of the Training-Through-Research Programme. Moscow/Mozhenka, Russia, 28 January - 3 February 2001. UNESCO/Intergovernmental Oceanographic Commission, Workshop Report No.175, p. 13-14

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Annex V

LIST OF ACRONYMS

CNRS	National Centre for Scientific Research (France)
CTD	Conductivity-Temperature-Depth probe
EC-MAST	Marine Science & Technology Programme of the European Commission
GBCP	Geosphere-Biosphere Coupling
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
NIS	New Independent States
ODP	Ocean Drilling Program
OKEAN	long-range sidescan sonar system
O.R.E.tech	deep towed sidescan sonar system
RAS	Russian Academy of Science
R/V	Research Vessel
SOC	Southampton Oceanography Centre (U.K.)
TTR	Training-through-Research
TTR-EC	Executive Committee, TTR programme
UNESCO	United Nations Educational, Scientific and Cultural Organization