FLOATING UNIVERSITY FACILITY

Innovative training through research

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

TRAINING, EDUCATION AND MUTUAL ASSISTANCE PROGRAMME
IOC OF UNESCO

Annual Report, 1996

The activities of the UNESCO-MSU Centre represent part of the overall 'Training Through Research' (TTR) programme, also referred to as the 'Floating university'. It is sponsored by the Training, Education and Mutual Assistance (TEMA) Programme of the Intergovernmental Oceanographic Commission of UNESCO (IOC). Most of the TTR activities are inter-linked and inter-dependent. The present report covers part of this joint programme, executed by, or with the participation of researchers and students from the Centre. Because of the international co-operative nature of the TTR programme, the report refers to the jointly executed projects. The authors and editors of the report fully recognize the important role of all co-operating partners from many countries of the world in the execution of the 'Floating university' project.

Contributors: E. Akentieva, R. Almendinguer, S. Buriak, E. Kozlova, O. Krylov, M. Ivanov, A.F. Limonov, A. Volkonskaya

Editors: Anatoly Limonov (Moscow State University)
Victor Trofimov (Science Advisor, Moscow State University)
Gunnar Kullenberg (Intergovernmental Oceanographic Commission)
Alexei Suzyumov (UNESCO)

Cover photos: Courtesy of the TTR-6 cruise team.

Inside photos: E. Kozlova

The publication of this report was financed through a grant allocated to Moscow State University by the UNESCO Participation Programme.

SC-97/WS/32

Table of Contents

UNESCO-MSU RESEARCH AND TRAINING CENTRE FOR MARINE GEOLOGY AND GEOPHYSICS and the TTR PROGRAMME (summary)

The scientific and educational activities of the UNESCO-MSU Research and Training Centre for Marine Geology and Geophysics, affiliated to the Geology Faculty of the Moscow State University (MSU), are aimed at advanced training and research for undergraduate and post-graduate students, based on international co-operation programmes with the involvement of universities and research institutions of many countries (see Annex 1).

The activities of the UNESCO-MSU Centre represent part of the overall 'Training Through Research' (TTR) programme, also referred to as the 'Floating university'. Most of the TTR activities are interlinked and inter-dependent. The present Report covers part of this joint programme, executed by, or with the participation of researchers and students from the Centre. Because of the international co-operative nature of the TTR programme, the Report refers to the jointly executed projects. The authors and editors of the Report fully recognize the important role of all co-operating partners from many countries in its execution.

The TTR programme was designed in 1990 by an international group of scientists under the auspices of UNESCO and, later, the European Science Foundation (ESF) and the UNESCO's Intergovernmental Oceanographic Commission (IOC/TEMA) to benefit from the advantages provided by the combination of the training of students and young scientists and 'cutting-edge' research in the field of geomarine sciences. A long-term plan for annual TTR cruises was developed for the Mediterranean and Black Sea regions.

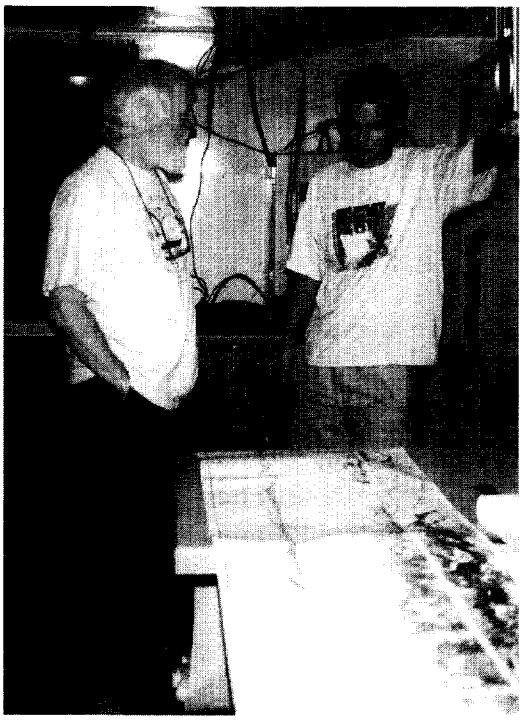
The main TTR objective is to generate and share advanced knowledge through: (i) state-of-the-art education and training in specific geomarine fields, and (ii) acquisition of high-quality data during the TTR cruises and their processing and interpretation, presentation and publication.

The programme is managed by the Executive Committee (Co-ordinator: Dr. J. Woodside, Free University of Amsterdam, the Netherlands). The Scientific Committee of the programme is responsible for formulating research tasks and targeting the TTR cruises.

The annual cycle of the TTR Programme includes the following steps: (i) preparation of a TTR cruise by the Executive and Scientific Committees, (ii) the cruise itself, with (when possible) a mid-cruise workshop for the participants and invited scientists, (iii) preliminary data processing, preparation of the cruise scientific report and its publication; (iv) post-cruise conferences to present and discuss the results of ongoing analyses and interpretation of data obtained during the TTR cruises, and to co-ordinate with other regional studies, (v) preparation of scientific publications.

Between 1991-1996, six major TTR cruises, four mid-cruise workshops and four post-cruise conferences were organized, in addition to a number of other field exercises, group and individual training activities, presentation and publication of the research results.

The Centre operates under the following arrangements. MSU provides the staff of the Centre (currently 5 persons). Six postgraduate and four undergraduate students from different Departments of the Geology Faculty are involved on a permanent basis in various projects. Some 30 undergraduate students became involved in the Centre's training activities.



Co-ordinator of the TTR programme, J. Woodside, discussing the research results with one of the students onboard the R/V Gelendzhik.

In 1996, funds for research and training activities were provided by the Russian Ministry for Science and Technological Policy (now, State Committee for Science and Technology), the Russian Committee for Geology (now, Ministry of Natural Resources), the Russian Foundation for Basic Research, as well as by UNESCO and its IOC. The Netherlands and Turkey contributed to joint field activities.

The Centre has three branches: (i) Marine Geology and Sedimentology (including Micropaleontology), (ii) Geophysics and Geoacoustics, and (iii) Organic Geochemistry. It provides various laboratory and computing facilities, including the central Sun station for geophysical data processing, and is supported by a series of central services provided by MSU, such as libraries, analytical laboratories, e-mail service, Science Park, etc. It enjoys co-operation with many Departments of the Geology Faculty and ensures the necessary marine science-related training. At the national level, it also co-operates in data processing and analyses with various institutions of the Russian Academy of Sciences, such as the Geological Institute, the Institute of the Lithosphere, the Shirshov Institute of Oceanology, the Vernadsky Institute of Geochemistry and Analytical Chemistry, the Paleontological Institute, the Institute of Microbiology, the Scientific and Production Institute 'Okeangeofizika', the Central Geological-Geophysical Expedition, and the Polar Marine Geological Prospecting Expedition of the Russian Committee for Geology.

1996 RESEARCH AND TRAINING ACTIVITIES OF THE CENTRE

1. Research projects

A number of research projects, mostly regional, continued to be executed at the Centre by the MSU research staff and students, in co-operation with national and foreign universities and research institutions (see Annex 1).

In the Black Sea region:

- Seafloor morphology in areas of mud volcanism and fluid expulsion in the Central Black Sea Basin and in the Sorokin Trough, South of the Crimea (based on Simrad EM-12S multibeam echosounder data);
- Acoustic characteristics of the seafloor in the Central Black Sea Basin and in the Sorokin Trough, South of the Crimea (based on MAK-1 deep-towed sonographs);
- Morphological typization of mud volcanoes;
- Seismic evidence for gas occurrence in sedimentary cover;
- Shallow gas occurrence from subbottom profiler data;
- Mass movement on the Crimean continental margin related to shallow gas occurrence;
- Lithological composition and age of bottom marine sediments;
- Lithological composition and age of rock clasts from mud volcano breccia;
- Gas content and gas composition in marine sediments and mud volcano breccia;
- Organic matter in rock clasts from mud volcano breccia;
- Gas hydrates: structure and composition;
- Diatomaceous sediments within the Danube deep-sea fan;
- Structure of the paleo-Don and paleo-Kuban delta-fans and their deep-sea fans;
- Seafloor morphology of the Caucasian margin;
- Carbonate mineral assemblage in bottom sediments from areas of active fluid venting;
- Pore water composition from bottom sediments;
- Bacterial mats in anoxic environment.

In the Mediterranean region:

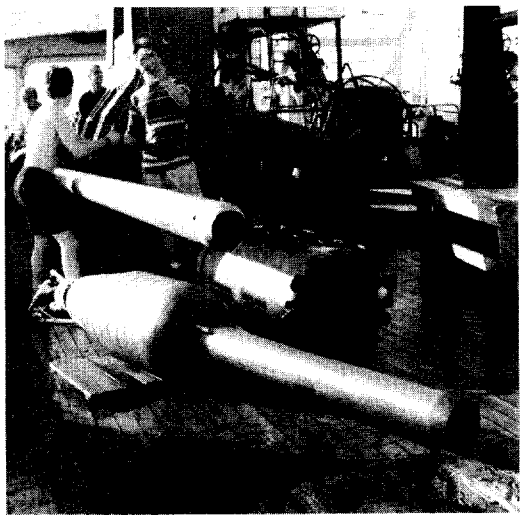
- Seafloor morphology of the crestal part of the Mediterranean Ridge as the reflection of the ongoing tectonic dislocation (from Simrad EM-12S data);
- Morphology of the Anaximander Mountains (from Simrad ES-12D data);
- Tectonic setting of the Anaximander Mountains;
- Neotectonics of the Anaximander Mountains in relation to the geodynamics of the Cyprean and Hellenic Arcs;
- Fault tectonics of the Anaximander Mountains;
- Tectonic stress inferred from deformation analysis;
- Slope instability;
- Age and composition of rocks composing the Anaximander Mountains as compared to the rocks known onshore;
- Mud volcanism and fluid venting in the Anaximander Mountains area;
- Age and composition of rock clasts from the mud breccia in the Anaximander Mountains area;
- Gas content and composition of the Anaximander Mountains mud volcanoes;
- Gas hydrates from the Anaximander Mountains mud volcanoes;

- Organic matter in rock clasts from mud volcano breccia;
- Structure and composition (including isotope composition) of recent carbonate crusts in the Mediterranean Sea;
- Structure, origin, and evolution of the Finike and Antalya Basins North of the Anaximander Mountains in relation to the evolution of this area;
- Processing of the 'Sismique rapide' data obtained during the ANAXIPROBE-95 Cruise (R/V L'Atalante).
- Pore water composition from bottom sediments.

Projects of general nature and studies in non-Mediterranean-Black Sea regions

- Comparative characteristics of mud volcanism in different tectonic settings;
- Study of large submarine slides on the Faeroe margin (North Atlantic) within the ENAM Programme;
- Comparative characteristics of structure and evolution of deep-sea fans in different tectonic settings;
- Genetic study of recent sediments and sedimentary rocks;

I. Belenkaya, a MSU undergraduate student, discusses the research results during a shipboard seminar, TTR-6 cruise.



Some of the geological equipment used onboard the R/V Gelendzhik during the TTR-6 cruise

- Development of methods of marine geological-geophysical investigations;
- Development of methods of digital processing of seismic and sidescan sonar data.

2. The sixth TTR Cruise.

The TTR-6 cruise took place onboard the R/V Gelendzhik (as in 1991-1994). The cruise was funded mostly through two national projects, ANAXIPROBE (GOA, the Netherlands) and 'Bathymetric Mapping of the Black Sea within the Russian Economic Zone' (Committee for Geology, Russia). Additional funding was provided by UNESCO/IOC and the Russian Ministry of Science and Technological Policy. Turkey provided support by granting free passage through the Bosporus Strait and waiving port charges. The cruise co-chief scientists J. Woodside (the Netherlands) and M. Ivanov (Russia) are taking this opportunity to thank the above contributing organizations on behalf of all cruise participants.

The cruise started from Naples (Italy) on 5 July, and terminated at Novorossiysk (Russia) on 19 August. During this period, the ship visited Istanbul (24-26 July) where the Mediterranean leg of the expedition ended and the Black Sea leg began, and Trabzon (6-7 August). Thirty one (31) scientists and technicians and twenty nine (29) students from 8 countries and 16 organizations took part in the cruise (Annex 2). A partial exchange of participants took place during the port calls. In addition to an extensive research programme, over 30 seminars and presentations were organized during the cruise as part of its training exercise (Annex 3).

The methods of investigations included: single-channel seismic profiling; bathymetric swath mapping with the Simrad EM-12S multibeam echosounder; acoustic swath mapping and bottom profiling with the MAK-1M deep-tow acoustic system; dredging; and bottom sampling with a large-diameter gravity corer. The ship navigation was ensured by GPS, and the towed acoustic system was navigated by the Rakushka underwater navigation system. Several personal computers were at the disposal of research staff and students for shipboard data processing.

The main areas of investigations were as follows:

1. Crestal part of the Mediterranean Ridge (Central-Eastern Mediterranean)
2. Anaximander Seamountains (North-Eastern Mediterranean)
3. Mud volcano area in the central part of the Black Sea
4. Sorokin Trough (South of the Eastern part of the Crimea)
5. Pallas Uplift (off the Kerch Strait in the Black Sea)
6. The Caucasian continental margin.

(a) The Mediterranean Leg

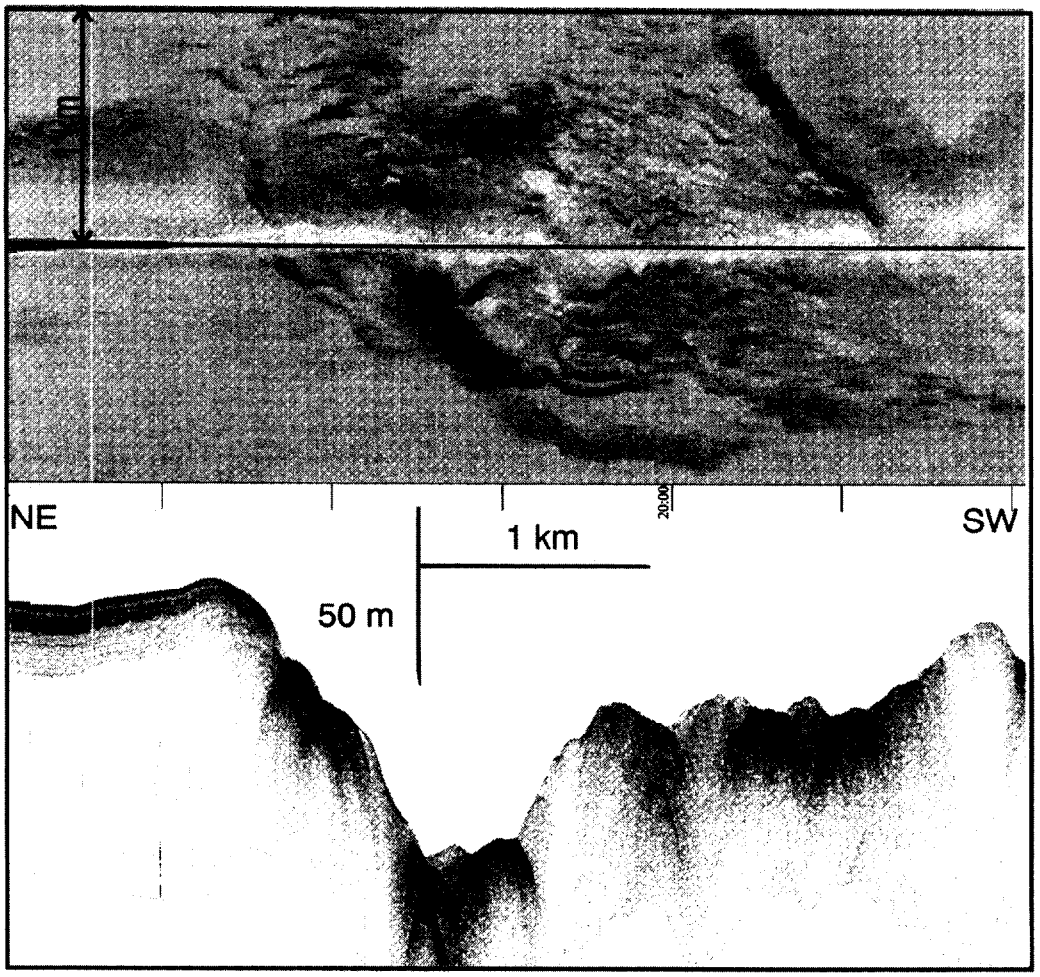
Part of the Mediterranean Ridge was mapped with the Simrad EM-12S multibeam echosounder along a continuous profile from the central Ionian Sea to the Anaximander Mountains. The profile was run across the most interesting areas of mud volcanism investigated by the TTR expeditions in 1993, 1994 and 1995. The detailed investigations on the Anaximander Mountains. were based on the previous studies carried out during the TTR-1 cruise (1991) and the Dutch ANAXIPROBE-95 Cruise (1995).

Group of students describing a core onboard the R/V Gelendzhik, TTR-6 cruise.

International sedimentological and paleontological team, TTR-6 cruise. From left to right, standing: A. Mazzini (Italy), A. Sautkin (Russia), S. Gablina (Russia), H. van den Bosch (The Netherlands), E. Mityakina (Russia), A. Stadnitskaya (Russia), A. Korkin (Russia), I. Belenkaya (Russia), A. Limonov (Deputy Chief of the cruise, Russia), E. Belokrinitskiy (Russia), E. van der Schans (The Netherlands); sitting: T.L.P. Kleeven (The Netherlands), J. Henderiks (The Netherlands), A. Akhmetjanov (Russia), E. Ivanova (The Netherlands), A. Dorofeeva (Russia), S. Buryak (Russia). Photo: G. Akhmanov (Chief of the team).

The Anaximander Mountains. have three peaks and are notable for a complex setting, being situated on the junction of the Hellenic and Cyprus Arcs. Due to such a position, the Anaximander Mountains, in the course of their neotectonic history, underwent both intensive vertical and horizontal movements and the alternation of compressional and extensional regimes. The current research has shown that the Anaximander Mountains are at present mainly under strong compressional tectonic stress. Several MAK-1 profiles, followed by dredging and sampling have proven the presence of a great number of mud volcanoes, six of which were named (according to the existing tradition) Amsterdam, Kula, Tuzlukush, San-Remo, Kazan, and Saint-Ouen-l'Aumone. During the TTR-6 cruise, gas hydrates were taken for the first time onboard from the Mediterranean sea-floor (site 234). These has hydrates were preserved in a cold laboratory onboard the ship under the temperature of -18°C and taken to Moscow for further analysis.

Fluid escape turned out to be a wide-spread phenomenon in this region Fluidization of surficial sediments in the valley between the peaks of the Anaximander Mountains is significant. The flow of the fluidized sediments form several morphologically well-expressed lobes entering the Finike Basin from the South. Coring in a spot with high backscatter on one of the lobes



The Kazan mud volcano in the Anaximander Mountains area. MAK-1 sonograph and profile.

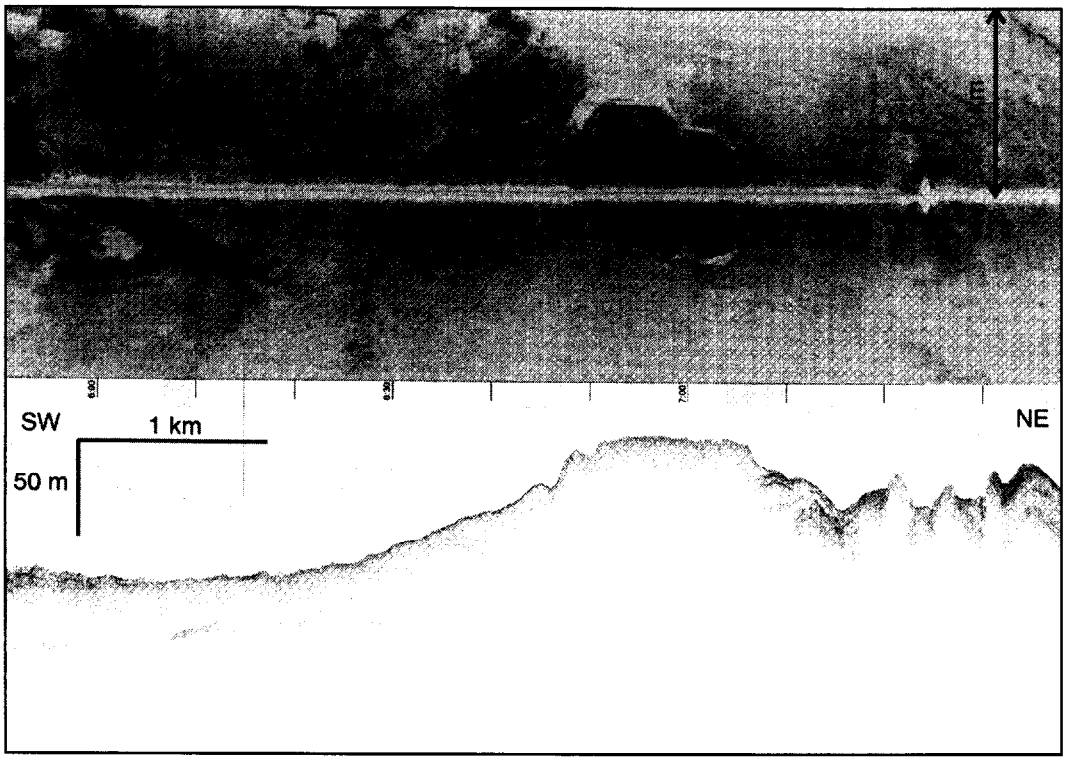
resulted in the recovery of sediments similar to those from neptunic dikes (sandy-silt water-saturated sediments). The fluidization is believed to be caused by the dewatering of deeper lying rocks due to tectonic compression between various blocks of the Anaximander Mountains. Many faults have been found to be active, and tectonic movement along them is accompanied by slumping and sliding of bottom sediments.

The study confirmed that the Anaximander Mountains represent a submerged part of the Anatolian Microplate and are subdivided into two parts that are the prolongation of the Antalya and Bey-Daglary structural zones of onshore Turkey

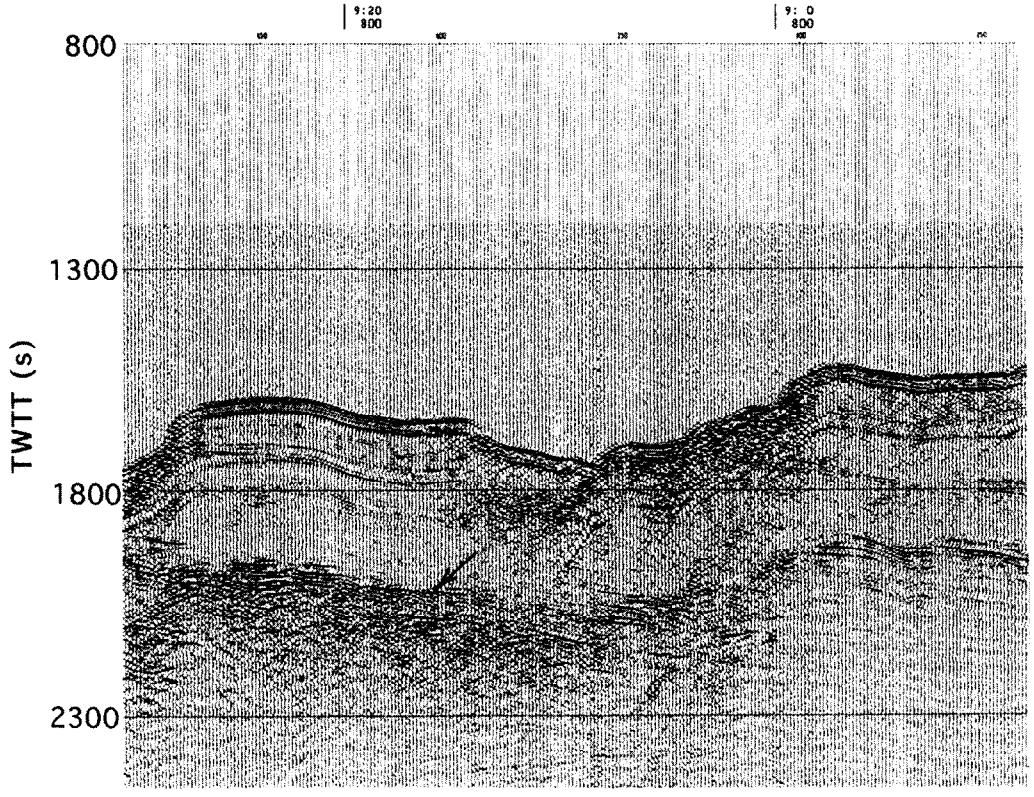
(b) The Black Sea Leg

In the Black Sea, the deep-water mud volcano area was mapped, and a detailed map of the seafloor relief was constructed. In the Sorokin Trough (South of the Crimea), the seismic survey unexpectedly resulted in a new scheme of the tectonic trends of the Oligocene-Lower Miocene diapiric structures which were known before in the trough. For more than 15 years, it was widely accepted that these structures are arranged along the general trend of the trough (that is from SW to NE). The structural pattern obtained has demonstrated that those diapiric ridges are controlled by the older underlying structures and have variable trends. Moreover, the diapiric ridges have a very complicated structure and consist of diapirs of second and third orders. Many of them are crowned by mud volcanoes. On MAK-1M sonographs, 16 mud volcanoes with a different morphology were observed. About half of them were sampled, and a rich collection of gas hydrates was gathered and taken back to Moscow for further analyses.

Slope mass instability plays an important role on the Crimean continental slope. The MAK-1 sonographs showed wide areas of slump sediments. Some gradation in slump evo-



The Dvurechenskii mud volcano in the Sorokin Trough (MAK-1 sonograph and profile). This mud volcano belongs to the "Barbados type" distinguished by steep, low slopes, flat top and liquid eruption products.



Detail from a seismic profile over the Pallas Uplift (off the Kerch Strait). Thick Quaternary sediments make up a composite deep-sea fan of the paleo-Don and paleo-Kuban Rivers. Arrow indicates a discontinuous seismic reflector with an appearance of BSR.

G. Çifçi (Turkey) and O. Krylov (Russia) studying core 287 on the ship deck, TTR-6 cruise.

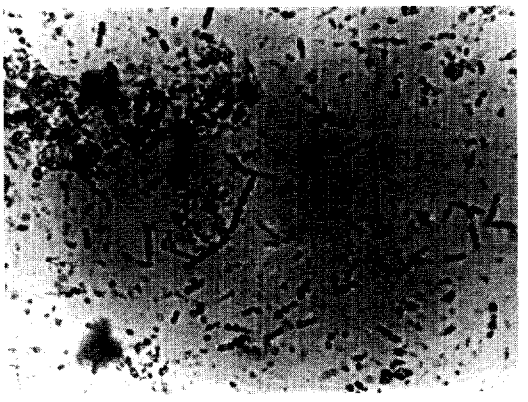
lution was studied: from initial break-off cracks with zigzag outlines to large detached masses. The slumping was interpreted as a consequence of surficial sediment saturation with fluids.

On the Pallas Uplift, which is considered to be very promising in hydrocarbon occurrence, direct evidences of fluid and gas escape were not found, but on the seismic profiles, a strong reflector similar to a bottom simulating reflector (BSR) was detected. This Uplift is covered by Pleistocene sediments of the paleo-Don and Paleo-Kuban fans, more than 1 km thick. Seismic profiling revealed several stacked channel-levee complexes, and the MAK-1 images allowed recent active and inactive channels to be distinguished. The largest Anapa Channel adjoining to the Caucasian margin was interpreted to be inactive over most of its length, but it can be fed by canyoned sediments from the Caucasian margin in its lower reaches. The uplift was mapped in detail and prepared for drilling.

In the eruptive products of the Black Sea mud volcanoes there were observed fragments of carbonate crusts typically originated under conditions of methane exhaust. Some of these fragments were incrusted by vary-coloured bacterial mats: colonies of hemosynthetic methane-reducing organisms.

There, on the Caucasian continental margin, a detailed 70 km wide bathymetric map with 10 m contour interval was for the first time drown for the Russian economic zone from the multibeam data. The map is of large scientific and economic importance and provides the basis for future investigations on selected objects.

Breccia with gas hydrates from the Black Sea floor, site 288.



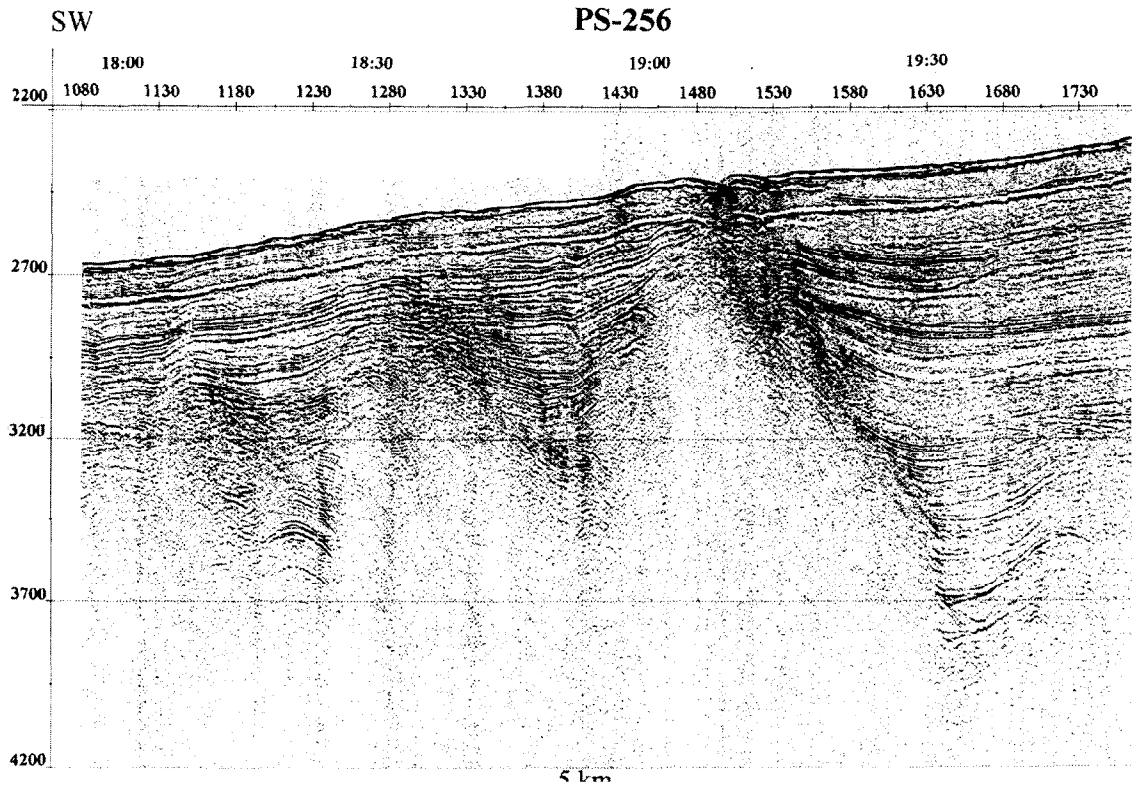
Microphotograph of a bacterial colony from a bacterial mat developed in a methane seep at a depth of about 1900 m in the Black Sea, x1000.

3. UNESCO Chair in Marine Geology and Geophysics

The UNESCO Chair in Marine Geology and Geophysics was established in 1995 following the UNESCO-MSU Agreement. In 1996, it continued functioning as part of the UNESCO-MSU Centre. The general objectives of the Chair are as follows: (i) further promotion of educational programmes in marine geosciences through the development of twinning and other types of bilateral and multilateral inter-university co-operation and co-operative undertakings with various national and foreign research institutions, and (ii) supervision of undergraduate and postgraduate studies. The Chair co-operates with many Departments of the Geology Faculty of the Moscow State University in fulfilling its educational tasks.

Examples of the Chair activities in 1996:

(a) The selection of MSU students for TTR cruises and their pre-cruise training remains one of the major activities of the Chair. As the number of places onboard is limited, only the most qualified students may participate. Upon pre-



Detail from a seismic profile in the Sorokin Trough (Southeast of the Crimea) showing South-verging diapiric folds made up of clays of the Maikopian Formation. One of the folds (at 1480) is accompanied by a mud volcano.

sentation of candidates by various Departments, the Chair sets up a series of informal exams, discussions and information meetings. Those selected attended lectures related to the subjects of the future cruise to update their knowledge on the methods of marine investigations and regional geology.

(b) The Chair regularly organizes seminars in marine geosciences for students. Students report on their research. These seminars also provide the basis for the selection of the best students' presentations to various national and international meetings and seminars, and discussions on the completed research papers. Visiting guest professors were also given the floor (Annex 4).

(c) Following a contest for students, organized in November-December, the best students' papers were recommended for presentation at the 4th Post-cruise meeting (see Chapter 4 below for more details).

(d) The programme of the Chair also includes short- and mid-term study grants for students enabling them to participate, as described below, in the activities of leading European laboratories on data processing and analysis, as well as in their field research projects, and obtain the supervision of internationally-recognized specialists necessary for undergraduate and postgraduate projects.

(i) E. Akentieva, a MSU postgraduate student, was granted a fellowship to work at the Southampton Oceanography Centre, UK (November 1995-January 1996) and NIOZ, the Netherlands (February-April 1996) with Dr. N.H. Kenyon and Dr. Tj.C.E. van Weering respectively on TOBI deep-towed sidescan sonar data processing and interpretation. These data were collected on the Faeroe continental margin (Northeast Atlantic) during the R/V Pelagia cruise in 1995 (ENAM Programme).

(ii) S. Buryak, a MSU postgraduate student, visited the Free University, Amsterdam, and NIOZ to prepare proposals for an international project and process geophysical data from the Black Sea under the supervision of Dr. J.M. Woodside and Dr. Tj.C.E. van Weering (September-October 1996).

M-B. Cita (right, Italy) and A. Limonov (Russia) during the 5th TTR Post-cruise Meeting in Zvenigorod.

(iii) E. Kozlova, a Centre staff scientist, visited NIOZ where she interpreted geological-geophysical data (collected in the northern Black Sea during the TTR-6 Cruise and some earlier cruises) under the supervision of Dr. Tj. C.E. van Weering (September-December).

(iv) R. Almendinger, a MSU postgraduate student, worked at IFREMER, Brest (France) on digital modelling of sidescan sonar images under the supervision of Dr. J.-P. Foucher (November-December 1996).

(e) Supervision of Ph.D. studies is one of the major activities of the Chair. Five post-graduate students of the Centre (E. Akentieva, G. Akhmanov, A. Akhmetjanov, R. Almendinguer, and S. Buryak) are working on their Ph.D. theses under the supervision of staff scientists of the Centre: Dr. M.K. Ivanov, Dr. A.F. Limonov, and Dr. V.G. Gainanov. The topics of the theses are related to lithological peculiarities of mud volcanism eruptive products; comparative evolution of deep-sea sedimentary systems; modelling, processing, and interpretation of seismic and sidescan sonar data, and are largely based on information obtained during the TTR cruises.

M. Ergun (Turkey), N. Kenyon (UK), M. Comas (Spain), J. Mascle (France) and M-B. Cita (Italy) (from left to right) during the 5th TTR Post-cruise Meeting in Zvenigorod.

4. Meetings and workshops

4.1 UNESCO-IOC-ESF planning and co-ordination meeting and the Fourth Post-Cruise Meeting (29.01-3.02, Moscow and Zvenigorod, Russia)

The 4th Post-cruise Meeting on 'Sedimentary Basins of the Mediterranean and Black Sea' was organized and hosted by the UNESCO-MSU Centre. It was dedicated to the 5th Anniversary of the TTR programme and co-sponsored by UNESCO/IOC, the Russian Foundation for Basic Research, the Ministry of Science and Technological Policy of the Russian Federation and the Moscow State University. National funding sources in France, Italy, the Netherlands, Spain and the UK provided funding for some national participants. The meeting was attended by nearly 100 scientists and students from 10 countries, involved in the TTR project. Over 50 papers, based mostly on data obtained during five 'Floating university' cruises in the Mediterranean and Black Seas (1991-1995) were presented. Topics of scientific research for 1996-2000 were outlined during a two-day round table discussion which aimed at determining the direction of the programme scientifically and geographically over the next five years and getting plans completed early in order to secure funding. A new Scientific Committee was established for this new phase of the programme, and a new Executive Committee was appointed. The Conference Abstracts were published later as MARINF/100 (UNESCO, April 1996) (Annex 7).

4.2 Meeting of the TTR Executive Committee (13-15.04, Paris, France)

The first meeting of the newly established TTR Executive Committee was hosted by IOC of UNESCO. From the Russian side, it was attended by Dr. M. Ivanov as one of its members. The meeting discussed topics for the project's 1996-2000 research program, and appointed co-ordinators for the future TTR cruises. Involvement of the project in various regional IOC programs, as well as in the celebration of the Year of the Ocean (1998) was discussed as well.

Members of the TTR Executive Committee (from left to right): J. Woodside (Chairman, the Netherlands), M. Marani (Italy), M. Comas (Spain), M. Ivanov (Russia). The IOC representative is missing on this photo.

4.3 First Master Workshop on 'Gas Hydrates. Relevance to World Margin Stability and Climatic Change' (18-20.09, Gent, Belgium)

The workshop, organized under the auspices of the European Commission, DG XII, MAST Programme, and the European Science Foundation, was attended by more than 100 scientists from 57 universities, institutions, and oil companies of 16 countries of the world. Various aspects of the formation, distribution and influence of gas hydrates on modern geological processes and climate were discussed. The TTR group was presented by three researchers from the Netherlands, Russia and the United Kingdom, as well as by two students from Russia and one student from the Netherlands (Annex 5). Four communications were presented on the study of gas and gas hydrates from the Mediterranean and Black Seas. The TTR group actively participated in debates on working out the Conference decisions and future research plans.

4.4 Fourth International Conference on 'Gas in Marine Sediments' (28.09-01.10, Varna, Bulgaria)

The above Conference was organized by the international 'Shallow Gas Group'. It was attended by about 50 scientists from Bulgaria, Canada, Germany, Italy, Russia, UK, Saudi Arabia and Scandinavian countries. A broad spectrum of problem related to hydrocarbon gas generation and migration, evidence for shallow gas occurrence, chemistry of shallow gas, gas hydrates, mud volcanism etc. was discussed. A geological excursion to the 'Broken Stones' Nature Reserve near Varna was organised. The TTR group represented by three senior researchers and two undergraduate students made four oral and two poster communications. During the planning and organising meeting of the 'Shallow Gas Group', Dr. A.F. Limonov made a proposition to produce an Atlas of Shallow Gas Occurrence. The idea was enthusiastically accepted by the participants.

5. Publications

In 1996, a special volume of 'Marine Geology' international journal, mostly based on the results of the 3rd TTR cruise was published (Elsevier, Amsterdam, June, 1996). It includes a number of papers prepared by researchers and students of the UNESCO-MSU Centre (see Annex 7). The Report of the 5th TTR cruise (1995) was published in the UNESCO Reports in Marine Science series. Other publications, including abstracts of presentations at various international fora, may be also found in the above Annex. Altogether, this Annex includes 45 references.

6. Visits to the Centre

In 1996, the Centre hosted several guest professors who came for joint research or in view of negotiating further co-operation with the Moscow State University and other organizations of the Russian Federation (see Annex 4). The guests professors met with the students, staff of the Centre and the Moscow University officials, lectured on their research in the Mediterranean region and elsewhere, and on various co-operation matters.

J. Woodside (left, the Netherlands), E. Bonatti (centre, Italy) visiting the UNESCO-MSU Centre, with M. Ivanov, Director of the Centre.

Annex 1

LIST OF INSTITUTIONS, WHICH CO-OPERATED WITH THE UNESCO-MSU CENTRE IN THE EXECUTION OF THE TTR PROGRAMME IN 1996

Belgium	-Renard Centre of Marine Geology, Geology Institute, University of Gent (Gent)
Bulgaria	- Institute of Oceanology, BAN (Varna)
France	- IFREMER (Brest) - University Pierre and Marie Curie, GEMCO (Paris and Villefranche-sur- Mer)
Germany	- GEOMAR, Research Centre for Marine Geosciences (Kiel)
Georgia	- Tbilisi State University (Tbilisi)
Italy	- University of Milan (Milan) - University of Genoa (Genoa) - Institute of Marine Geology (Bologna)
The Netherlands	- The Netherlands Organization for Scientific Research (NWO) (The Hague) - The Netherlands Geoscience Foundation (GOA) (The Hague) - Free University (Amsterdam) - University of Amsterdam (Amsterdam) - University of Utrecht (Utrecht) - The Netherlands Institute for Sea Research (NIOZ) (Texel)
Russia	- Ministry of Science and Technological Policy (Moscow) - Russian Committee for Geology (ROSKOMNEDRA) (Moscow) - Russian Oceanographic Committee (Moscow) - Shirshov Institute of Oceanology, RAN (Moscow) - Paleontological Institute, RAN (Moscow) - Vernadsky Institute of Geochemistry and Analytical Chemistry, RAN (Moscow) - Institute of Microbiology, RAN (Moscow) - Institute of Geology of Fossil Fuel, RAN-Ministry of Fuel and Energy (Moscow) - Faculty of Geology, St.-Petersburg State University (St. Petersburg) - Central Geological-Geophysical Expedition, ROSKOMNEDRA (Gelendzhik) - NIPI Okeangeofizika, ROSKOMNEDRA (Gelendzhik)
Spain	- Andaluz Institute of Geosciences, CSIC, University of Granada (Granada)
Switzerland	- Geological Institute, University of Neuchatel (Neuchatel)
Turkey	- Dokuz-Eylul University (Izmir) - Istanbul University (Istanbul) - Piri Reis Foundation (Izmir)
United Kingdom	- University of Wales (Cardiff) - University of Southampton (Southampton) - Southampton Oceanographic Centre (Southampton) - Dept. of Geology and Petroleum Geology, University of Aberdeen (Aberdeen) - Edinburgh University (Edinburgh)
European Science Foundation	- Scientific Networks Committee (Strasbourg, France)
UNESCO	- Intergovernmental Oceanographic Commission (IOC) (Paris, France) - Coastal Regions and Small Islands Unit (CSI) (Paris, France)

Annex 2

LIST OF PARTICIPANTS IN THE TTR-6 CRUISE

France	J.-P. Foucher (IFREMER, Brest) J.-F. Dumont (IFREMER, Brest)
Georgia	E. Sakvarelidze (Tbilisi State University)
Germany	M.Ludde (Hamburg University)
Italy	A. Mazzini (University of Genoa)
The Netherlands	J.M. Woodside (Free University, Amsterdam) B.B. Swaak (Free University, Amsterdam) A.J. Doest (Free University, Amsterdam) E. Ivanova (Free University, Amsterdam) E. van der Schans (Free University, Amsterdam) T.L.P. Kleeven (Free University, Amsterdam) H. van den Bosch (Free University, Amsterdam) J. Henderiks (Free University, Amsterdam) S. Woodside (University of Amsterdam)
Russia	B. Shirokozhukhov (CGGE, Gelendzhik) A. Shanin (CGGE, Gelendzhik) V. Skorkin (CGGE, Gelendzhik) L. Zlotnikov (CGGE, Gelendzhik) O. Zuev (CGGE, Gelendzhik) A. Pavlov (CGGE, Gelendzhik) V. Gubenkov (CGGE, Gelendzhik) S. Maraev (CGGE, Gelendzhik) V. Vasilyev (CGGE, Gelendzhik) P. Lygin (CGGE, Gelendzhik) R. Kazantsev (CGGE, Gelendzhik) A. Rudnev (CGGE, Gelendzhik) V. Tsyganenkov (CGGE, Gelendzhik) V. Sirotin (NIPI Okeangeofizika, Gelendzhik) V. Petrenko (NIPI Okeangeofizika, Gelendzhik) V. Kharlamov (NIPI Okeangeofizika, Gelendzhik) V. Noskov (NIPI Okeangeofizika, Gelendzhik) L. Meisner (NIPI Okeangeofizika, Gelendzhik) M. Ivanov (Moscow State University) V. Gainanov (Moscow State University) S. Buryak (Moscow State University) A. Volkonskaya (Moscow State University) E. Mityakina (Moscow State University) A. Trofimuk (Moscow State University) R. Almendinger (Moscow State University) P. Shashkin (Moscow State University) E. Kotochigov (Moscow State University) A. Burlakov (Moscow State University) A. Limonov (Moscow State University) O. Krylov (Moscow State University) G. Akhmanov (Moscow State University) E. Kozlova (Moscow State University) A. Akhmetjanov (Moscow State University)

A. Korkin (Moscow State University)
E. Belokrinitskiy (Moscow State University)
A. Sautkin (Moscow State University)
A. Stadnitskaya (Moscow State University)
I. Belenkaya (Moscow State University)
A. Dorofeeva (Moscow State University)
E. Udilovich (Moscow State University)
S. Gablina (Paleontological Institute, RAN)

Switzerland S. Wagner (Geological Institute, University of Neuchatel)

Turkey M. Ergun (Piri Reis Foundation, Izmir)
G. Çifçi (Dokuz Eylul University, Izmir)
B. Alpar Saban (Marine Science and Management Institute, Istanbul)
S. Turgut (Turkish Petroleum Co).

Annex 3

LIST OF SEMINAR PRESENTATIONS DURING THE TTR-6 CRUISE

7 July	*J. Woodside* – Origin of Anaximander Mountains
7 July	*V. Gainanov* – The 'Gelendzhik' Story-94 (Video film)
8 July	*S. Turgut* – Onshore Western Taurus lithofacies and offshore Finike Basin evolution
10 July	*J.-F. Dumont* – Outlook of neotectonics from Turkey
11 July	*M. Ergun* – Evolution of NE Mediterranean back-arc basins: geological implications
12 July	*A. Limonov* – Eastern Mediterranean: geological review
13 July	*V. Gainanov* – Seismic indications of mud volcanoes, gas accumulations, and gas hydrates on the Mediterranean Ridge
14 July	*J.-F. Dumont* – The autochthonous sections of the central part of the Isparta Angle (Isparta Angle history and Antalya Basin questions)
15 July	*E. Ivanova* – Biostratigraphy of the Late Quaternary sediments from the Eastern Mediterranean
16 July	*E. Kozlova* – Some results of organic matter investigations in rock clasts from the Stoke-on-Trent mud volcano breccia
16 July	*J.-F. Dumont and G. Akhmanov* – Preliminary results of the sampling
17 July	*S. Gablina* – Diatoms and some features of their distribution in the Eastern Mediterranean deposits
18 July	*G. Akhmanov* – The Mediterranean mud breccia lithology
20 July	*A. Stadnitskaya* – The methods of geochemical sampling
20 July	*I. Belenkaya* – Authigenic carbonate minerals in the sediments from the United Nations area, eastern Mediterranean Ridge
21 July	*J.-F. Dumont* – Neotectonics with rivers in flood plains: the flexural basins of Peru and Bolivia
22 July	*H. van den Bosch* – Rhythmic Cenomanian deposits on the Crimea: climatic control on a cm-scale
28 July	*M. Ivanov* – Mud volcanism and diapirism in the Black Sea
29 July	*L. Meisner and A. Limonov* – Geological setting of the Black Sea Basin
30 July	*S. Buryak* – Bright spots in the deep Black Sea: evidence for gas accumulations
31 July	*J.-P. Foucher* – Mud volcanoes of the Barbados Accretionary Prism
1 August	*A. Akhmetjanov* – Mud volcanoes of the Kerch Peninsula. General review
2 August	*B. Alpar Saban* – Secular sea-level variations along the Turkish coast
3 August	*G. Cifci* – Image characteristics of deep seismics in Calabria (S. Italy) using tomography and ray tracing
4 August	*R. Almendinger* – Sidescan sonars. General review
5 August	*J. Woodside* – ANAXIPROBE-96: short review of initial results from Leg 1
10 August	*A. Volkonskaya* – Some results of processing of seismic data of the TTR-5 Cruise
11 August	*A. Limonov* – The UN Rise: what is it from geological standpoint?
12 August	*A. Akhmetjanov and S. Gablina* – The Danube Deep-Sea Fan. Unusual siliceous sediments related to peculiarities of channel pattern
13 August	*L. Meisner* – Fluidogenic deformations of the Black Sea
14 August	*A. Stadnitskaya* – Methods of geochemical investigations in application to the TTR-5 data.

Annex 4

LIST OF VISITORS TO THE UNESCO-MSU CENTRE

Dr. B.T. Cronin (University of Aberdeen, UK)

- Joint scientific work (04-12.02)

Dr. G. Kullenberg (UNESCO/IOC)

- Discussion and planning of the IOC co-operation with the Floating University Programme (26-27.03)

Dr. J.M. Woodside (Free University, Amsterdam, the Netherlands)

- Planning of the 1996 TTR expedition (20-28. 04)

Prof. E. Bonatti (Institute of Marine Geology, Bologna, Italy)

- Planning of the marine expedition (23-27. 04)

Annex 5

SCIENTIFIC CONFERENCES AND MEETINGS, TO WHICH THE RESULTS OF THE TTR PROJECT WERE PRESENTED IN 1996 BY RESEARCHERS AND STUDENTS OF THE UNESCO-MSU CENTRE

Sedimentary Basins of the Mediterranean and Black Seas, UNESCO-IOC-ESF 4th Post-Cruise Meeting Moscow-Zvenigorod (Russia), 29 January - 04 February

(the list below is given in order of presentations; for the complete list of presentations, see MARINF/100, UNESCO, 1996)

A.E. Suzyumov and V.T. Trofimov – 5 years of the "Floating University".

J.M. Woodside, M.K. Ivanov, A.F. Limonov – TTR Programme: main scientific results.

M.K. Ivanov – Mud volcanism, its origin and geological role.

A. Limonov – Shallow structure of the eastern segment of the Mediterranean Ridge deduced from seismic and sidescan sonar data.

E. Kozlova, E. Akentieva – Main morphological features of the United Nations Rise area.

A. Akhmetjanov, P. Shashkin – Thc Holocene-Upper Pleistocene sands and silts of the Marsili Basin (Tyrrhenian sea). Pathways of transportation, composition and possible sources.

A. Akhmetjanov, M. Ivanov, V. Arkhipov – The Danube Deep-Sea Fan: main features and origin.

G. Akhmanov, J. Woodside, and Shipboard Scientific Party, ODP leg 160 – Lithological and fabric variations of Olimpi area mud breccia samples from ODP Leg 160.

A. Akhmetjanov, O. Krylov, E. Basov, E. Kozlova, G. Akhmanov, and A. Stadnitskaya – Mud volcanoes of Kerch Peninsula: general review (field trip 1995).

E. Basov and L. Meisner – Mud volcanoes of the Taman Peninsula (western Caucasus). Morphology, structure and lithological composition.

A. Stadnitskaya – Composition of organic matter and hydrocarbon gas from recent sediments of the UN Rise area, Eastern Mediterranean Ridge.

I. Belen'kaya – Carbonate mineral assemblage occurring around hydrocarbon vents in the United Nations Rise area, Eastern Mediterranean Ridge.

D. Abezgauz – On the results of pore water studies, Eastern Mediterranean.

A. Egorov and M. Ivanov – Hydrocarbon gases connected with mud volcanoes and vent of the Mediterranean Ridge.

A. Egorov, A. Stadnitskaya, and D. Abezgauz – Gas composition and organic geochemistry investigations of Eastern Mediterranean Ridge sediments during the TTR-5 cruise.

V. Gainanov – Some seismic profiling results of the 1995 TTR cruise.

S. Bouriak – Bright spots on the TTR-5 seismic profiles: is it really gas?

R. Almendinguer – Processing and interpretation of seismic and sidescan sonar data obtained during the TTR-4 cruise in the northwestern part of the Algero-Provencal basin.

E. Akentieva, Tj. van Weering, and N. Kenyon – Processing TOBI sidescan sonar from around the Faeroes.

A. Volkonskaya – Methods of seismic profiling and data processing used in the TTR-5 cruise.

Gas Hydrates. Relevance to World Margin Stability and Climatic Change First Master Workshop. Gent (Belgium), 18-20 September

M.K. Ivanov and J.M. Woodside – Shallow gas and gas hydrates on the Crimean continental margin, Black Sea.

J.M. Woodside, M.K. Ivanov, and Shipboard Scientists of the ANAXIPROBE-96 Expedition – Shallow gas and gas hydrates in the Anaximander Mountains Region, Eastern Mediterranean Sea.

S.V. Bouriak – Accumulations of gas hydrates on the continental slope of the Crimea from the seismic standpoint.

A.N. Stadnitskaya – Composition of organic matter from seabed sediments reflecting gas venting: United Nations Rise, Eastern Mediterranean Ridge.

Gas in Marine Sediments. Fourth International Conference Varna (Bulgaria), 28 September - 9 October

A.F. Limonov and M.K. Ivanov – The United Nations Rise: a new area of mud volcanism and fluid expulsion on the Mediterranean Ridge accretionary complex.

I. Belen'kaya – Hydrocarbon gas-derived authigenic carbonate minerals from the United Nations Rise, Eastern Mediterranean Ridge.

A.N. Stadnitskaya – Extractable organic matter from seabed sediments as an indicator of gas venting. The United Nations Rise (Eastern Mediterranean Ridge).

A.V. Egorov – Hydrocarbon gases in bottom sediments of the Mediterranean Ridge accretionary complex: mud volcanism and fluid seeping influence

Lomonosov Annual Conference. MSU, Moscow (Russia), 23-26 April

A.F. Limonov – The Mediterranean Ridge: its origin, structure, and evolution.

M.K. Ivanov and E.V. Kozlova – Organic matter in mud breccia rock clasts from mud volcanoes of the Black Sea and Mediterranean Ridge.

Annex 6

LIST OF SEMINAR PRESENTATIONS AT THE UNESCO-MSU CENTRE, 1996

17.1	R. Almendinguer	Processing, interpretation, and modelling of sidescan sonar data from the UN Rise area
18.1	E. Kozlova	The seafloor morphology of the United Nations Rise area
23.1	G. Akhmanov	Lithological and fabric variations of Olimpi area mud breccia sampled during ODP Leg 160
23.1	E. Basov	Mud volcanoes of the Taman Peninsula (West Caucasus). Morphology, structure, and lithological composition
29.2	S. Buryak	Influence of pore fluids on the seismic wavefield. (Literature overview)
14.3	M. Ivanov	Scientific aims and schedule of the TTR-6 Cruise
21.3	V.T. Frolov *(Geology Faculty, MSU)*	Submarine weathering (lecture review and slide presentation)
18.4	E. Kozlova	Organic geochemistry of sediments from the UN Rise area
25.4	M. Ivanov	The 1996 cruise plan and schedule
24.10	R. Almendinger	Plans of the research to be done at IFREMER, Brest (France) and perspectives
24.10	S. Buryak	The First Master Workshop on Gas Hydrates, Gent (Belgium) The main results
14.11	E. Basov	Lithology of mud breccia clasts from mud volcanoes of the Kerch and Taman Peninsulas
	A. Limonov	Informational report on Conference 'Gas in Marine Sediments', Varna (Bulgaria)
28.11	E. Akentieva	Large sediments slides on the Faeroe continental margin Results of TOBI data processing
	E. Akentieva	Cyprus seismicity project
19.12	V.N. Kholodov *(Geological Institute, RAS)*	Processes of fluid squeezing out and mud volcano formation (Azerbaijan, West Turkmenistan, and the Ukraine)

Annex 7

LIST OF PUBLICATIONS BY RESEARCHERS AND STUDENTS OF THE UNESCO-MSU CENTRE, 1996

(For the complete list of publications under the TTR project for the period 1991-1995, see "Floating university facility", Annual Report, 1995. UNESCO, 1996)

Abezgauz D. On the results of pore water studies, Eastern Mediterranean. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Akentieva, E., van Weering, Tj. and Kenyon, N. Processing TOBI sidescan sonar from around theFaeroes. In: *Sedimentary Basins of the Mediterranean and Black Seas*. UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Akhmanov, G.G. Lithology of mud breccia from the Mediterranean Ridge. *Marine Geology* (Special issue), 1996, vol. 132, no. 1/4, pp. 151-164.

Akhmanov, G., Woodside, J. and Shipboard Scientific Party, ODP leg 160. Lithological and fabricvariations of Olimpi area mud breccia samples from ODP Leg 160. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Akhmetjanov, A., Krylov, O.,Basov, E., Kozlova, E., Akhmanov, G. and Stadnitskaya A. Mud volcanoes of the Kerch Peninsula: general review (field trip, 1995). In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Akhmetjanov, A., Ivanov, M., Arkhipov A. The Danube Deep-Sea Fan: main features and origin. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Akhmetjanov, A., Shashkin, P. The Holocene-Upper Pleistocene sands and silts of the Marsili Basin (Tyrrhenian sea). Pathways of transportation, composition and possible sources. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Almendinguer, R. Processing and interpretation of seismic and sidescan sonar data obtained during the TTR-4 cruise in the northwestern part of the Algero-Provencal basin. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Basov, E.I. and Ivanov, M.K. The Late Quaternary mud volcanism in the deep part of the Black Sea. *Litologiya i Poleznye Iskopaemye*, 1996. No 2, pp.215-221. (in Russian).

Basov E. and Meisner, L. Mud volcanoes of the Taman Peninsula (Western Caucasus). Morphology, structure and lithological composition. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01- 04.02. MARINF/100, UNESCO, 1996

Belen'kaya, I. Carbonate mineral assemblage occurring around hydrocarbon vents in the United Nations Rise area, Eastern Mediterranean Ridge. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Belen'kaya, I. Hydrocarbon gas-derived authigenic carbonate minerals from the United Nations Rise, Eastern Mediterranean Ridge. *Gas in Marine Sediments. Environmental Impact.* 4th Int. Conf. Varna, Bulgaria, September 28-30, 1996 (abstract).

Belen'kaya, I. Gas-related authigenic minerals in recent sediments (Mediterranean Ridge and Black Sea). *Gas Hydrates. Relevance to World Margin Stability and Climatic Changes.* First Master Workshop. Gent, Belgium, September 18-20. Abstracts, pp. 56-57.

Bouriak, S.V. Bright spots on the TTR-5 seismic profiles: is it really gas? In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Bouriak, S.V. Accumulations of gas hydrates on the continental slope of the Crimea from the seismic standpoint. *Gas Hydrates. Relevance to the World Margin Stability and Climatic Changes.* First Master Workshop. Gent, Belgium, September 18-20. Abstracts, pp. 61-62.

Cifci, G., Dimitrov, L., Gainanov, V., and Limonov, A. Investigations of the mud volcanoes at the Eastern extension of the Mediterranean Ridge. *11th Petroleum Congress of Turkey*, 1996, Ankara, pp. 49-57

Cita, M.B., Ivanov, M.K. and Woodside, J.M. (Eds): The Mediterranean Ridge Diapiric Belt. *Marine Geology* (Special Issue) Vol. 132, No.1/4, 1996, 273 pp.

Egorov A. and Ivanov, M.: Hydrocarbon gases connected with mud volcanoes and vent of the Mediterranean Ridge. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow- Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Egorov, A., Stadnitskaya, A. and Abezgauz, D.: Gas composition and organic geochemistry investigations of Eastern Mediterranean Ridge sediments during the TTR-5 cruise. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Egorov A. and Ivanov, M.: Hydrocarbon gases connected with mud volcanoes and vent of the Mediterranean Ridge. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow- Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Egorov, A., Stadnitskaya, A. and Abezgauz D.: Gas composition and organic geochemistry investigations of Eastern Mediterranean Ridge sediments during the TTR-5 cruise. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Gainanov, V.G. Mud volcanoes, gas accumulations and gas hydrates in the deep Black Sea and Mediterranean Ridge according to seismic data. *Gas in Marine Sediments. Environmental Impact.* 4th Int. Conf. Varna, Bulgaria, September 28-30, 1996 (abstract).

Ivanov M.K. Mud volcanism, its origin and geological role. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Ivanov, M.K. and Limonov, A.F. Mud volcanism in the Black and Mediterranean Seas. In: *Oil and Coal Basins in Russia* (Ed. B.A.Sokolov). Moscow: MGU, 1996, pp. 205-231 (in Russian).

Ivanov, M.K., Limonov, A.F., and Cronin B.T. (Eds.). Mud volcanism and fluid venting in the Eastern part of the Mediterranean Ridge. Initial results of geological, geophysical and geochemical investigations during the 5th Training-through-Research Cruise of R/V Professor Logachev (July-September 1995). *UNESCO Reports in Marine Science*, 1996, No 68, 126 pp.

Ivanov, M.K., Limonov, A.F., van Weering, Tj.C.E. Comparative characteristics of the Black Sea and Mediterranean Ridge mud volcanoes. *Marine Geology* (Special issue), 1996, vol. 132, No 1/4, pp. 253-272

Ivanov, M.K. and Woodside, J.M. Shallow gas and gas hydrates on the Crimean continental margin, Black Sea. *Gas Hydrates. Relevance to World Margin Stability and Climatic Changes.* First Master Workshop. Gent, Belgium, September 18-20. Abstracts, pp.46-47.

Kozlova, E., Akentieva E. Main morphological features of the United Nations Rise area. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Limonov, A. Shallow structure of the Eastern segment of the Mediterranean Ridge deduced from seismic and sidescan sonar data. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Limonov, A.F. Shallow structure of the Eastern part of the Mediterranean Ridge deduced from seismic and sidescan sonar data. *Geomarine Letters* (submitted).

Limonov, A.F. and Ivanov, M.K. The United Nations Rise: a new area of mud volcanism and fluid expulsion on the Mediterranean Ridge accretionary complex. *Gas in Marine Sediments. Environmental Impact.* 4th Int. Conf. Varna, Bulgaria, September 28-30, 1996 (abstract).

Limonov, A.F., Ivanov, M.K., Meisner, L.B., Glumov, I.F., Krylov, O.V., and Kozlova, E.V. New data on the structure of the sedimentary cover in the Sorokin Trough (Black Sea). *Vestnik Moskovskogo Un-ta. Geologiya* (in Russian, submitted)

Limonov, A.F., Woodside, J.M., Cita, M.B., and Ivanov, M.K. The Mediterranean Ridge and related mud diapirism: a background. *Marine Geology* (Special issue), 1996, vol. 132, no 1/4, pp. 7-19.

Limonov, A.F., van Weering, Tj.C.E., Kenyon, N.H., Ivanov, M.K., and Meisner, L.B. Seabed morphology and gas venting in the Black Sea mud volcano area: observations with the MAK-1 deep-tow sidescan sonar and bottom profiler. *Marine Geology* (in press).

Morris, S.A., Kenyon, N.H., Limonov, A.F., and Alexander, J. Downstream changes in large-scale bedforms in turbidites around the Valencia Channel Mouth, NW Mediterranean: implications for paleoflow reconstruction. *Sedimentology* (submitted)

Morris, S.A., Alexander, J., Kenyon, N.H., and Limonov, A.F. Turbidites around an active fault scarp on the lower Valencia Fan, Northwestern Mediterranean. *Geomarine Letters* (submitted).

Palanques, A., Kenyon, N.H., Alonso, B., and Limonov, A.F., 1996. Erosional and depositional patterns in the Valencia Channel Mouth: an example of a modern channel-lobe transition zone. Marine Geophysical Research, vol. 18 pp. 103-118.

Stadnitskaya, A. Composition of organic matter and hydrocarbon gas from recent sediments of the UN Rise area, Eastern Mediterranean Ridge. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Stadnitskaya, A.N. Extractable organic matter from seabed sediments as an indicator of gas venting. The United Nations Rise (Eastern Mediterranean Ridge). *Gas in Marine Sediments. Environmental Impact.* 4th Int. Conf. Varna, Bulgaria, September 28-30, 1996 (abstract).

Stadnitskay, A.N. Composition of organic matter from seabed sediments reflecting gas venting; the United Nations Rise, Eastern Mediterranean Ridge. *Gas Hydrates. Relevance to World Margin*

Stability and Climatic Changes. First Master Workshop. Gent, Belgium, September 18-20. Abstracts, pp. 71-72.

Volgin, A.V. and Woodside, J.M. Sidescan sonar images of mud volcanoes from the Mediterranean Ridge: possible causes of variations in backscatter intensity. *Marine Geology* (Special issue), 1996, vol. 132, no 1/4, pp. 39-54

Volkonskaya, A. Methods of seismic profiling and data processing used in the TTR-5 cruise. In: Sedimentary Basins of the Mediterranean and Black Seas (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. *MARINF/100*, UNESCO, 1996

Woodside, J.M., Ivanov, M.K. and Shipboard Scientists of the ANAXIPROBE-96 Expedition. Shallow gas and gas hydrated in the Anaximander Mountains Region, Eastern Mediterranean Sea. *Gas Hydrates. Relevance to World Margin Stability and Climatic Changes*. First Master Workshop. Gent, Belgium, September 18-20. Abstracts, pp. 48-49

Woodside, J.M., Ivanov, M.K., and Limonov, A.F.: TTR Programme: main scientific results. In: *Sedimentary Basins of the Mediterranean and Black Seas* (UNESCO-IOC-ESF 4th Post-Cruise Meeting. Moscow-Zvenigorod (Russia), 29.01-04.02. MARINF/100, UNESCO, 1996

Woodside, J.M. and Volgin, A.V. Brine pools associated with Mediterranean Ridge diapirs: an interpretation of echo-free patches in deep-tow sidescan sonar data. *Marine Geology* (Special issue), 1996, vol. 132, no. 1/4, pp. 55-62.