Floating University Facility

Training Through Research Programme

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

CONTRIBUTION TO THE INTERNATIONAL YEAR OF THE OCEAN

TRAINING, EDUCATION AND MUTUAL ASSISTANCE (TEMA) PROGRAMME
INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

Annual Report, 1997

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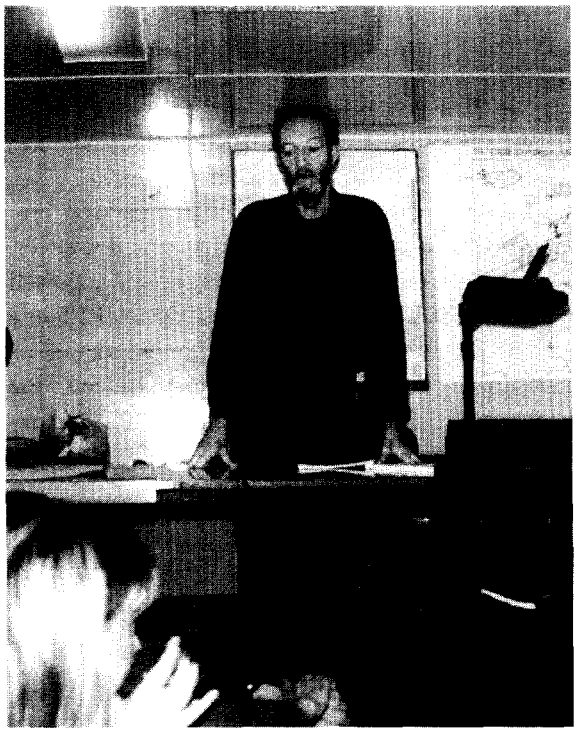
Activities described in this report represent part of the overall international 'Training-through-Research' (TTR) programme, also referred to as the 'Floating University'. Most of the TTR activities are inter-linked and inter-dependent. The present report covers activities carried out by, or with the participation of, researchers and students from the UNESCO-MSU Research and Training Centre for Marine Geology and Geophysics. Given the international co-operative nature of the TTR programme, this document reports on the jointly executed projects. The important role of all co-operating partners from many countries in the implementation of the programme is fully recognized and appreciated.

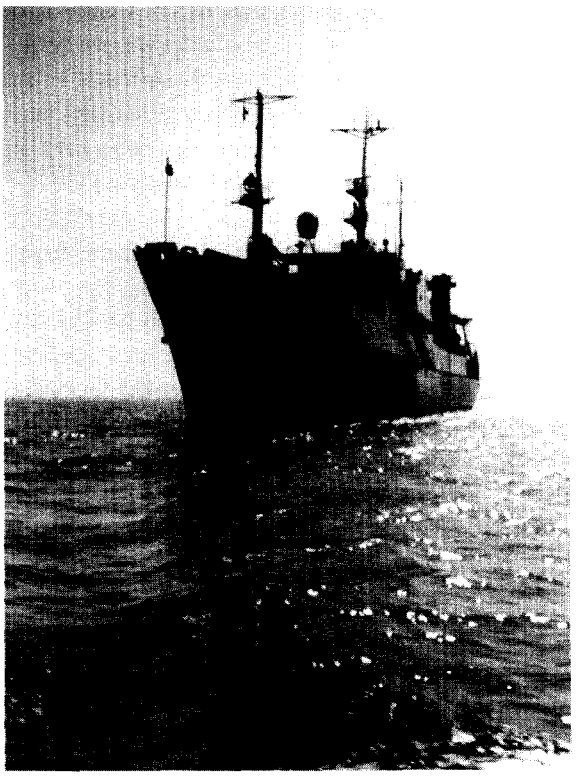
THE TRAINING-THROUGH-RESEARCH PROGRAMME

The Training-through-Research (TTR) programme, designed in 1990 by an international group of scientists under the auspices of UNESCO, continues to benefit from the advantages provided by the combination of the training of students and young scientists with 'cutting-edge' research in the field of geomarine sciences. Since 1996, the programme has been co-sponsored by the Intergovernmental Oceanographic Commission (IOC) of UNESCO through its Training, Education and Mutual Assistance (TEMA) programme.

The TTR programme is managed by the Executive Committee (Co-ordinator Dr. N. Kenyon, Southampton Oceanography Centre, UK). The Scientific Committee of the programme is responsible for formulating research tasks and targeting the TTR cruises.



Dr. Neil Kenyon (Southampton Oceanography Centre, UK), the TTR co-ordinator and TTR-7A Co-chief Scientist, presenting the programme of the cruise to the shipboard party.



The R/V Professor Logachev *at sea*

The annual cycle of the TTR programme includes: (i) preparation of TTR cruises by the Executive and Scientific Committees; (ii) TTR cruises, with (when possible) mid-cruise workshops for the participants and invited scientists; (iii) preliminary data processing, preparation and publication of scientific reports; (iv) post-cruise conference to present and discuss the results of ongoing analyses and interpretation of data, and to co-ordinate with other regional studies; and (v) preparation of scientific publications.

Between 1991-1997, seven major TTR cruises, five mid-cruise workshops and five post-cruise conferences were organized, in addition to a number of other field exercises (including smaller cruises), group and individual training activities, presentation and publication of the research results.

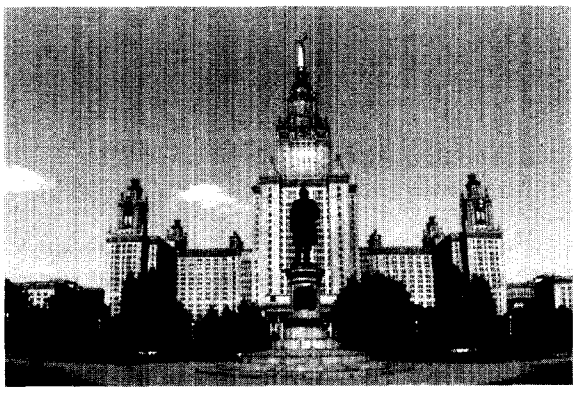
UNESCO-MSU CENTRE: ITS MISSION AND STRUCTURE

The scientific and educational activities of the UNESCO-MSU Research and Training Centre for Marine Geology and Geophysics, affiliated with the Geology Faculty of the Moscow State University (MSU), aim to provide 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 (Annex 1).

The Centre operates under the following arrangements. MSU provides the staff of the Centre (currently six persons). Six postgraduate and five undergraduate students from different departments of the Geology Faculty are involved on a permanent basis in various projects. Some 15 undergraduate students became involved in the Centre's training activities.

The Centre has three branches: (i) Marine Geology and Sedimentology (including Micropaleontology), (ii) Seismics and Geoacoustics, and (iii) Geochemistry. It provides various laboratory and computing facilities and is supported by a series of central services provided by MSU, such as libraries, analytical laboratories, e-mail service, Science Park, etc. It co-operates 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 Russia's Academy of Sciences and the Ministry of Natural Resources (Annex 1).

'Training-through-Research' in action: Dr. M. Ivanov, Co-chief Scientist of the TTR-7A cruise, and students extracting a long sedimentary column from a gravity corer.



Moscow State University main building with the statue of its organizer Mikhail Lomonosov.

In 1997, funds for research and training were provided by the Russia's Ministry of Natural Resources, Ministry of Science and Technology, MSU, as well as by UNESCO and its IOC. The CORSAIRES and ENAM projects of the European Union, as well as institutions in Belgium, Denmark, Ireland, the Netherlands, Portugal, Turkey and the UK contributed to joint field activities. All the above contributions are sincerely acknowledged (Annex 2).

RESEARCH AND TRAINING ACTIVITIES OF THE CENTRE IN 1997

Research projects

A number of research projects, mostly regional, continued to be carried out at the Centre by the MSU research staff and students, in co-operation with national and foreign universities and research institutions. This includes:

In the Mediterranean/Black Sea regions:

1. Mud volcanism in the Eastern Mediterranean and Black Seas;
2. Evolution of the Eastern Mediterranean based on lithology of mud breccia matrix and clasts recovered from the Mediterranean Ridge mud volcanoes;
3. Organic matter in rock clasts from mud volcano breccia;
4. Pore water composition from bottom sediments;
5. Structure and composition (including isotope composition) of recent carbonate nodules and crusts;
6. Structure and evolution of the Anaximander Mountains area;
7. Gas and gas hydrate composition from the Mediterranean and Black Seas.

In the North Atlantic region:

1. Deep-water carbonate mounds;
2. Possible relation between the mounds and gas venting on the seafloor (organic geochemistry, gas content);
3. Coarse sediments in deep sea depositional systems;
4. Slope instability;
5. Analyses of seismic and acoustic images of deep sea coral reefs;
6. Influence of turbiditic flows on deep sea clastic sedimentation;
7. Correlation between magnetic susceptibility and lithologies of the sediments.

Projects of general nature:

1. Acoustic anomalies in the uppermost sediments of deep sea basins;
2. Dependence of backscattering on lithology from multibeam and sidescan sonar data;
3. Digital processing of seismic and acoustic images.

Field activities

In 1997, TTR field activities included a series of successive and mutually supportive cruises. The TTR-7A cruise aboard the R/V *Professor Logachev* was carried out in the NE Atlantic and the TTR-7B cruise aboard the R/V *Akademik Boris Petrov* was carried out in the Eastern Mediterranean. Three other cruises in the North Atlantic, on board the R/V *Belgica* (to the Porcupine Basin, NE Atlantic), the R/V *Pelagia* (to the Rockall Trough Area, NE Atlantic) and the R/V *Professor Logachev* (to the SE Greenland margin) not being the official part of the TTR programme, served however the same 'training-through-research' purposes. All the above cruises were attended by the Centre's research staff and/or students.

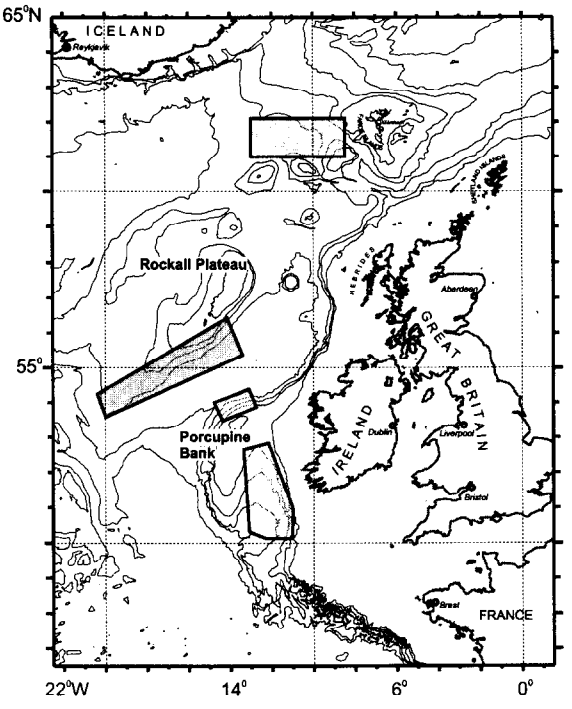
TTR-7A Co-chief Scientists, Dr. J-P. Henriet (right) and Dr. M. Ivanov, in Brest before the Logachev *departure for Leg 2*

The summer 1997 field activities contributed to the preparation of the International Year of the Ocean (1998) in a number of ways. Thus, during the Lisbon port call of the *Logachev* at the end of June, a few hundred visitors became acquainted with this and other IOC-supported activities. Brochures and reports were distributed. Several articles were published in the local press (including the *EXPO'98 Information Bulletin*, September, 1997). Information regarding the programme was distributed, via local media, in other port calls as well.

■ *TTR-7A Cruise in the NE Atlantic*

The Training-through-Research Cruise-7A was carried out from 1 July to 16 August 1997 in the NE Atlantic Ocean. A total of 58 people (scientists, technicians, post- and undergraduate students) from Belgium, Denmark, France, Ireland, Italy, the Netherlands, Russia and the UK took part in the expedition aboard the R/V *Professor Logachev*, which belongs to the Ministry of Natural Resources (Annex 3). The MSU team consisted of 22 participants (five scientists, eight post-graduate and nine undergraduate students). Nineteen specialists (engineers and technicians) from the Polar Expedition (St. Petersburg) of the Ministry of Natural Resources provided technical support. Co-chief Scientists of the expedition were: for Leg 1 Dr. Mikhail Ivanov (Russia), Dr. Jean-Pierre Henriet (Belgium) and Dr. Pat Shannon (Ireland), and for Leg 2 Dr. Mikhail Ivanov, Dr. Neil Kenyon (UK) and Dr. Tove Nielsen (Denmark).

The cruise fell within the IOC/TEMA programme, as well as two major projects of the European Union: CORSAIRES (co-ordinator Dr. J-P. Henriet, Belgium) and ENAM (co-ordinator Dr. J. Mienert). It was supported by IOC, the two above-mentioned European projects, Russia's Ministry of Natural Resources and Ministry of Science and Technology, and several European institutions (Annex 2). Assistance was also provided by the Portuguese National Commission for UNESCO. The Organizing Committee of EXPO'98 (Portugal) financially supported the port call at Lisbon.

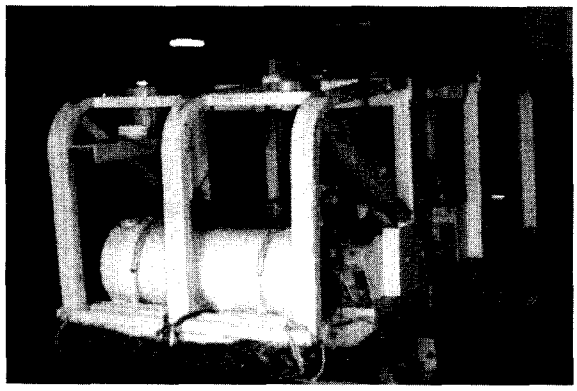


TTR-7A location map

The principal aim of the cruise was to provide advanced training to students from the participating countries through enhanced international co-operation in the field of marine geosciences. Its major scientific objectives were to study:

- deep-water carbonate (coral) mounds,
- slope instability processes on the NE Atlantic European margin and
- deep-sea depositional systems.

TTR-7A shipboard party, Leg 1



Underwater photo and TV system on the Logachev

The geographical settings of the study areas, selected during the cruise from the original proposal, were as follows:

- Porcupine Seabight , SW of Ireland;
- northern margin of the Porcupine Bank, west of Ireland;
- south-eastern part of the Rockall Plateau and the north-western Rockall Trough, NW of Ireland;
- western continental margin of the Faeroe Islands.

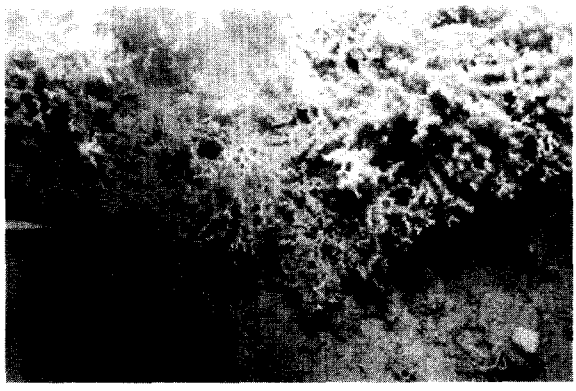
The following set of geological-geophysical methods was applied to achieve the understanding of the bottom and shallow subbottom geology of those areas:

- six-channel seismic reflection profiling with 2.5 and 3-litre airguns as a source, accompanied by OKEAN long-range sidescan sonar survey (with a swath range of 10.2 km);
- OREtech medium/short-range deep-towed sidescan sonar survey (with a swath range of 2 and 0.5 km respectively) of the selected bottom objects, accompanied by subbottom profiling;
- underwater TV recording and photography;
- bottom sampling with
  - (a) large-diameter gravity corer;
  - (b) kasten-corer;
  - (c) box-corer;
  - (d) dredge, and
  - (e) TV-controlled PREUSSAG grab-sampler.

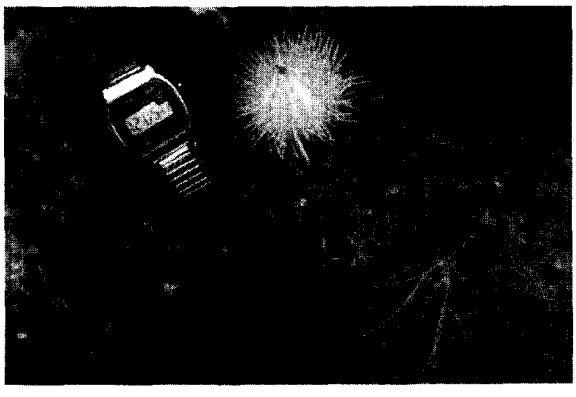
A dredge takes bottom sediments and biological samples aboard the Logachev

The cruise consisted of two legs, with partial change of participants at Brest (France). Leg 1 (1-22 July) started from Lisbon (Portugal), where the Russian team embarked onboard the ship. During a transit to Dublin (Ireland), where the first group of the West-European participants joined the expedition, the equipment was prepared and tested. After the termination of this Leg, all the cruise participants took part in the "Core Logging" Workshop of the CORSAIRES project, which was held at IFREMER (Brest, France) between 24-25 July; a geological excursion to the south of Brest was organized as well.

Leg 2 (26 July-16 August) started from Brest and terminated at Aberdeen (Scotland).



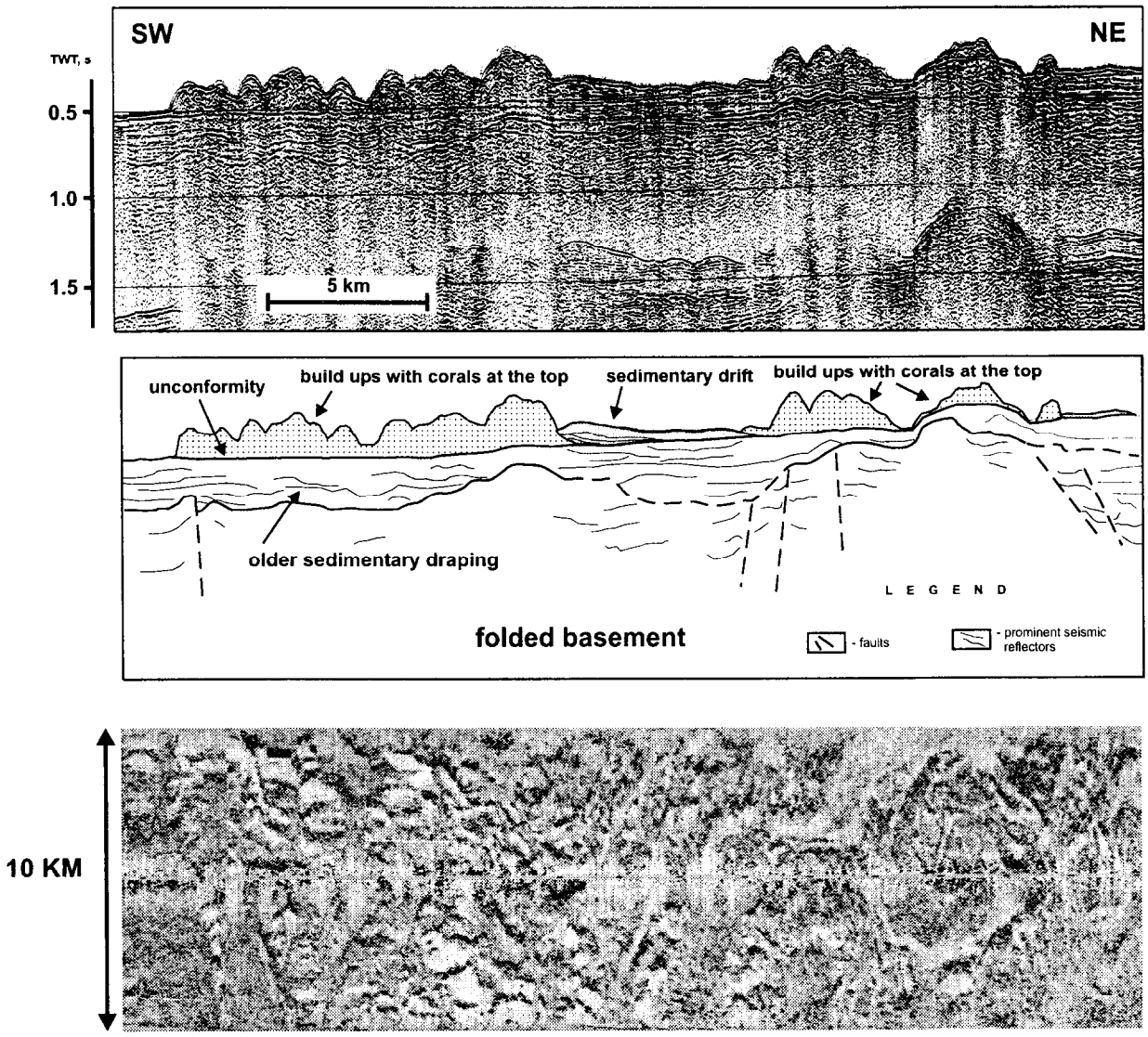
Cold water corals growing at the depth of 1000 m



Biological samples from the top of one of the carbonate mounds, TTR-7A cruise

THE CRUISE PARTICIPANTS' REPORT

During the cruise, 31 seismic and OKEAN lines (total length is over 1485 km) and 15 OREtech lines (around 350 km) were run; bottom sediment samples were taken at 73 sites. Four TV and bottom photography profiles crossed morphologically different carbonate (coral) mounds. The data were shared between the participating organizations for further

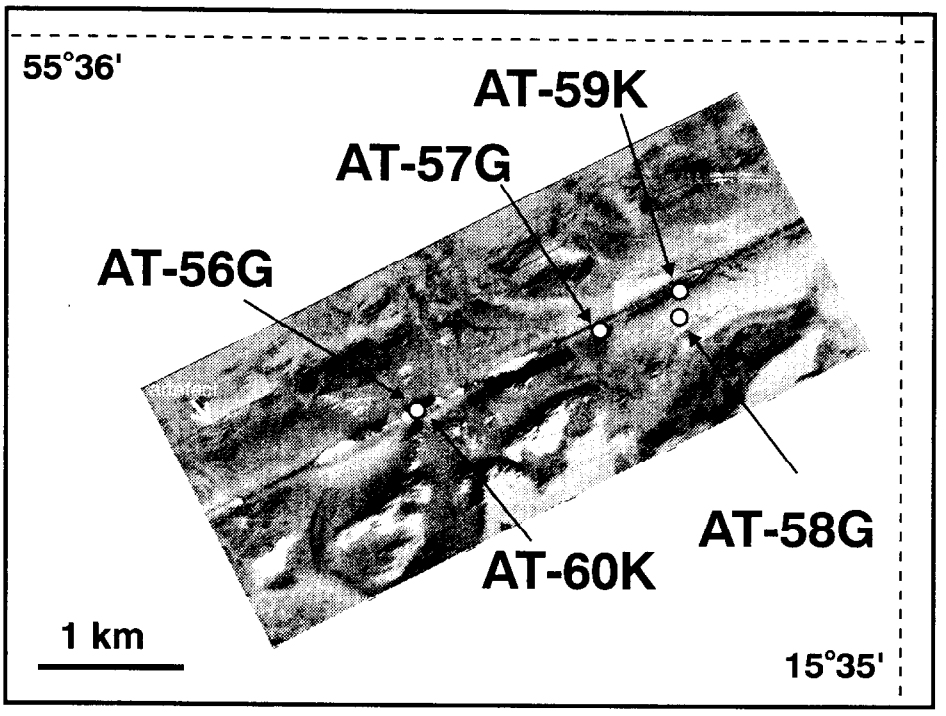


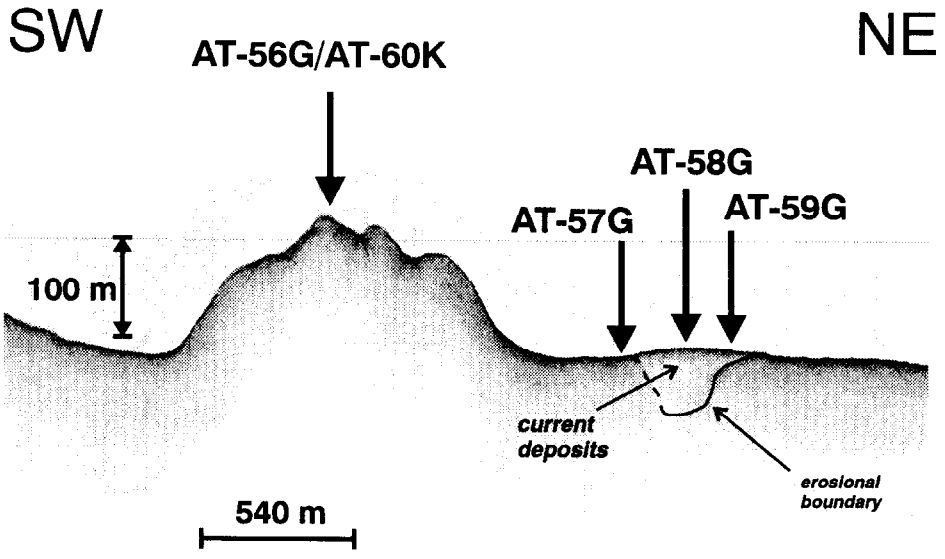
Record of seabed mounds (Rockall Plateau). Shown are: a seismic line (upper), its interpretation (middle) and the corresponding OKEAN side-scan record (bottom).

processing and analysis. Several agreements were achieved regarding future co-operative work in this respect. Although many scientific problems are still to be resolved, the results obtained during the TTR-7A cruise are judged as successful.

Major attention was given to seabed mounds discovered recently at depths of 500 to 1000 m which were suspected to be built up by deep, cold water corals. Subbottom currents south-east from the Faeroe Islands and canyon systems on the north-eastern continental margin of Europe were the focus of investigations as well. The following were among the most important scientific highlights of the cruise:

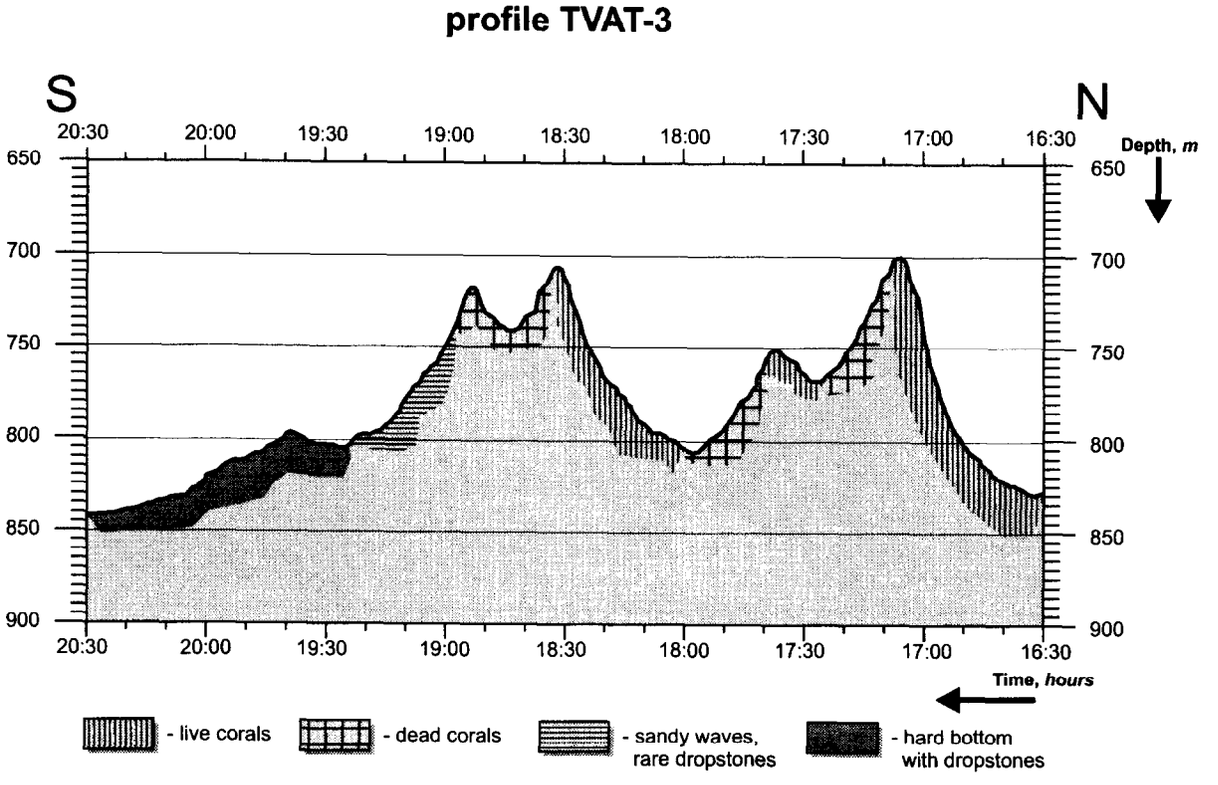
- It was recognized that huge quantities of carbonates are found within cold water carbonate mounds, which are up to 400 m high and 5 km long and vary widely in shape. Over 150 mounds were mapped on just a small part of the slopes of the Rockall Trough and Porcupine Seabight that lie to the west of Ireland.
- Advancement was achieved – from biological, geochemical and sedimentological studies – in understanding why carbonate mounds occur. The importance of fast flowing currents to the growth of cold water corals, the main growth builder of the mounds, was clearly demonstrated as was their preference for pre-existing raised platforms from which to develop. Moulding of mounds by prevailing currents was also clearly seen. The results of geochemical analyses will have to show whether evidence exists that coral growth is promoted by methane seepage up faults.



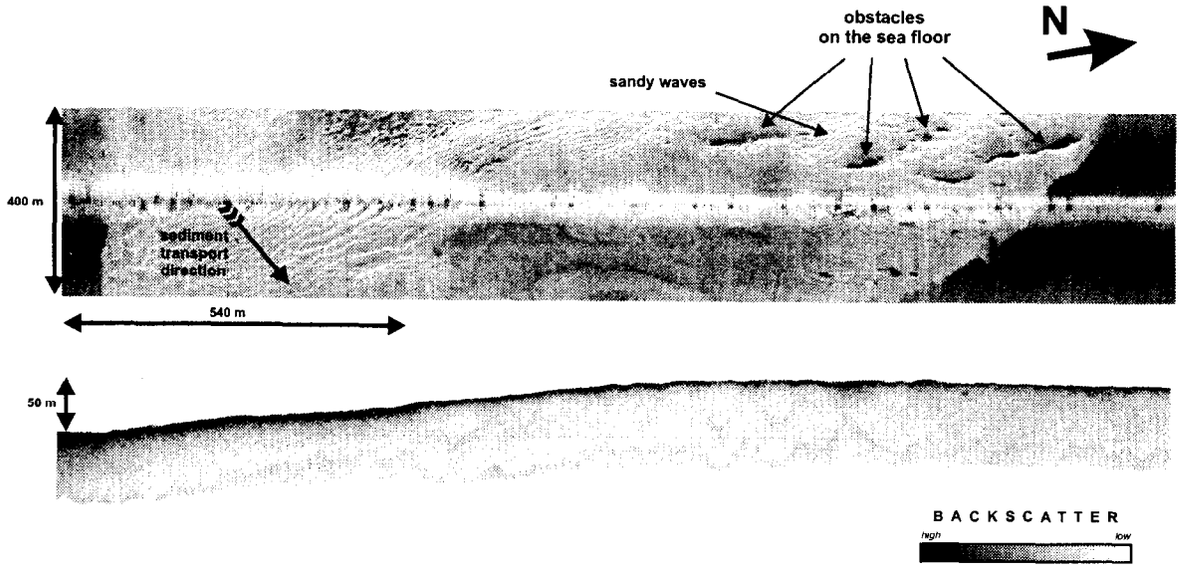


Fragment of OREtech 30 kHz SSS and subbottom profiler records and position of coring stations

- Deep-water trawling damage to corals on the upper slope is demonstrated from sidescan sonar data, but the corals appear to regenerate fairly rapidly.
- Contour currents are one of the main forces in the shaping of slopes in the region. Sandy contourites are rarely recognised in studies of either ancient or modern sediments but are shown to be very significant in this part of the Atlantic Ocean. Sidescan sonar proved the most effective way to map the pathways of strong currents with a resolution of 100 kHz mode showing a patch of low backscatter with regular wavy pattern. A hitherto unknown strong northward current was discovered by this method in the Porcupine Seabight. Strong currents were also sweeping sands along the upper slope east of Rockall Bank and along the slope west of Porcupine Bank. Complex channels shaped by the cold, salty overflow water from the Norwegian Sea were mapped in the Iceland Basin.
- A giant submarine slide was discovered on the Southern Rockall Bank. At least 60 miles wide, it has apparently overwhelmed carbonate mounds growing in the area but they have promptly re-established themselves.



Asymmetry in coral distribution seen in a deep-tow TV profile

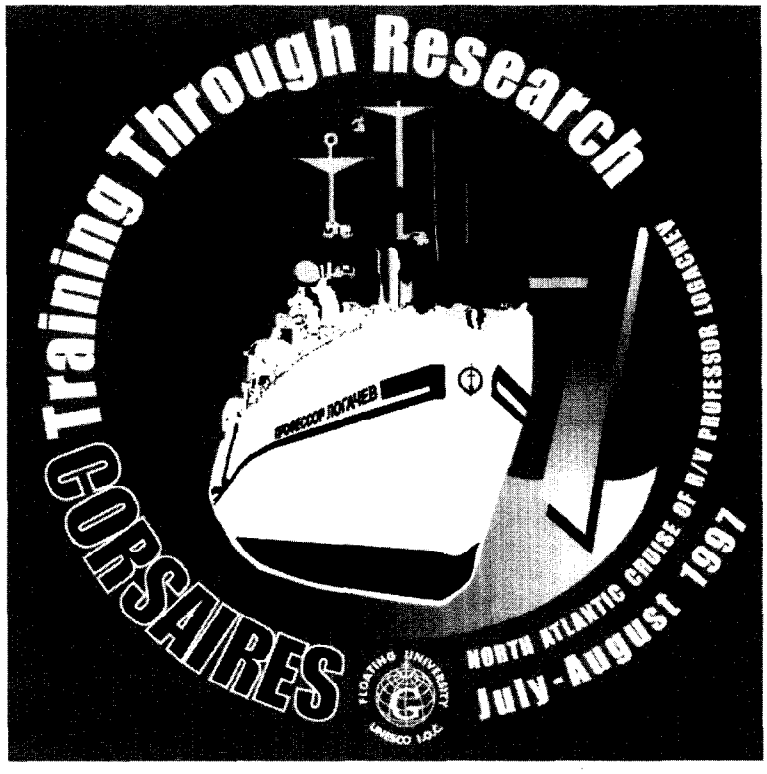


Fragment of OREtech side-scan sonar record (line orat-14) with resolution of 100 kHz mode showing a patch of low backscatter with regular wavy pattern. This record is interpreted as an area of coarse sediment (strong backscatter) covered with thin layer of fine to medium-grained, well sorted sand. Wavy pattern indicates presence of bottom current directed almost to the east as derived from wave asymmetry. Wavelength for waves visible in the middle part of the sonogram is about 10 m and it is about 20 m for those seen at the left part. Wave height is about 2.3 m. Several south-north elongated obstacles seem to affect a pattern of wave distribution in the way that wave crests are oriented along a local slope. Southeast Rockall Bank margin (55°31.2 N; 15°49.2 W) at the depth of about 800 m.

Group of students making sub-sampling aboard the Logachev

It was concluded that the sidescan sonar is clearly an important tool for physical oceanographers in studying such currents, and for fisheries researchers in identifying such potential hazards as coral mounds.

The shipboard educational program included everyday training provided to the students by involving them in data collection and interpretation. A series of lectures and seminars was given (practically on a daily basis) by the cruise scientists and postgraduate students on a wide range of subjects related to various oceanographic, geological, geophysical and biological subjects. Undergraduate students were involved in presentation of preliminary results of the cruise (Annex 4). The "Core Logging" Workshop in Brest served the same 'training-through-research' purpose.



■ *TTR-7B Cruise in the Eastern Mediterranean*

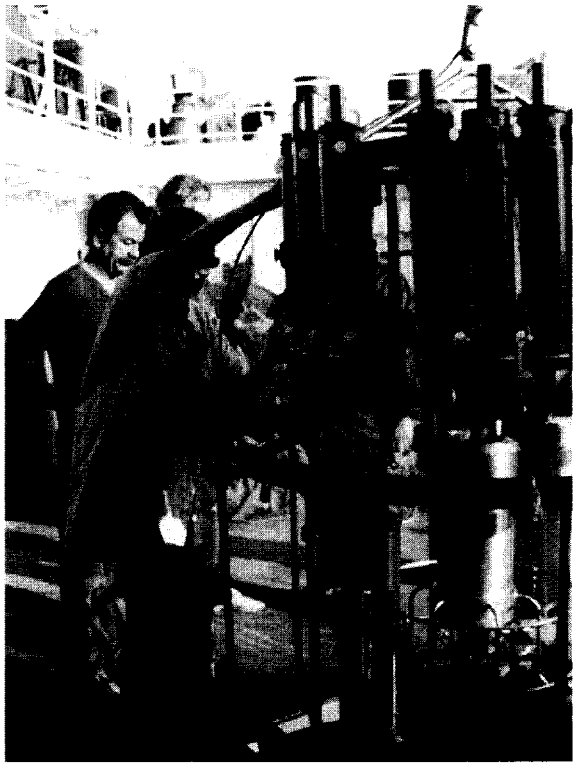
This cruise was organized by the Free University of Amsterdam and carried out between 2 and 8 June in the Eastern Mediterranean (Chief Scientist Dr. J. Woodside). It was funded by the Dutch ANAXIPROBE project. Turkey provided support by granting free passage through the Bosporus Strait and waiving port charges. Aboard the R/V *Akademik Boris Petrov* were 17 students and scientists from Italy, the Netherlands, Russia, Switzerland, Turkey, and the United Kingdom. Five participants (1 scientist, 2 post-graduate and 2 undergraduate students) came from the UNESCO-MSU Centre (Annex 5).

The *Petrov*, built in 1984, belongs to the Vernadsky Institute of Geochemistry and Analytical Chemistry of the Russian Academy of Science. The ship has a displacement of 2600 tons. Its NAVOS 625 integrated navigation system continuously determines the position of the vessel and automatically steers the vessel along the desired research lines.

This expedition focused on the neotectonics and the phenomenon of mud volcanism and sea floor fluid seeps in the region of the Anaximander Mountains. The following geological-geophysical methods were used:

- A low-frequency Hollming "Echos 15/625" Narrow Beam Multibeam Echosounder System was used to make a bathymetric map of the seafloor. This system is a hydrographic 15-beam mapping echosounder to portray the sea bed directly beneath and to the port and starboard side of the underway research vessel. Its operation is based on a crossed fan beam echosounding principle. The position and course/speed data come from the ship's DR (deduced reckoning) navigational computer. The scale of plots varies from 1:25000 to 1:100000. The accuracy of investigations appeared to be 3%; the water depth and isobaths were drawn every 50 m.
- Water sampling was carried out with the US-made MK III Neil Brown CTD/ROSETTE System, which is used for measuring of pressure, temperature, salinity and conductivity, and for taking water samples from different sea levels at a water depth of up to 6000m.
- Bottom sampling was done with
  (a) small-diameter gravity corer;
  (b) dredge;
  (c) grab.

The TTR-7B shipboard party



Water sampling from the CTD/ROSETTE System, TTR-7B cruise

The cruise started and terminated at Antalia (Turkey). An excursion in the Taurus Mountains (southern Turkey) was organized in the area which was shown during the TTR-6 cruise in 1996 to be the onshore continuation of the Anaximander Mountains.

THE CRUISE PARTICIPANTS' REPORT
(contributed by Dr. J. Woodside, the cruise Chief Scientist, and the shipboard party)

During this expedition geological and geophysical investigations were carried out in the region of the Anaximander Mountains. At least one new mud volcano was discovered and named Ottawa. The

CTD/ROSETTE System was used three times for water-sampling from different levels. Twenty-nine water samples were collected using twenty-four bottles, each bottle has a volume of 1.7 l.

A total of sixteen stations were selected for sampling during the cruise (12 gravity core-, 2 box-core- and 2 dredge-stations). Sampling sites were chosen on the basis of the bathymetric and bottom reflectivity data obtained in 1995 during the multibeam echosounder EM-12D survey and from the acoustic images of the MAK-1 deep-towed sidescan sonar system obtained during the TTR-6 cruise.

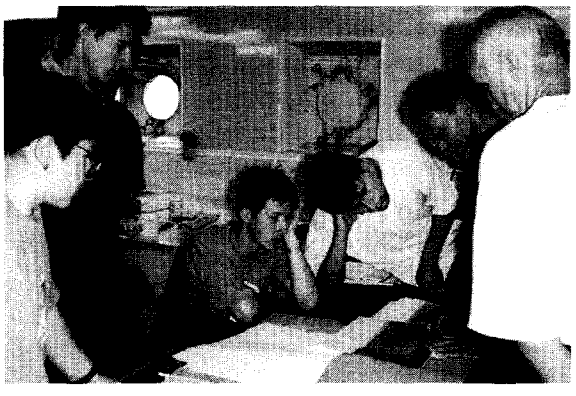
Two sites were dredged during this cruise. The first one was located on the SE flank of a NE-SW going ridge between the Anaximenes and Anaxagoras Mountains. Here, the objective was to collect outcropping rocks and eventually find similarities between these and the ones that are exposed on land in the southern Turkey. The fragments of ancient turbidity layers (flysch formation) found in the dredge haul may be correlated with the Miocene flysch known from the southern Turkey.

The second site was located on a low angle slope on the western part of the Anaximander Mountains where evidence of gas escape was recorded on the MAK-1 sidescan sonar and subbottom profiler during the TTR-6 cruise. The pelagic sediments recovered there were typical for the uppermost part of the Quaternary sequence in the Eastern Mediterranean. However, no direct evidence of the presence of gas was found.

In addition to practical experiences in data collection and interpretation, the participants were given a series of lectures on geological processes in the Mediterranean Sea and the Atlantic Ocean (Annex 6).

■ *The Denmark Strait Expedition*

This expedition, organized by the Faculty of Earth Sciences, Free University of Amsterdam, was carried out on the *Logachev* from August 16 to September 15 on the SE Greenland margin. The cruise started in Aberdeen (Scotland) and terminated at Kiel (Germany). An excursion on the geology of Iceland was organized on September 8 during the Reykjavik (Iceland) port call. Twenty-four scientists, post- and undergraduate students and technicians from Denmark, the Netherlands, Sweden, Russia, Canada and the UK participated. The MSU team consisted of 10 participants (2 scientists, 5 post-graduate and 3 undergraduate students, Annex 7). The cruise Chief Scientist was Dr. Simon Troelstra (Free University of Amsterdam), Co-chief Scientist was Antoon Kuijpers (Geological Survey of Denmark and Greenland - GEUS, Denmark). The cruise focused on the late Quaternary overflow history of the Denmark Strait Pathway. This expedition was not an official part of the TTR programme, however with a number of students on-board it served the TTR purpose.



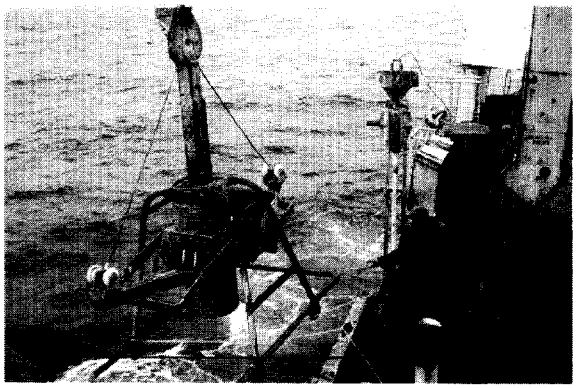
Dr. A. Kuijpers, the expedition Co-chief Scientist, discussing the results of a seismic survey with students

The following set of geological-geophysical methods was used:

- six-channel seismic reflection profiling with 3-litre airguns as a source;
- OREtech medium-range deep-towed sidescan sonar swath survey (with a swath range of 2 km respectively) of the sea-bottom surface;
- oceanographic investigations with:
  - (a) hydro-bios plankton-net;
  - (b) waterbottles;
  - (c) planktonpump;
  - (d) seasurface temperature (SST) measurements;
- bottom sampling with:
  - (a) Alpine piston-corer, modified by NIOZ;
  - (b) cylindrical HAJA box-corer;
  - (c) TV-controlled PREUSSAG grab-sampler;
- magnetic susceptibility survey was executed using a Bartington MS2C core scanning sensor.

THE CRUISE PARTICIPANTS' REPORT
(contributed by Dr. S. Troelstra, the cruise Chief Scientist, and the shipboard party):

Preliminary station positioning in the northern part of the research area was based on existing multichannel seismic data collected by GEUS. Precision position-



Box corer and piston corer used during the Denmark Strait Expedition

ing was achieved by interpretation of the OREtech sidescan sonar and sub-bottom profiler records. During the expedition, six sidescan sonar profiles (152 km) and one seismic line (63 km) were shot. The side-scan profiles provided unique records of the east Greenland margin, showing a complete scala of iceberg plough marks on the shelf, glacial channels, mass flow, and turbiditic sediments on the rise and basin floor, and current-induced bedforms characteristic of the present day bottom current regime.

The position of the polar front could accurately be determined by SST measuremcnts. Samples across this front include:

- pumpsamples for foraminiferal DNA research;
- pumpsamples for planktonic foraminiferal assemblages;
- water samples for stable O/C isotopes;
- water samples for reservoir age determination;
- filtered samples for calcareous nannoplankton assemblages; and
- plankton-net samples.

The cores from the E. Greenland basin have a turbiditic Late Glacial base and extended pelagic deglaciation sequences (9 box-core- and 8 piston-core-stations were taken ranging in length from 7 to 11 m). One core is positioned immediately below the Polar Front. It shows 4 m of varved sediment in its lower part, which provides a high age-resolution and may assist in correlation with existing ice-core chronology. Magnetic susceptibility was measured onboard for all cores.

The grab contained a large variety of basaltic, granitic and other lithologies which will provide information on the origin of the icebergs and glacial marine fan sediments. The video-movie shows a seafloor covered by large dropstones.

Co-operation

On 22 October, M. Ivanov visited the Department "Géosciences Marines", IFREMER (Brest, France). He had individual discussions with several scientists on specific subjects of interest to both MSU and IFREMER. In particular, he met with H. Bougault, Director of the Department, P. Cochonat, Head of the laboratory "Environnements sédimentaires" of this Department and J-P. Foucher, IFREMER leader of the joint project on "Mud volcanism in the Eastern Mediterranean and Black Seas". It was concluded that the co-operation between IFREMER and Moscow State University was active and successful until very recently, but would now need a revival. Two main scientific themes are of mutual interest: deep-sea sedimentary depositional systems (deep sea fans, turbiditic systems, small sandy fans) and gas related sedimentary processes (gas seepage, gas hydrates, mud volcanism, slope instability). Both sides agreed on various actions they wish to undertake together within the frame of this co-operation.

A visit was also paid to the "Université de Bretagne Occidentale", Brest. Interest was expressed by both sides in developing co-operation within the TTR programme, specifically in preparation and implementation of the TTR-8 cruise.

The co-operation agreement between the Centre and NIOZ (the Netherlands) continues to be successfully implemented. Under the agreement with the University Paris VI, a training visit of one of the MSU students is planned for early 1998. An agreement for co-operation was concluded with Gent University (Belgium). A Letter of Intent for co-operation was signed between the Centre and the Sedimentary School (the Netherlands).

In accordance with the agreement between UNESCO and MSU (signed in 1994), a UNESCO Chair in Marine Geology and Geophysics continued functioning as part of the Centre, providing educational support to its research projects (for more details, see the corresponding Chapter of the present Report).

UNESCO CHAIR

Research and training activities

(a) During February-April 1997, a research visit by Dr. O. Krylov to the Dokuz-Eylul University (Izmir, Turkey) was devoted to the interpretation of seismic, sidescan (SIMRAD EM 12S) and geological data obtained during the TTR-6 cruise in the Black Sea (1996). The main purpose included the correlation of neotectonic processes with the mud volcanism on the sea floor and the identification of the gas-saturated sediments in the upper part of the sedimentary cover. Data processing and interpretation was carried out in co-operation with Prof. M. Ergun and Dr. G. Cifci of the above university. The results were presented at the International Geophysical Conference (Istanbul, 4-7 July), and two papers were prepared for a joint publication with Prof. M. Ergun and Dr. G. Cifci. Dr. O. Krylov also gave a lecture to the university students and staff on new data on the Black Sea mud volcanism. The visit was financially supported by UNESCO and the Piri Reis Foundation (Izmir, Turkey).

Prof. E. Izdar, Chairman, Piri Reis Foundation (Izmir, Turkey, sitting) with O. Krylov (standing, centre) and scientists of the Dokuz-Eylul University

(b) S. Buryak and P. Shashkin, MSU post-graduate students, visited the University of Gent to participate in gathering and processing geophysical data from the Porcupine Basin (Northeast Atlantic) under the supervision of Dr. J. P. Henriet (7 May-1 July). These data were collected during the R/V *Belgica* cruise in May 13-29, in which they had both participated. The visit was supported by the CORSAIRES Programme and the bilateral Belgium/Russia co-operative project.

(c) A. Akhmetjanov, a MSU post-graduate student, worked (May to November) at the Netherlands Institute for Sea Research (NIOZ) in the framework of an MSU-NIOZ co-operation agreement. His work was done under the supervision of Dr. Tj.C.E. van Weering and included participation in the R/V *Pelagia* cruise from 22 May to 14 June (ENAM-II Programme) in the area of the Rockall Trough (North Atlantic) and in the TTR-7A Cruise of the R/V *Professor Logachev* in the same area. The main subject of this visit was to study the activity of the deep-sea contourite currents and related phenomena on the basis of seismic, side-scan sonar and bottom sampling data. The data obtained were processed at NIOZ and some results were presented at the Second ENAM-II Workshop, which was held on 30 October to 2 November in Kinsale, Ireland. In addition, A. Akhmetjanov was one of the representatives of the MSU team during the Denmark Strait expedition (North Atlantic) onboard the R/V *Professor Logachev* in August-September.

(d) Grigorii Akhmanov, an MSU post-graduate student, was granted, by the President of the Russian Federation, a long-term fellowship (May 1997 - March 1998), which he decided to use to process data obtained during TTR cruises from areas of mud diapirism on the Mediterranean Ridge. Under the supervision of Prof. M.-B. Cita (Milan University), the lithology of mud breccia matrix and clasts recovered from the Mediterranean Ridge mud volcanoes were studied with a view to identifying the source of the material and to reconstruct evolution of the Eastern Mediterranean. Additional study was performed on mud volcanic deposits from cores taken during the Bannok and Eastward cruises (1978, 1981, 1988,

and 1989), stored at the Milan University. A grain size analysis of the fine fraction of mud breccia matrix, the microscopic study and dating of mud breccia clasts were carried out in order to draw up accurately a deep-seated sedimentary succession and the Meso-Cenozoic history of the Eastern Mediterranean. During his stay at Milan University, G. Akhmanov finalized a manuscript devoted to the results of a study of mud breccia recovered during the ODP Leg 160, in which he also made a comparison of these data with the TTR data previously obtained from the same area (accepted for publication in the "Scientific Results, Proceedings of the Ocean Drilling Program"). Different aspects of three-year investigations of the Mediterranean mud volcanism and lithology of mud volcanic deposits were discussed with professors and researchers of Milan University as well as with Prof. Asahiko Taira from the University of Tokyo and Dr. Michael Hannah from Victoria University of Wellington, who visited Milan University at that time. G. Akhmanov was invited to give a few lectures concerning mud volcanism phenomena within the course on marine geology at the Department of Earth Sciences of Milan University. The results achieved during the visit have been included in his doctoral work, scientific guidance for which was provided by scientists of the Geological Faculty of Moscow State University and the Department of Earth Sciences of Milan University.

Dissertation defended

On 10 June, E. Basov presented before the jury of the Geology Faculty and successfully defended his PhD thesis on the "Late Quaternary Mud Volcanism in the Deep-Water Black Sea Basin". Included in this study are the results of geological-geophysical investigations of this phenomenon in the Black Sea deep-water basin (TTR and other cruises) and on Kerch and Taman peninsulas; a comparative analyses of mud breccia from underwater and on-land mud volcanoes is made and similarities of processes demonstrated. Three phases of the Late Pleistocene-Holocene mud volcano activities are described and the oldest (of the identified phases) is shown to be of middle Pleistocene age, this corresponding to the major post-Chaudian regression. Dr. M. Ivanov and Dr. P. Kuprin (both MSU) supervised this work. At various stages of the study, supervision was also provided by Dr. Tj.C.E. van Weering (NIOZ, the Netherlands), Dr. A. Limonov (MSU) and Dr. L. Meisner (NIPI "Okeangeofizica", Gelendzhik, Russia).

Other activities

- Seminars were organized for the students (both post-graduate and undergraduate) involved in the research projects of the Centre. These included: (i) lectures on specific subjects by the MSU and external (including international) staff; (ii) discussions on the research results; assistance in preparing and finalizing papers to be presented at national and international meetings; (iii) selection of papers for various contests; and (iv) assistance in formulating requests for grants etc.;
- Seminars were held for undergraduate students who for the first time would join the TTR programme and cruise(s). These included: (i) selection of capable students based on submissions of candidates by the Geology Faculty Departments; (ii) providing those selected with scientific literature on a region of future field research; (iii) lectures followed by informal examinations (including in English) before departure and (iv) final selection of the cruise participants;
- Supervision of research projects and dissertation works was conducted.

MEETINGS AND WORKSHOPS

Congress "Gas and Fluids in Marine Sediments" (27-29 January, Amsterdam)

The congress was organized and hosted by the Free University of Amsterdam (the Netherlands). It constituted also the post-cruise and annual meeting of the international Training Through Research Programme. The congress was attended by 68 participants from Belgium, France, Germany, Italy, the Netherlands, Russia, Spain, Switzerland, Turkey, United Kingdom and the USA. Fourteen (14) students and scientists from the UNESCO-MSU Centre attended. Of 33 presentations, 14 were given by the above group (Annex 8). The congress results were published as *IOC Workshop Report* No. 129 (1997).

The above publication summarizes the congress results as follows:

In July and August of 1996, the R/V *Gelendzhik* successfully carried out the sixth TTR expedition which conducted its research activities in the Eastern Mediterranean (ANAXIPROBE-1996) and the Black Sea. The theme of the congress arose naturally from this expedition because of the degree of attention paid to the phenomena of gas and fluid venting through the seafloor, sampling and mapping of gas-charged sediments and gas hydrates (including the first gas hydrates sampled from the Mediterranean Sea), and associated mud volcanoes and occurrences of mass sediment movement.

The congress included, therefore, a number of presentations on data analysed in connection with the TTR-6 expedition, especially by students whose research is based on the TTR programme. Among the invited scientists were participants from previous TTR expeditions, scientists involved in the organization and co-ordination of the TTR programme, local students and scientists having an interest in the subject of TTR research and special guests. An excursion on the Influence of Man on Geological Environments in the Netherlands was organized.

The congress was supported by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the Netherlands Foundation for Geosciences (Stichting GOA), Shell Nederland bv, Elf Petroland bv, Koninklijk Nederlands Geologisch Mijnbouwkundig Genootschap (KNGMG), and the Free University Funds (Stichting Het Vrije Universiteitsfonds Amsterdam). GeoVusie, the student organisation within the Faculty of Geology, contributed in many ways to its success.

Prof. W. Ryan (USA), Chairman of the Congress jury (left), with Prof. M. Ergun (Turkey) and Dr. V. Gainanov (Russia), members of the jury, presenting awards for the best student presentations

TTR Executive Committee and Scientific Committee Meetings: planning for 1997 (27-28 January, Amsterdam)

The two committees met separately and then jointly during the congress to discuss plans for future TTR research. A proposal to organize the TTR-7 cruise in the Western Mediterranean was discussed but not finally approved because of insufficient funding. The possibility of organising a cruise in the North Atlantic was considered (the matter was followed up later on in more detail through correspondence). The TTR EC Chairman, Dr. John Woodside, resigned after six years of successful work, and the Committee unanimously appointed Dr. Neil Kenyon (UK) as Chairman. M. Ivanov attended both meetings as the TTR EC member.

TTR Executive Committee Meeting: planning for 1998-99 (18-19 October, Paris)

This meeting took place at UNESCO Headquarters and was hosted by IOC. The previous year's TTR activities were discussed and plans for the 1998-99 biennium considered. Preparations for the TTR-7 post-cruise meeting in Gent (February, 1998) were

TTR Executive Committee (from left to right): N. Kenyon (Chairman, UK), J-P. Henriet (Belgium), M. Marani (Italy), G. Kullenberg (IOC), M. Ivanov (Russia), J. Woodside (the Netherlands). M. Comas (Spain) is missing on this photo.

discussed. An agreement was reached on the preparation, using the TTR examples, of didactic materials for students. A new EC member, Dr. J-P. Henriet (Belgium), was appointed. M. Ivanov attended the meeting as the TTR EC member.

Other meetings attended by the Centre's staff and students

- *Conference of young MSU scientists* (2 April, Moscow); papers were presented by I. Belenkaya, A. Sautkin, A. Stadnitskaya and A. Volkonskaya.
- *Lomonosov Annual Conference* (23-29 April, Moscow); M. Ivanov and A. Limonov presented a paper.
- *All-Russia Scientific and Practical Conference of Young Scientists "Geophysics-97"* (3-6 June, St. Petersburg); papers were presented by E. Akentieva, V. Gainanov and A. Volkonskaya.
- *International Geophysical Conference* (4-7 July, Istanbul); O. Krylov presented a paper (in co-authorship).
- *XII International School on Marine Geology* (14-18 October, Moscow); I. Belenkaya presented a paper (in co-authorship).
- *Second ENAM-II Workshop* (30 October-2 November, Kinsale, Ireland); A. Akhmetjanov presented two papers (in co-authorship).

AWARDS AND GRANTS

- M. Ivanov was awarded the Lomonosov Prize in Education in recognition of his achievements in higher education.
- G. Akhmanov and A. Volkonskaya were granted long-term fellowships provided by the President of the Russian Federation to the best students to support further education and in recognition of the results of their research.
- G. Akhmanov was awarded a honour's diploma following a contest among young MSU scientists.
- A. Akhmetjanov was granted a diploma for his paper presented to the same contest.
- G. Akhmanov, A. Akhmetjanov, I. Belenkaya, A. Stadnitskaya and A. Volkonskaya were granted the Soros student fellowships in recognition of the results and to further support their education and research.
- M. Ivanov was awarded the Soros grant in recognition of and in support to his educational activities.

PUBLICATIONS

The results of the "Gas and Fluids in Marine Sediments" Congress were published in the IOC Workshop Reports series as No. 129 (entitled *Gas and Fluids in Marine Sediments: Gas Hydrates, Mud Volcanoes, Tectonics, Sedimentology and Geochemistry in the Mediterranean and Black Seas*). The TTR-6 cruise results were published in the IOC Technical Series as No. 48 (entitled *Neotectonics and fluid flow through seafloor sediments in the Eastern Mediterranean and Black Seas*, part 1: Eastern Mediterranean Sea, part 2: Black Sea). A special issue of an international journal "Geomarine Letters" was prepared presenting the research results introduced during the fourth TTR post-cruise meeting (January-February 1996, Moscow and Zvenigorod). A series of three papers was submitted and accepted for publication in a book entitled *Gas Hydrates: Relevance to World Margin Stability and Climate Change* (the Geological Society Special Publication). The list of papers (including abstracts of presentations at various meetings) published and submitted in 1997 by the research staff and students of the Centre exceeds 50 items (Annex 8).

Annex 1

LIST OF INSTITUTIONS WHICH CO-OPERATED IN THE TTR PROGRAMME IN 1997

Belgium	Catholic University of Leuven (Leuven)
	University of Gent (Gent)
Denmark	Geological Survey of Denmark and Greenland (Copenhagen)
	University of Aarhus (Aarhus)
France	IFREMER (Brest)
	Laboratoire de geodynamique sous-marine (Villefranche-sur-Mer)
	University of Lille (Lille)
Germany	GEOMAR (Kiel)
Ireland	Dublin Institute of Advanced Studies (Dublin)
	Geological Survey of Ireland
	Irish Marine Institute (Dublin)
	Martin Ryan Institute, University College of Galway (Galway)
	Petroleum Affairs Division of Dublin (Dublin)
	University College of Cork (Cork)
	University College of Dublin (Dublin)
Italy	Institute of Marine Geology (Bologna)
	University of Genoa (Genoa)
	University of Milan (Milan)
The Netherlands	
	Free University (Amsterdam)
	Netherlands Institute for Sea Research (NIOZ, Texel)
	Utrecht University (Utrecht)
Portugal	Directorate of EXPO'98
	National Commission for UNESCO/National IOC Committee
Russian Federation	
	Institute of Microbiology, RAS (Moscow)
	Institute of Oceanology, RAS (Moscow)
	Ministry of Natural Resources (Moscow)
	Ministry of Science and Technology (Moscow)
	Moscow State University (Moscow)
	National Commission for UNESCO (Moscow)
	NIPI "Okeangeofizika" (Gelendzhik)
	Paleontological Institute, RAS (Moscow)
	Permanent Delegation to UNESCO (Paris)
	Polar Marine Geological Exploration Expedition (St. Petersburg)
	Vernadsky Institute of Geochemistry and Analytical Chemistry, RAS (Moscow)

Spain	Andaluz Institute of Geosciences, University of Granada (Granada)
Switzerland	Geological Institute, University of Neuchatel (Neuchatel)
Turkey	Dokuz-Eylul University (Izmir) Piri Reis Foundation (Izmir)
United Kingdom	Edinburgh University Natural Environment Research Council (UK) Royal Holloway University of London (London) Southampton Oceanography Centre (Southampton) University of Aberdeen (Aberdeen) University of Aberystwyth (Aberystwyth) University of Wales (Cardiff)
UNESCO	Intergovernmental Oceanographic Commission (Paris)

Annex 2

LIST OF CONTRIBUTORS TO THE TTR FIELD ACTIVITIES, 1997

Antalya Port Authority (Turkey)
Commission for Oceanography and Limnology (Switzerland)
Dublin Institute of Advanced Studies (Ireland)
EC CORSAIRES drilling project
EC European North Atlantic Margins project (ENAM)
EXPO'98
Flemish Government (Belgium)
Geological Survey of Denmark and Greenland (Denmark)
Geological Survey of Ireland (Ireland)
Intergovernmental Oceanographic Commission of UNESCO
Irish Marine Institute (Ireland)
Martin Ryan Institute, University College of Galway (Ireland)
Ministry of Natural Resources (Russia)
Ministry of Science and Technology (Russia)
Moscow State University (Russia)
Natural Environment Research Council (UK)
Petroleum Affairs Division of Dublin (Ireland)
Piri Reis Foundation (Turkey)
Southampton Oceanography Centre (UK)
The Netherlands Foundation for Geosciences (the Netherlands)
Turkish Maritime Affairs Administration (Turkey)
University of Aberdeen (UK)
University College of Cork (Ireland)
University College of Dublin (Ireland)

Annex 3

LIST OF PARTICIPANTS IN THE TTR-7A CRUISE

(1 July - 16 August 1997, R/V *Professor Logachev*, NE Atlantic)

Belgium	Rudy Swennen (University of Leuven)
	David van Rooij (University of Gent)
	Sigrid Pillen (University of Gent)
	Ben De Mol (University of Leuven)
Denmark	Tove Nielsen (Geological Survey of Denmark and Greenland, (Co-chief Scientist, Leg 2)
	Tina Mikkelsen (University of Aarhus)
France	Sebastein Zaragosi (IFREMER)
	Christine Degryse (University of Lille)
Ireland	Andrew James Wheeler (University of Cork)
	Angela McDonnell (University College of Dublin)
	Robert Kennedy (Martin Ryan Institute, Galway)
Italy	Adriano Mazzini (University of Genoa)
The Netherlands	Jurgen Foeken (Free University, Amsterdam)
	Max Horstink "
	Ewald Iking "
	Katya Ivanova "
	Allard van der Molen "
Russian Federation	Michael Ivanov (Moscow State University), Co-chief Scientist
	Valery Gainanov "
	Oleg Krylov "
	Elena Kozlova "
	Anatoly Limonov "
	Ekaterina Akenteva "
	Grigorii Akhmanov "
	Andrey Akhmetjanov "
	Alexey Almendinger "
	Anna Balashova "
	Irina Belenkaya "
	Sergey Buryak "
	Kirill Epov "
	Olga Makhova "
	Leonid Mazurenko "
	Alexander Morozov "
	Yury Naumov "
	Anna Saprykina "
	Alexander Sautkin "
	Pavel Shashkin "
	Alina Stadnitskaya "
	Anna Volkonskaya "

	Alexey Krotov (Polar Marine Geological Exploration Expedition)	
	Alexandr Shagin	"
	Alexandr Machulin	"
	Evgeny Samsonov	"
	Valery Babanov	"
	Gennady Antipov	"
	Irina Antipova	"
	Victor Sheremet	"
	Boris Smirnov	"
	Valentin Konfetkin	"
	Alexandr Plakhotnik	"
	Sergey Luybimov	"
	Alexandr Ivanov	"
	Alexandr Marakulin	"
	Konstantin Spiridonov	"
	Petr Krinitsky	"
	Vyacheslav Gladush	"
	Igor Laletin	"
	Yury Goremykin	"
United Kingdom	Neil Kenyon (Southampton Oceanography Centre)	Leg 2 Co-chief Scientist
	Patrick Friend	"
	Cristina Vina Herbon	"
	Paulo Sumida	"
	Rachel R. Cave	"
	Bryan Cronin (University of Aberdeen)	
	Nicholas Satur	"
	Justin Taylor (University of Wales)	
	John Brodie Wilson (Royal Holloway University of London)	

Annex 4

LIST OF SEMINAR PRESENTATIONS DURING THE TTR-7A CRUISE

9 July	**Neil Kenyon** (UK), **Rudy Swennen** (Belgium), **Anatoly Limonov** (Russia): North Atlantic. TTR-7. Corsaires. Cruise objectives.
10 July	**Rudy Swennen** (Belgium): Petrographical techniques to describe carbonate rocks illustrated by examples from oil exploration (+exercise) and discussion.
11 July	**Angela McDonnell** (Ireland): Brief geological history of the Porcupine Basin
12 July	**Pavel Shashkin** (Russia): New province of buried carbonate mounds off-shore Ireland (preliminary results of the R/V Belgica, May 1997).
13 July	**Rudy Swennen** (Belgium): Use of stable isotopes in diagenetic research. **Anna Balashova** (Russia): TV-profile 1. Top news from the sea bottom.
14 July	**Andrey Akhmetjanov** (Russia): A survey of SW Rockall Trough and Porcupine Bank Margins. Initial results of ENAM-97 cruise of the R/V Pelagia.
15 July	**Rudy Swennen** (Belgium): Formation of carbonate concretions and the role bacteria play.
16 July	**Irina Belenkaya** (Russia): Authegenic gas-derived carbonates in recent sediments of the Black Sea
17 July	Discussion on preliminary results of the Area 1 (reports from the heads of research teams).
18 July	**Alina Stadnitskaya** (Russia): Hydrocarbon gases in seabed sediments and their relation to organic matter.
19 July	**Sebastein Zaragosi** (France): Celtic deep sea fan
20 July	**Bryan Cronin** (UK): Ancient, leveed deep-water canyons on a tectonically active slope in SE Turkey.
21 July	**Andrew Wheeler** (Ireland): Grain-size analysis: statistical approaches and climate forcing.
22 July	Discussion on preliminary results of the Leg 1.
27 July	General meeting of all participants of the Leg 2.
28 July	**Neil Kenyon** (UK): Sedimentary processes and pathways on the Northeast Atlantic margin.
29 July	**Ekaterina Akentieva** (Russia): TOBI survey of the NE Faeroe margin.
30 July	**Andrey Akhmetjanov** (Russia/the Netherlands): General view on the SW Rockall Trough and Porcupine Bank Margins (Initial results of the ENAM 97 cruise of the R/V Pelagia)
31 July	**John Brodie Wilson** (UK): Deep water corals
1 August	**Rachel Cave** (Ireland): Mid-Ocean Ridges and Hydrothermal activity.
2 August	**Justin Taylor** (UK): GLORIAS view of the North Faeroes Margin (North Sea Fan).
3 August	**Sergey Bouriak** (Russia): Seismic manifestations of shallow gas: General overview.
4 August	**Tove Nielsen** (Denmark): The continental margin North of the Faeroes - Seismic interpretation.
5 August	**Grigorii Akhmanov** (Russia): Mud volcanism: a few words about vast subject.
6 August	**Anatoly Limonov** (Russia): Anaximander Mountains in the North-eastern Mediterranean: morphology, structure, and origin.
7 August	**Elena Kozlova** (Russia): Organic matter in rock clasts from the Stoke-on-Trent mud volcano breccia (Mediterranean Ridge).
8 August	**Alina Stadnitskaya** (Russia): Composition of Hydrocarbon Gas in Seabed Sediments of the south-eastern part of the Crimean Margin (Black Sea).
9 August	Discussion on preliminary results of the Areas 5-6 (reports from the heads of research teams).

10 August	**Anna Volkonskaya, Elena Kozlova** (Russia): Quaternary deep-sea fans on the North-eastern margin of the Black Sea.
11 August	**Alexander Sautkin** (Russia): Paleoclimatic changes over the last 130 Kyrs in the Eastern Mediterranean (study based on distribution of calcareous nannofossils).
13 August	**Adriano Mazzini** (Italy): Climatic fluctuation and Heinrich events in the North Atlantic.
14 August	**Jurgen Foeken, Ewald Iking** (the Netherlands): The Gargano Promontory (Southern Italy): Fore bulge or thrust belt?
15 August	Discussion on preliminary results of the Leg 2.

Annex 5

LIST OF PARTICIPANTS IN THE TTR-7B CRUISE

(2-8 June 1997, R/V *Akademik Boris Petrov*, Eastern Mediterranean)

Italy	Adriano Mazzini (University of Genoa)
	Giovanni Aloise de Larderel (University of Milan)
The Netherlands	
	John Moffatt Woodside (Free University of Amsterdam) Chief Scientist
	Guido Michael Blenk "
Russian Federation	
	Ekaterina Akentieva (Moscow State University)
	Grigorii Akhmanov "
	Irina Belenkaya "
	Elena Kozlova "
	Alina Stadnitskaya "
Switzerland	Cedric Egger (Institute of Geology, Neuchatel)
	Raphael Gonzalez "
Turkey	Mert Avci (Institute of Marine Science and Technology, Izmir)
	Mustafa Ergun (Dokuz-Eylul University, Izmir)
	Fatma Istar Isler "
	Ersel Zafer Oral "
United Kingdom	
	Sarah Lee (University of Wales, Cardiff)
	Nicola Ann Rimington "

Annex 6

SEMINAR PRESENTATIONS DURING THE TTR-7B CRUISE

4 June	**Mustafa Ergun** (Turkey): General Remarks About the Tectonic Setting of the Eastern Mediterranean
	John Woodside (the Netherlands): What is the Anaximander Mountains? Description of the Work Underhand
5 June	**Grigorii Akhmanov** (Russia): Mud Volcanoes
6 June	**Alina Stadnitskaya** (Russia): Products and Processes of Fluid Venting Through the Seafloor
7 June	**Nicola Rimington** (UK): Depositional History of Sands on the Amazon Fan
	Sarah Lee (UK): INTERMUD: The Morphological Development of Intertidal Mudflats (An Introduction and Cardiff's Role)
8 June	**Adriano Mazzini** (Italy): Depositional Models Related to "Heinrich Events" in a Deep Sea Core (North Atlantic)

Annex 7

LIST OF PARTICIPANTS FROM THE UNESCO-MSU CENTRE IN THE DENMARK STRAIT EXPEDITION

(16 August - 15 September 1997), R/V *Professor Logachev*

Andrey Akhmetjanov (MSU and NIOZ)
Sergey Buryak
Valery Gainanov
Elena Kozlova
Leonid Mazurenko
Alexander Morozov
Pavel Shashkin
Alexander Sautkin
Alina Stadnitskaya
Anna Volkonskaya

Annex 8

LIST OF PUBLICATIONS BY RESEARCHERS AND STUDENTS OF THE UNESCO-MSU CENTRE, 1997

AKENTIEVA, E.L. Peculiarities of the processing and interpretation of the TOBI sidescan sonar data from the north-eastern Faeroe margin. In: *All-Russian Scientific-Practical Conference of Young Scientists and Specialists "Geophysics-97"*. Abstracts. St-Petersburg, 1997, p.69. (in Russian).

AKENTIEVA, E.L. Large submarine slides of the Faeroe margin: sidescan sonar and seismic interpretation. In: *Gas and Fluids in Marine Sediments: Gas Hydrates, Mud volcanoes, Tectonics, Sedimentology and Geochemistry in Mediterranean and Black Seas*. Fifth Post-cruise Meeting of the Training-through-Research Programme and International Congress, Amsterdam, The Netherlands, 27-29 January 1997. - IOC Workshop Report No 129, UNESCO, p. 19-20.

AKHMANOV, G.G. Recent Mud Volcanic Deposits as a Key to Paleoenvironment. In: *Abstracts of 18th IAS Regional European Meeting of Sedimentology*, Heidelberg, September 2-4, 1997, p.41.

AKHMANOV, G.G. AND WOODSIDE, J.M. ODP Leg 160 mud volcanic samples in the context of the TTR data on the Mediterranean Ridge mud volcanism. In: *Gas and Fluids in Marine Sediments: Gas Hydrates, Mud Volcanoes, Tectonics, Sedimentology and Geochemistry in Mediterranean and Black Seas*. Fifth Post-cruise Meeting of the Training-through-Research Programme and International Congress, Amsterdam, The Netherlands, 27-29 January 1997. - IOC Workshop Report No 129, UNESCO, p. 28-29.

AKHMANOV, G.G. AND WOODSIDE, J.M. Lithology of the rock clasts from mud breccia of the Mediterranean Ridge mud volcanoes. In: *Proceedings of ODP. Scientific Results* (in press).

AKHMETZHANOV. A. The Holocene turbiditic sedimentation on the Crimean slope and rise referred to the Yalta Deep-Sea Fan formation. In: *Gas and Fluids in Marine Sediments: Gas Hydrates, Mud Volcanoes, Tectonics, Sedimentology and Geochemistry in Mediterranean and Black Seas*. Fifth Post-cruise Meeting of the Training-through-Research Programme and International Congress, Amsterdam, The Netherlands, 27-29 January 1997. - IOC Workshop Report No 129, UNESCO, p. 6-7.

AKHMETZHANOV, A.M., The Holocene Turbiditic Sedimentation on the South-eastern Crimean Slope and Rise Referred to the Yalta Deep-sea Fan Formation. In: *Abstracts of 18th IAS Regional European Meeting of Sedimentology*, Heidelberg, September 2-4, 1997, p.42.

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Annex 9

LIST OF ACRONYMS

CORSAIRES	Coring Stable and Instable Realms in European Seas
ENAM	European North Atlantic Margins project
GEUS	Geological Survey of Denmark and Greenland
IFREMER	French Institute for the Sea Exploration
IOC	Intergovernmental Oceanographic Commission of UNESCO
MSU	Moscow State University
NIPI	Research and Applied Institute
NIOZ	Netherlands Sea Research Institute
ODP	Ocean Drilling Programme
R/V	Research Vessel
TEMA	Training, Education and Mutual Assistance programme of IOC
TTR	Training through Research programme
UNESCO	United Nations Educational, Scientific and Cultural Organization