Floating University Facility

Training Through Research Programme

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

Intergovernmental Oceanographic Commission

Annual Report, 1998

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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 executed 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

In operation since 1990, the Training through Research (TTR) programme (also referred to as the Floating University) continues to benefit from the advantages provided by combining the training of students and young scientists with advanced research in the field of marine geosciences. Since 1996, the programme has been co-sponsored by the Intergovernmental Oceanographic Commission (IOC) of UNESCO.

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

The annual cycle of the TTR programme includes: (i) preparation of a TTR cruise by the Executive and Scientific Committees; (ii) TTR cruise, with (when possible) a mid-cruise workshop and/or field excursion 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 1991-1998, eight major TTR cruises, five mid-cruise workshops and six post cruise conferences were organized. In addition, there have been a number of other field exercises (including smaller cruises), group and individual training activities, as well as the presentation and publication of the research results.

To date, at least 340 scientists and students have been taken part in the eight annual cruises. They have come from over 20 countries. All together, over one thousand people have become involved in TTR, if mid-cruise workshops and post-cruise meetings and other activities are counted.

Dr. Neil Kenyon (SOC), Co-ordinator of the TTR programme (left), with Dr. Mikhail Ivanov, Director of the UNESCO-MSU Centre

UNESCO-MSU Centre: its mission and structure

The 'Floating University' lives on!

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

The Centre operates under the following arrangements. MSU provides the staff (currently five) of the Centre. Six post-graduate and ten undergraduate students from different departments of the Geology Faculty are involved on a permanent basis in various projects. Some 15 undergraduate MSU students have taken part 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 institutes of the Ministry of Natural Resources and Russia's Academy of Sciences (Annex I).

In 1998, funds for research and training were provided by Russia's Ministry of Natural Resources, Ministry of Science and Technology, MSU, as well as by IOC, the Flemish Government and the CORSAIRES project of the European Commission.

The CORSAIRES, PRISMED-II and ENAM projects of the European Commission, STATOIL Exploration (Ireland) Ltd., as well as institutions in Belgium, Denmark, Ireland, The Netherlands, Portugal and the UK contributed to joint field activities. All the above contributions are gratefully acknowledged.

Student discussion on board the 'Floating University', TTR-8 cruise

Research and Training Activities of the Centre in 1998

Research projects

A number of research projects, mostly regional, continued to be carried out at the Centre, in cooperation with national and foreign universities and research institutions. This includes:

In the Northeast Atlantic:

- Slope instability
- Fluid venting on the seafloor (organic geochemistry, gas content)
- Mud volcanism/clay diapirism and related gas and gas hydrate occurrences in the Northeast Atlantic
- Influence of turbiditic and contourit currents on the deep-sea clastic sedimentation
- Coarse sediments in the deep-sea depositional systems
- Deep-water carbonate mud mounds
- Gas-related authigenic mineral assemblages in deep-water sediments
- Structure and composition, including isotope composition of recent carbonate nodules and crusts
- Pore water composition from bottom sediments
- Analyses of seismic and acoustic images of diapiric fields and gas-related structures (such as bottom simulated reflectors, acoustic voids and bright spots)

In the Mediterranean and Black Seas:

- Mud volcanism in the Eastern Mediterranean and Black Seas
- Evolution of the Eastern Mediterranean (based on lithology of mud breccia matrix and clasts recovered from mud volcanoes)
- Composition and maturity of the organic matter in rock clasts from mud volcano breccia (Eastern Mediterranean and Black Seas)
- Pore water composition from bottom sediments
- Structure and composition, including isotope composition of recent carbonate nodules and crusts
- Analysis of seismic images of the accretionary prism (the Mediterranean Ridge)
- Gas and gas hydrate composition from the Mediterranean and Black Seas

Project of general nature:

- Dependence of backscattering on lithology from sidescan sonar data
- Digital processing of seismic and acoustic images
- Fluid-related acoustic anomalies

Field activities

In 1998, the Training through Research strategy was applied in a series of research cruises attended by the MSU research staff and students. Concerned were cruises to the NE Atlantic: the major TTR-8 cruise onboard the R/V *Professor Logachev*, the R/V *Akademik Mstislav Keldysh* cruise, the R/V *Belgica* cruise, and the ENAM expedition onboard the R/V *Pelagia;* also the PRISMED-II cruise to the Eastern Mediterranean onboard the R/V *l'Atalante.*

The summer 1998 field activities contributed to the International Year of the Ocean. Thus, during the Lisbon port call, the *Logachev* took part in EXPO'98. A few thousand visitors became acquainted with the TTR programme and other IOC training and research activities.

TTR-8 Cruise to the NE Atlantic: working on the continental margin

On the Logachev *bridge*

The 8th geological-geophysical 'Training Through Research' (TTR-8) cruise of the R/V *Professor Logachev* (Russia) was dedicated to the International Year of the Ocean. It was carried out in the North-eastern Atlantic from 14 June to 1 August (25 working days and 24 days of the transit time and port calls). The ship is owned by the Ministry of Natural Resources of the Russian Federation.

The cruise started from Lisbon (Portugal), where the ship participated in EXPO '98, and terminated in St. Petersburg (Russia). Two mid-cruise port calls were made for partial exchange of the Scientific Party: in Cork, Ireland, on 24-25 June and in Thorshavn, Faeroe Islands, on 8-9 July. Following the schedule of the port calls, the cruise was subdivided into three legs:

- Leg 1: Lisbon to Cork, 14 to 24 June;
- Leg 2: Cork to Thorshavn, 26 June to 8 July; and
- Leg 3: Thorshavn to St.Petersburg, 10 July to 1 August.

An international team of 68 scientists, post- and undergraduate students, and technicians from 18 institutions of 11 countries (Belgium, Denmark, France, Ireland, Italy, The Netherlands, Poland, Portugal, Russia, Switzerland and the UK) participated in the above three Legs (Annex II). Beside research work, daily seminars with lectures for students and discussions on recently obtained data were carried out on board (Annex III). In Thorshavn, the participants took part in a geological field trip over one of the islands, organized by geologists from the University of Aarhus..

The Co-Chief Scientists of the cruise were:

- Leg 1: Prof. J. Monteiro (Portugal), Dr. N. Kenyon (UK), Dr. M. Ivanov (Russia);
- Leg 2: Dr. T. Neilson (Denmark), Dr. A. Kuijpers (Denmark), Dr. M. Ivanov;
- Leg 3: Dr. M. Ivanov, Dr. A. Wheeler (Ireland).

The objectives of the cruise were to study geological processes on continental slopes and to train students in marine geoscience research.

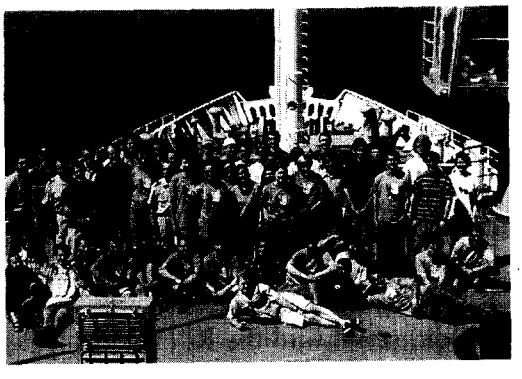
Cruise scientific programme

The cruise's research programme focused on the following major topics:

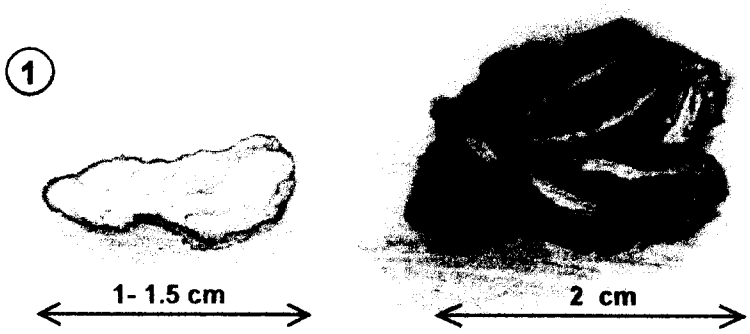
- slope stability,
- modern analogues of hydrocarbon reservoirs,
- fluid venting, and
- mud volcanism and related gas and gas hydrate occurrence.

Research targets

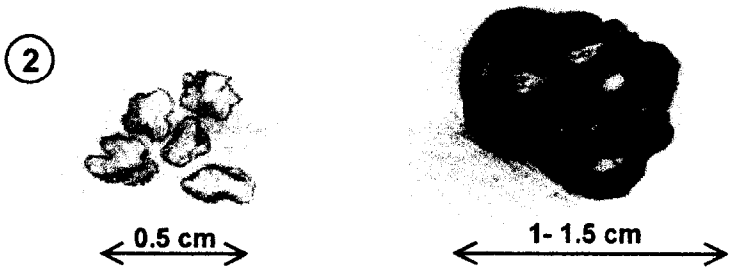
Research was carried out on the Portuguese Margin, in the Porcupine Seabight, on the eastern and north-eastern margins of the Faeroe Plateau, and on the Norwegian Sea margin. The study areas and particular scientific targets were as follows:



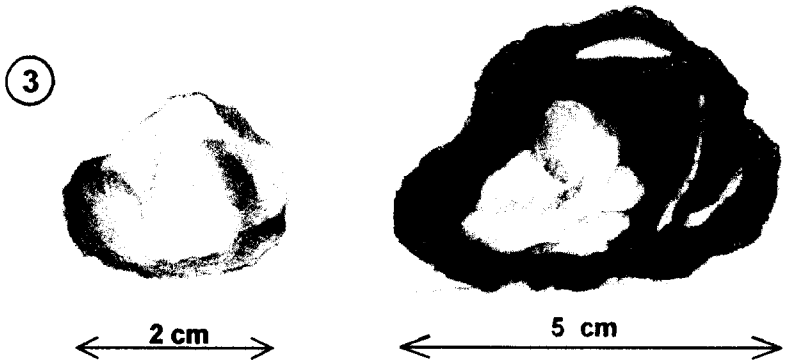
Leg 1 participants, TTR-8 cruise



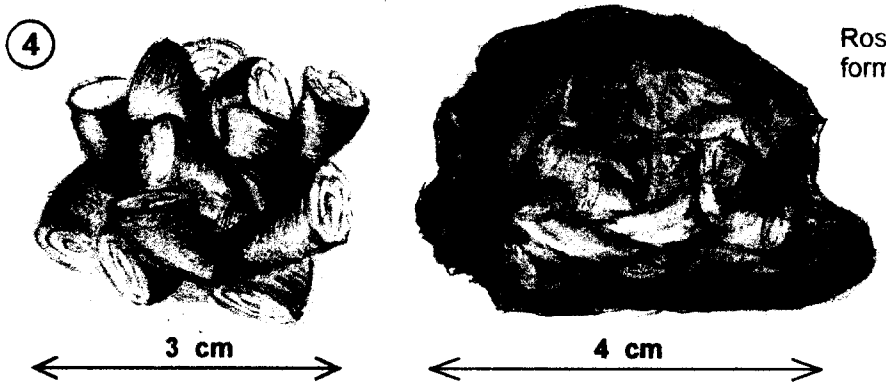
Flat fragments with irregular shape and rough boundary. Within sediments gas hydrates of this type form vein-shaped and lense structures. The size of this fragments is up to 1.5 cm.



Subrounded shape aggregates. Some of them form small smooth clasts. Others have a star-like shape. Within the sediments this type of gas hydrate looks like "ice-drops" up to 0.5 cm in size.

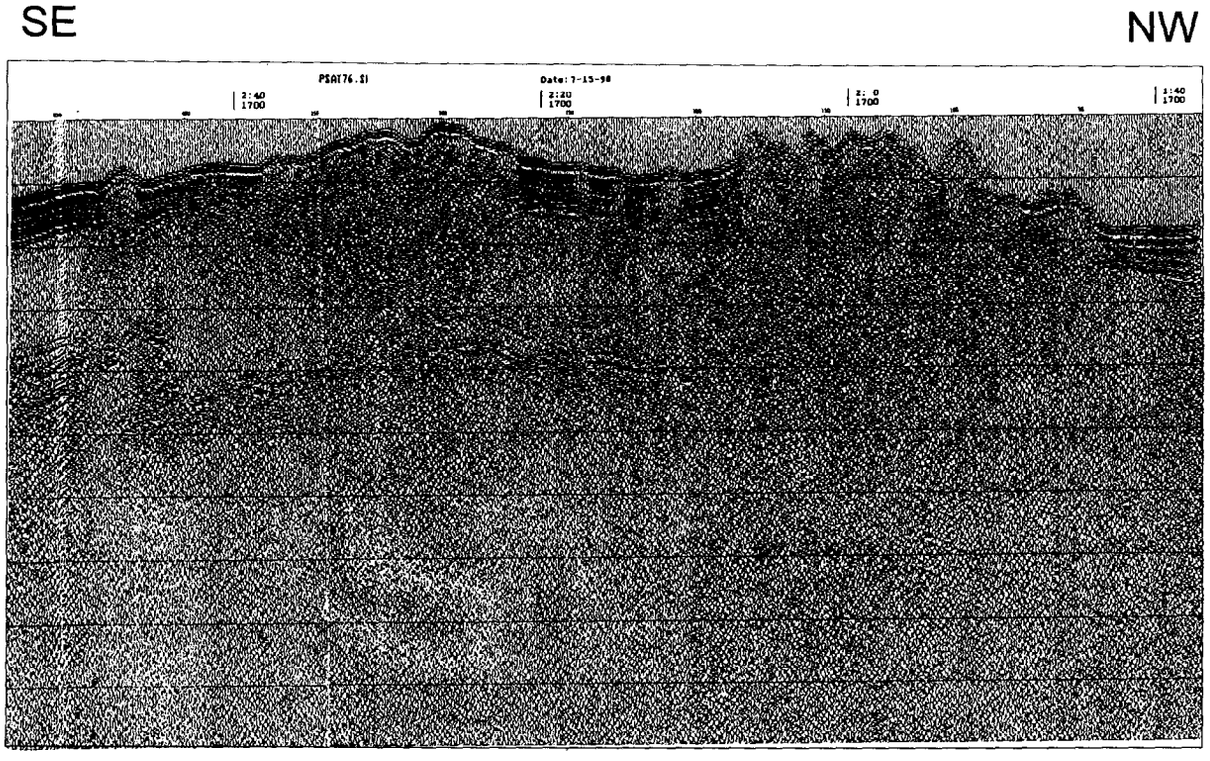


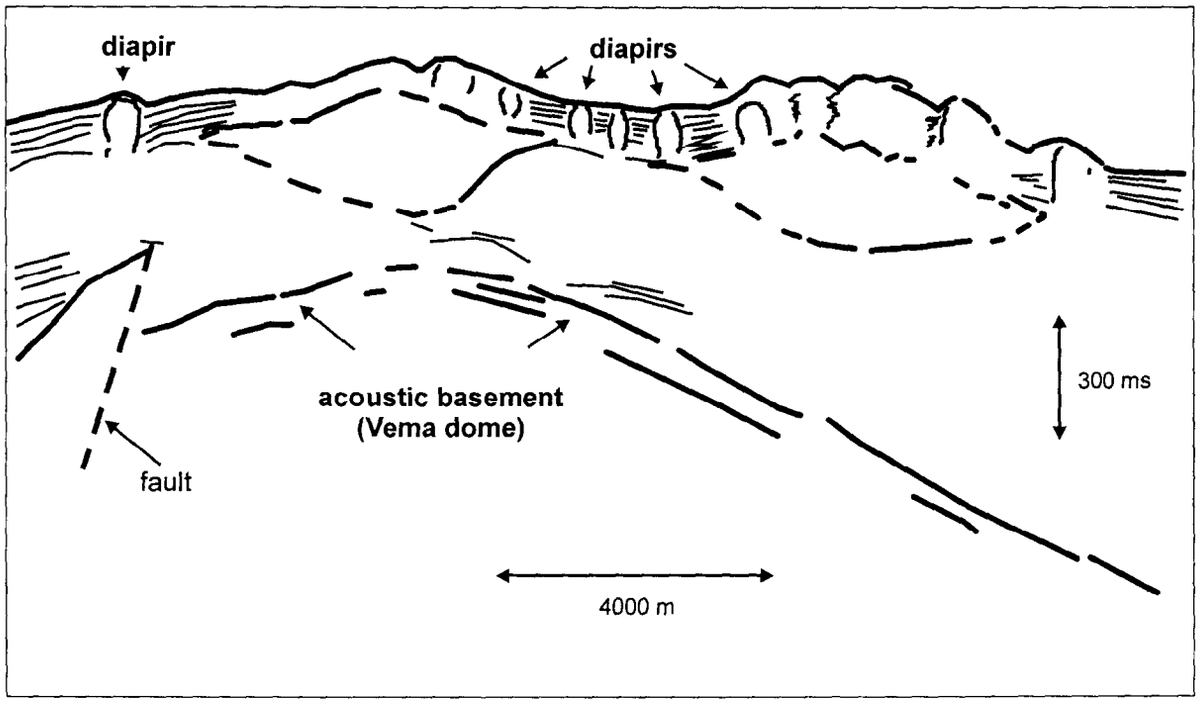
Isometric subrounded aggregates with smooth shape up to 2 cm.



Rose-like aggregates of crystals similar to those formed by calcite or gypsum up to 3 cm.

Gas hydrates morphology





Part of seismic line PSAT-76 shows diapiric-like structures in the Vema Dome Area (Eastern Vøring Plateau)

Extraction of a sedimentary column, TTR-8. In the centre- Prof. J. Monteiro, Leg 1 Co-Chief Scientist

Area 1. Study of the canyon system on the approaches to the Tagus Abyssal Plain, fed by the Lisbon Canyon. Another target was the scarp of a deep-seated fault on the Iberia Abyssal Plain. It was believed be the site of fluid seeps similar to those cored at ODP site 1068 in a similar situation (Krawczyk, C.M., Reston, T.J., Beslier, M.-O., and Boillot, G., 1996. Evidence for detachment tectonics on the Iberia Abyssal Plain rifted margin. In R.B. Whitmarsh, D.S. Sawyer, A. Klaus and D.G. Masson (Eds.), *Proceedings of the Ocean Drilling Program, Scientific Results,* 149: College Station, TX, 603-616).

Area 2. Further investigation of carbonate mud mounds and related acoustic anomalies observed on the subbottom profiler records in the Porcupine Seabight.

Areas 3 and 4. Study of the East Faeroes margin, including the occurrence of small submarine slides as well as study of the giant slide known to the north of the Faeroe Islands. It was mapped by both GLORIA and TOBI sidescan sonar but high-resolution sidescan sonar survey and coring were required.

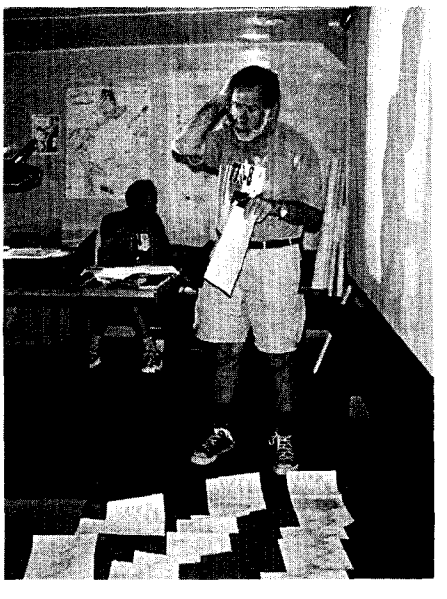
Areas 5, 6 and 7. Studies of gas seepage, possible gas hydrate and mud volcanoes occurrence on the Norwegian Sea margin. Several locations were visited including Storegga Slide, Vøring Plateau diapiric fields and the spectacular Haakon Mosby mud volcano recently discovered and studied by the Norwegian, American, and Russian scientists (Vogt P.R., et al., 1997. Haakon Mosby Mud volcano Provides Unusual Example of Venting. *EOS,* Transactions, American Geophysical Union, Vol. 78, No. 48, 556-557).

Equipment

To achieve the goals of the expedition, a wide range of equipment was used including single-channel high-resolution seismic reflection profiling with the 1.5 l airgun combined with simultaneous OKEAN 10 kHz long-range sidescan swath mapping of the seafloor; high resolution survey with O.R.E.tech deep-towed tool comprising 30 and 100 kHz sidescan sonar and 5 kHz subbottom profiler units. For more detailed studies an underwater TV system was engaged, as well as a large-diameter gravity-corer, box corer and dredging used for the bottom sampling.

Funding

Besides the IOC sponsorship, financial support for the cruise was provided by the Geological Survey of Denmark and Greenland, Southampton Oceanography Centre (UK), Instituto Geologico e Mineiro (Portugal), University College Cork (Ireland), STATOIL Exploration (Ireland) Ltd., University of Gent (Belgium), and Russia's Ministry of Science and Technological Policy, Polar Marine Geosurvey Expedition of the Ministry of Natural Resources, and MSU. Logistic support was provided by The Netherlands Sea Research Institute (NIOZ).



From practice to theory: Prof. J. Monteiro discusses the research results

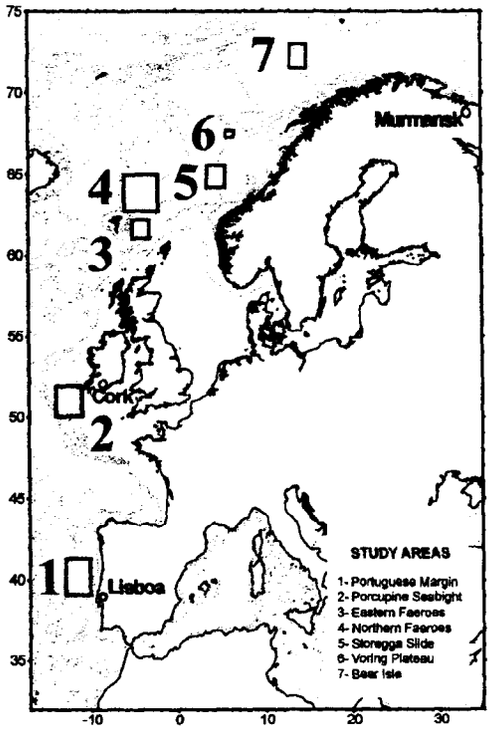
Cruise participants' report

The cruise data comprise more than 3000 km of seismic and long range sidescan sonar lines, 185 km of high-resolution sidescan survey, about 20 km of the bottom TV survey and 70 bottom samples obtained on the NE Atlantic margin.

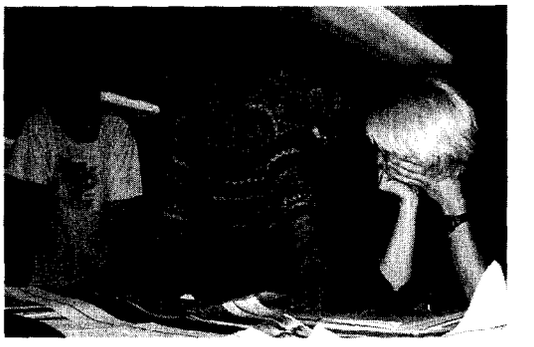
On the Portuguese margin, a broad network of bifurcating downslope-running canyons was mapped with the OKEAN sidescan sonar. The data obtained add and fit well to the dataset collected previously by Portuguese scientists.

The additional study conducted in the Porcupine Seabight mud mounds obtained more bottom samples for further geochemical and microbiological investigations. A better understanding of seabed processes, observed during the TTR-7 cruise (1997), and enhanced interpretation of the sidescan sonar images were achieved after revisiting one of the mounds and carrying out more detailed studies with a 100 kHz sidescan sonar.

A slump affecting the upper part of the sedimentary section was mapped on the eastern Faeroes margin. Another large slide structure, previously discovered on the northern Faeroes margin, was also visited and detailed studies showed a number of stages of slide development.



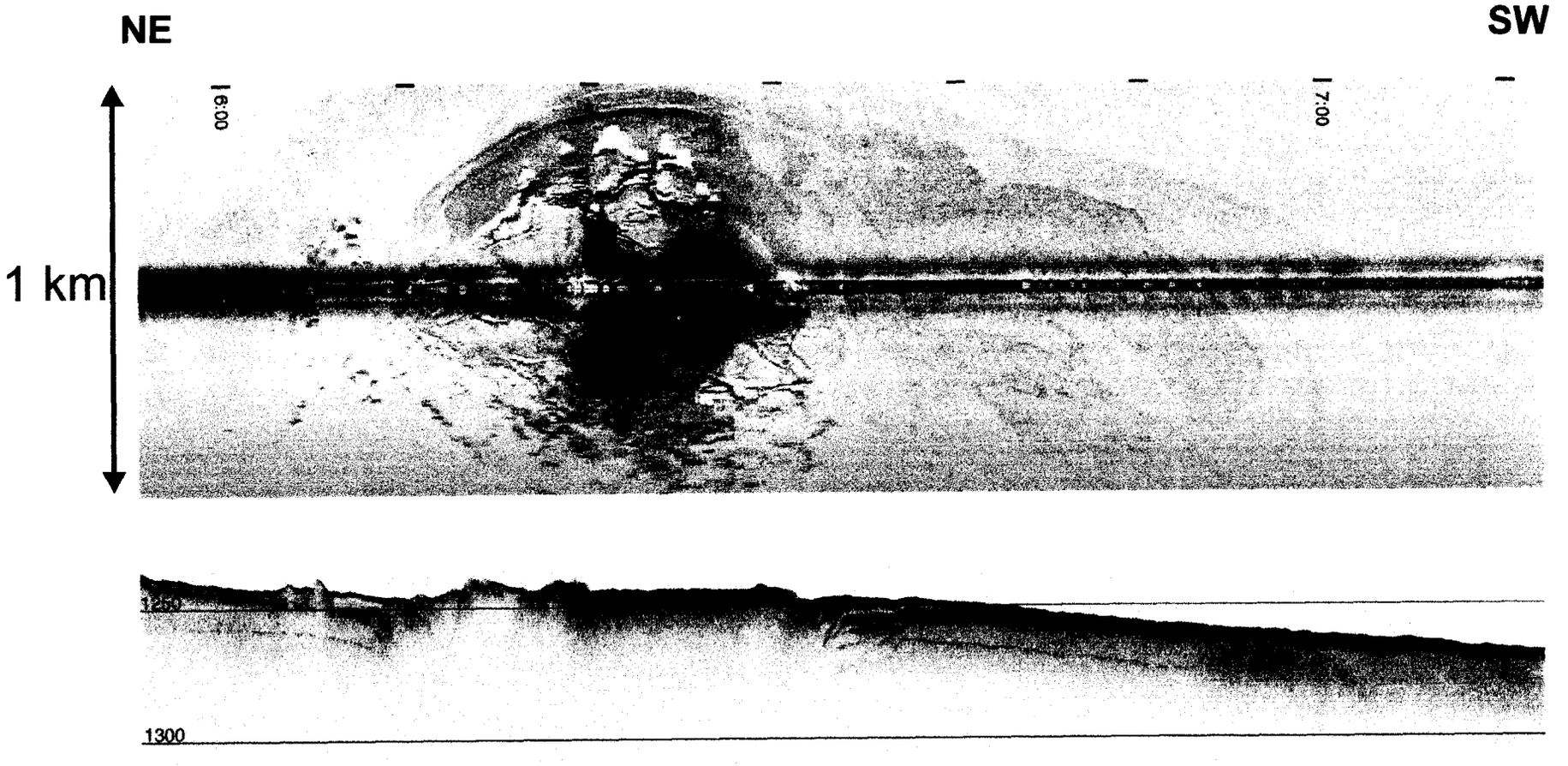
TTR-8 location map



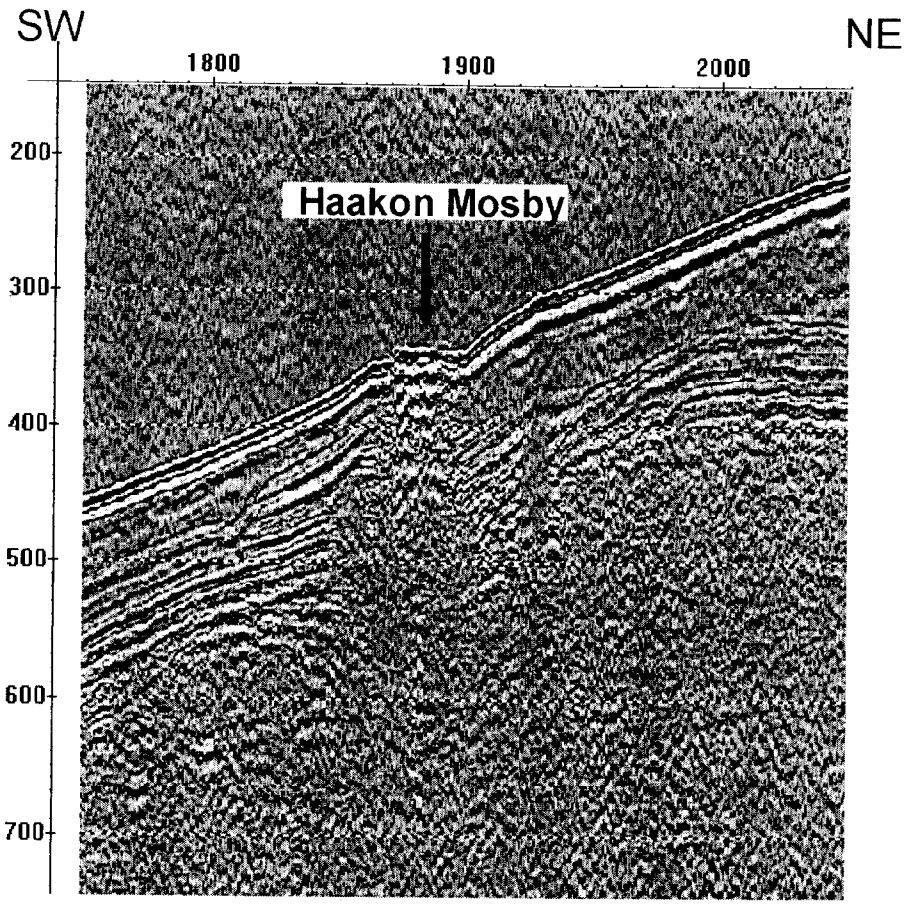
Leg 2 Co-Chief Scientists (right to left) Drs. T. Nielsen, A. Kujpers and M. Ivanov discussing seismic data with the students

A. Volkonskaya explains data processing technique to a new group of students, TTR-8 cruise

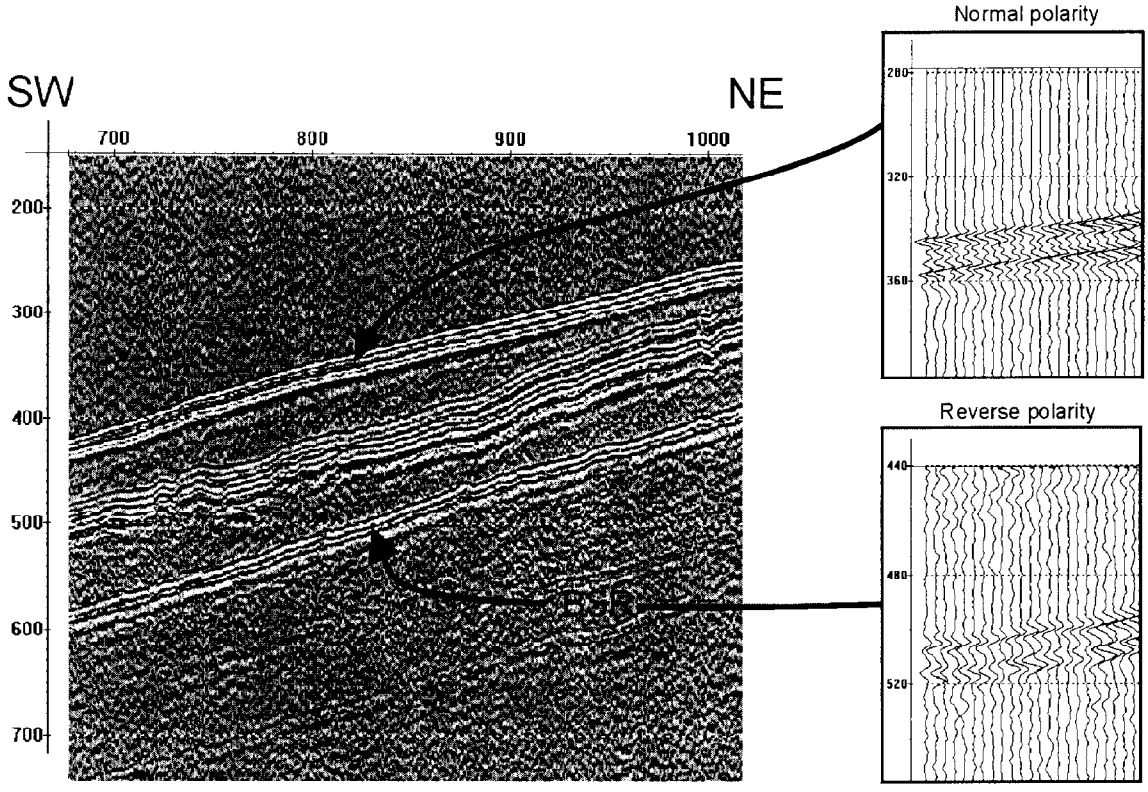
The presence of megaturbidite, the formation of which is probably related to the giant Faeroes Slide, was observed in the cores taken to the north of the slide. Investigations of the Southeastern part of the Vøring Plateau, adjusting to the Storegga Slide, shed more light on this area known by its numerous fluid escape structures and the possible presence of gas hydrates. A bottom simulating reflector (BSR) was observed in several places. It was found to be pierced by diapiric structures disturbing the sedimentary cover and exposing onto the seafloor at some locations. Some of the pockmarks very visible on the sidescan sonar data were carefully studied with high-resolution acoustic tools and bottom TV. The bottom biota activity, possibly related to gas seepage, was revealed, and direct observations of escaping fluids were made and recorded. Many samples taken from the pockmarks contain gas-saturated sediments and concretions of carbonate



The Haakon Mosby mud volcano (profile ORAT-24, O.R.E.Tech deep-towed sidescan sonar 100 kHZ)



Part of seismic line PSAT-82 across the Haakon Mosby mud volcano



Part of seismic line PSAT-82 shows the bottom simulating reflector (BSR)

I. Belenkaya in a chemical laboratory, TTR-8 cruise

minerals, the formation of which is very likely to be due to methane oxidation. The further geochemical analyses will provide more information on such processes.

The complex morphology of the seabed mounds located in the northwestern part of the Vøring Plateau was observed on the O.R.E.tech sonograph. The unique nature of the Haakon Mosby mud volcano, located southwest of Bear Isle, was confirmed by extensive seismic and OKEAN survey in this area. No other mud volcanoes were found.

All the students were actively involved into data collection and processing. Besides that, lectures and seminars on various topics of marine geosciences helped extend the scientific horizon of the young scientists (Annex III). A geological excursion in the Faeroe Islands served the same purpose. Many lectures and seminars were given by students themselves, thus providing a good opportunity to develop presentation skills and to discuss research projects.

Seismic profile analyses made enjoyable

Other TTR-related cruises

The TTR strategy was applied, in 1998, in several other cruises, in the North Atlantic, as well as in the Mediterranean.

Thus, one MSU researcher and one student participated in the PRISMED-II cruise, carried out onboard the R/V *l'Atalante* (January – March).

Two MSU students participated in the cruise of the R/V *Belgica* in the Porcupine Seabight (May).

An MSU post-graduate student took part in an international expedition on board the R/V *Pelagia* (September - October) carried out within the framework of the ENAM programme.

Another MSU student participated in a research cruise (June – August) of the R/V *Akademik Mstislav Keldysh* (Institute of Oceanology of the Russian Academy of Science) to the Norwegian Margin.

TTR uses any opportunity to give additional field training to students involved in the programme.

UNESCO Chair

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 UNESCO-MSU Centre for Marine Geology and Geophysics, providing educational support to its research projects.

Particular attention was paid to supervision of five Ph.D., six BSc and three MSc projects. Students carried out their projects in the MSU laboratories and other research institutions and universities in Russia, using data obtained in various TTR expeditions. Some of the students carried out their investigations abroad through agreements among the countries participating in the TTR programme.

Research and training activities

In 1998, a series of group and individual training and research activities were carried out by the Chair's staff and students. The selection of students for participation in the TTR-8 cruise was based on the submissions of candidates by the various Departments (such as Geology and Geochemistry of Oil and Gas, Lithology and Marine Geology, Geophysics, Paleontology etc.).

Well before the TTR expedition starts, students begin working in the laboratories and the MSU Science Park to learn the objectives of a particular expedition, to become acquainted with the geology of the study areas, the geological and geophysical methods to be used, and the equipment. Those selected are also given a series of lectures and seminars related to the subject of the cruise (March-May).

Another series of seminar presentations took place during the fall of 1998. As the result, fifteen post-graduate and undergraduate students, who presented the best research papers, were selected for participation in the TTR-8 post-cruise meeting (Southampton, UK, January 1999) (Annex IV).

Individual training and research activities included:

- Dr. Anatoly Limonov participated in the PRISMED-II cruise, carried out onboard the R/V *l'Atalante*, Leg 2 (14 February - 1 March). A detailed geophysical survey of four main sectors of the Eastern Mediterranean basin was carried out during the cruise.
- Anna Volkonskaya, a post-graduate student of the Geophysical Department of Moscow State University won a long-term fellowship (provided through Russia's Ministry of Higher and Professional Education) for study in scientific centres abroad in 1998. In the period from January to December, she received practical training in France at the 'Laboratoire de Geodynamique Sous-marine de l'Observatoire Oceanologique de Villefranche' where, under the supervision of Dr. J. Mascle, she processed and interpreted multichannel seismic data on the Mediterranean Ridge accretionary prism. During the training period, she participated in the above-mentioned PRISMED-II cruise (28 January – 1 March).
- In May-June, Pavel Shashkin and Alexei Almendinguer, both MSU students, visited the University of Gent (Belgium), in accordance with the bilateral co-operation agreement. They worked under the supervision of Prof. J.-P. Henriet. They also participated in the cruise of the R/V *Belgica* in the Porcupine Seabight (5 - 25 May) and took part in the processing of data obtained during the cruise.
- Irina Belenkaya, an MSU graduate student, visited the Catholic University of Leuven (Belgium) from 6 February to 30 April. The grant was provided through the Flemish Ministry of Education. Her

research on the data collected during the TTR-6 cruise (1996) was supervised by Dr. R. Swennen. During the above cruise, authigenic carbonate concretions and crust were sampled in the Black Sea in the area of the Sorokin Trough, characterized by active gas venting. Samples were prepared and analyzed for petrographic and geochemical studies using techniques of the Catholic University of Leuven. This visit resulted in a paper presented at the XXIIIth General Assembly of the European Geophysical Society (20-24 April, Nice, France); a research article was also prepared.

- In March-May, Andrey Akhmetzhanov (Ph.D. student) visited Southampton Oceanography Centre (SOC, UK) were he worked under the supervision of Dr. N. Kenyon. This work included processing of the TTR-7 cruise data and preparation of the cruise report that was submitted to and published by IOC. Another report dealing with the cruise data collected in the Rockall Trough area was compiled and presented in a CD-ROM format. This report was later submitted to the Rockall Studies Group of the Irish Petroleum Infrastructure Programme, which supported the work. During his stay, Andrey Akhmetzhanov attended the 'Geosciences '98' Conference held in Keele University (UK) were he presented a joint poster (with Dr. N. Kenyon) discussing cold water carbonate mounds west of Ireland.
- Following an invitation from Dr. Tj. van Weering, Alina Stadnitskaya, an MSU post-graduate student, visited The Netherlands Institute for Sea Research (NIOZ, The Netherlands) from 16 September to 17 December. She took part in an international expedition on board the R/V *Pelagia* (22 September - 16 October) carried out within the framework of the ENAM programme. Later she became involved in processing the geochemical data collected. She became acquainted with modern techniques of geochemical analyses, part of which were carried out in laboratories of the Free University of Amsterdam. The fellowship was provided through the NIOZ-MSU co-operation agreement.
- Leonid Mazurenko, an MSU student, participated in a research cruise (25 June – 1 August) of the R/V *Akademik Mstislav Keldysh* (Institute of Oceanology of the Russian Academy of Science) to the Norwegian Margin. The cruise focused on fluid venting and mud volcanism, which were studied in detail using two *MIR* submersibles.

Dissertation prepared

A D.Sc. thesis on 'Tectonics of the Eastern Mediterranean during the Neogen-Quaternary' was prepared by A.F. Limonov, (defended on 26 February 1999 at Moscow State University). This work is based on new data obtained during the TTR cruises of R/Vs *Gelendzhik* and *Professor Logachev*. It is shown that the major structures in the Eastern Mediterranean have been originated due to the consecutive closure of the Tethys oceanic space. The process of closure spreads from east to west. The subduction of the African lithosphere plate beneath the Eurasian one is still active only in the Calabrian Arc and the western portion of the Hellenic Arc. The remaining part of the Eastern Mediterranean area is characterized in general by compressional deformation caused by the incipient collision between the two lithospheric plates.

Meetings and workshops

'Geosphere-Biosphere Coupling: Carbonate Mud Mounds and Cold Water Reefs' (7-11 February, Gent, Belgium)

An international conference under the above title (which also represented the Sixth post-cruise meeting of the TTR programme) was organized by the Renard Centre of Marine Geology, University of Gent. The Conference summary (below) is taken from *IOC Workshop Report* No. 143, published by UNESCO in 1998.

The 'Carbonate Mud Mounds and Cold Water Reefs' (TTR-7 post-cruise) Conference was held from 7 to 11 February 1998 at the University of Gent, Belgium. This meeting brought together over 90 participants from 11 countries (Belgium, Denmark, France, Germany, Ireland, Italy, The Netherlands, Norway, Russia, United Kingdom and USA). Attending were representatives of industry, international organizations, researchers and students with different specialities (sedimentology, geophysics, geochemistry, microbiology, biology) and research interests falling in the area of the Conference theme. In total, some 40 oral presentations and 15 poster presentations were made.

The Conference started with a field trip, 'Waulsortian - and Frasnian reefs in Belgium', and the following days were divided into six scientific sessions:

- Carbonate mud mounds and cold water corals: are they methane-related?
- Porcupine: cold water corals, mud mounds, sedimentology, stratigraphy and tectonic setting.

Pre-congress geological excursion

- Open session with contribution on the Miocene cold-seep carbonates, lithoherms of the Florida Straits and the Haakon Mosby mud volcano in the Norwegian Sea.
- Rockall-Faeroe: cold water corals, mud mounds, sedimentology, stratigraphy and tectonic setting
- Fossil mud mounds.
- Results of previous TTR cruises

The field trip entitled 'Waulsort - and Frasnian reefs in Belgium' covered outcrops along the type localities of the Devonian Frasnian mound and the Carboniferous Waulsortian mounds. A transect was followed from Givetian mounds and 'Red Frasnian reefs' to the Waulsortian reef settings and the fore-reef sediments of Rocher Bayard. Those type localities amply demonstrated a variety of sedimentological features.

During the six scientific sessions an overview was given of the recent discoveries of reef and mound structures in the North Atlantic Ocean, with the results of the AIRS '96, the *Belgica* '97 and *Logachev* TTR-7 scientific cruises and some industrial cruises (ENNEX, 1985; STATOIL, 1996). There appears to be three distinct types of mounds in five main areas in the North Atlantic (South Porcupine Basin, main Porcupine Basin, SE Rockall Trough, NW Rockall Trough and off Norway).

Modern seabed mound and reef features in the Porcupine Basin and their fossil counterparts with examples in Morocco, Italy and Barbados are often related to petroleum systems and hydrocarbon seepage. Either active or past fluid venting could have provided some of the energy basis and carbon source for ecosystems independent of photosynthesis (bacteria, corals, echinoids, ...). Bacteria feeding on the hydrocarbon energy supply produce carbon dioxide as a metabolism, which is subsequently precipitated as calcium carbonate in seawater. Such carbonate precipitation may have lead to the formation of a hardground, which could

A. Stadnitskaya presenting her research results to Prof. M. Hovland at the poster session of the Conference

by reef-building organisms. Hydrocarbons may have migrated from deeper reservoirs along faults or discontinuities, but gasses, which originated from the destabilization of gas-hydrate layers or from vent sites in an intrusive environment might be taken into consideration as well.

In other examples, it was clear that the highest density of corals is found in areas with rugged seabed topography with glacial features such as tills, iceberg plough-marks or other elevated structures. It would appear that the corals have settled on these mounds to take advantage of the increased currents and of the associated suspended material supply. Some results show that there is a possible relation between the water stratification with nepheloid layers and the occurrence of cold-water corals.

The TTR7-related presentations of the geophysical field data and the first sedimentological and geochemical analyses can be summarized as follows. Seismic, sidescan sonar and subbottom profiler data suggest that some local acoustic anomalies might be connected with gas flux or shallow gas accumulations. The shallow core examinations on deck, however, did not show any visible evidence of the presence of gas or any geochemical clues. These observations were confirmed by measurements in fresh sediments. The values obtained are typical of normal basinal sediments. The continuous TV records and discrete photographic pictures taken along lines running over carbonate mounds revealed neither gas seeps through the seafloor nor associated phenomena. According to the conclusions drawn by the biological team, none of the more than 100 epibathyal species defined from carbonate mounds belongs to chemosynthetic communities. In other words, they cannot be looked upon as being related to methane seeps or enhanced bacterial activity.

These results, together with low methane concentration in sediments (from chromatography data) and low EOM content, cannot suggest the existence of detectable hydrocarbon fluxes through the carbonate mounds in the shallow sediments along the investigated profiles. The mineralogical composition of carbonate components (carbonate inclusions, fragments of shells and corals etc.), as well as isotope values of $\delta^{13}C$ and $\delta^{14}C$ for coral fragments collected from different parts of the sequence recovered, attest to the conclusion that a stable hydrocarbon flux has been absent on the samples sites during the whole Holocene and part of the Pleistocene, at least over 70 ka. Thus, the question of the nature and origin of the carbonate mud mounds of Porcupine Basin remains open. Surface evidence suggests that, at present and in the recent geological past, the distribution and patterns of active growth of cold water corals inhabiting these mounds are closely controlled by climatic variations and bottom currents. On the other hand, the numerous buried ring reefs ('Magellan mounds'), mapped by the R/V *Belgica,* argue for a past fluid flow event, and some acoustic anomalies can be interpreted in terms of local gas accumulations or fluxes. What probably eludes our efforts might be patterns in space (focused versus diffusive fluxes) and/or time (transient versus steady-state flows). An indirect evidence for this could be some observations of abnormal increases in the concentration of methane in the uppermost parts of several cores. Together with the observation of possible gas plumes on the subbottom profiler records, this might suggest charging of the sediment with methane-saturated water from nearby venting sites.

The topics included, among many others, the genesis of mound features, the cold-seep carbonates, the environmental conditions for the growth of ahermatypic deep-water corals, taphonomy of mound features, physical oceanographic circumstances near the mound features, and re-

lations between the geosphere and the biosphere.

Also, the results of previous TTR cruises were presented with special emphasis on mud volcanoes in the Mediterranean Sea and their relation to the destabilization of gas hydrates.

On the first day a debate was held entitled 'Deep Biosphere-Geosphere Coupling' with panel members: Dr. Jean Boissonnas (EC DC XII MAST), Dr. Agnes McLaverty (STATOIL), Dr. Alexei Suzyumov (UNESCO), Dr. André Freiwald (University of Bremen), and as moderator Dr. J.P. Henriet (University of Gent). The participants discussed fundamental questions, environmental issues and educational challenges. The debate concluded with a call for further concerted action between European universities and industry.

Prof. V.T. Trofimov, Vice-Rector of MSU, and Prof. J. Willems, Rector of the University of Gent signing a bilateral Agreement between the two Universities

One of the highlights of this meeting was the Signature of a Bilateral Research Agreement between the University of Gent and Moscow State University by Prof. J. Willems, Rector of the University of Gent, and Prof. V. T. Trofimov, Vice-Rector of MSU.

The discussions around the posters and the lively debates at coffee time and beyond were evidence of a very stimulating intellectual ambiance. All participants expressed great satisfaction with the Conference as having fully accomplished its objectives and facilitated fruitful contacts between the attendees.

Meetings of the TTR Executive and Scientific Committees

The two Committees met jointly on 8 February at the University of Gent during the TTR post-cruise conference. Plans for the TTR-8 cruise were discussed. Dr. J-P. Henriet was co-opted as a member of the Executive Committee.

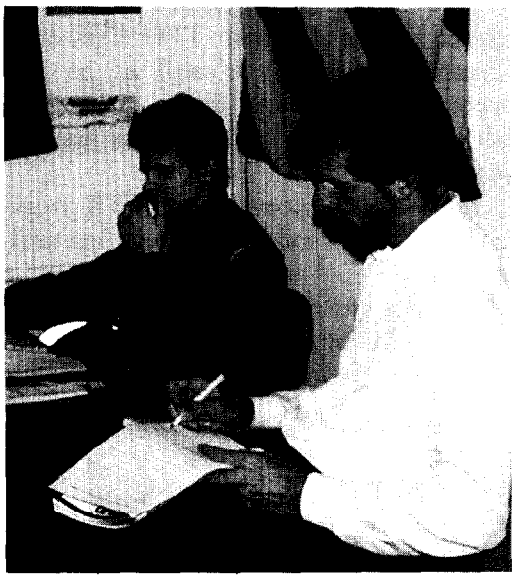
Another meeting of the Executive Committee took place, on the invitation of IOC, in UNESCO (Paris) on 4 October to discuss plans for the TTR-9 expedition (summer 1999). It was agreed that research in the NE Atlantic will be continued, possibly combined with additional studies in the Eastern Mediterranean, funds permitting.

Other meetings attended by the Centre's staff and students

- International conference of undergraduate and Ph.D. students "Lomonosov 98" (7-10 April, Moscow); papers were presented by A. Stadnitskaya (two presentations), A. Sautkin, A. Morozov, A. Saprykina, Yu. Naumov, L. Mazurenko;
- M. Ivanov presented a paper at the Lomonosov Annual Conference (29 April, Moscow);
- A group of scientists and students from the Geology Faculty of MSU (M. Ivanov, E. Kozlova, A. Stadnitskaya, I. Belenkaya and A. Volkonskaya) attended the XXIIIth General Assembly of the European Geophysical Society (20 - 24 April, Nice, France). They made oral presentations based on recent marine geological and geophysical investigations in the Mediterranean and Black Seas;
- A. Akhmetjanov, a Ph.D. student, made a poster presentation on the preliminary results of the R/V *Pelagia* cruise at the 'Geosciences' 98' Conference held at Keele University (UK);
- M. Ivanov took part in the World Conference on Higher Education, as a Holder of a UNESCO Chair (5-9 October, Paris). He was invited to make one of the key-note presentations on the UNESCO Chairs.

Cooperation and visits

Flemish-Russian Agreement for cooperation between MSU and the University of Gent (Belgium)



Prof. J-P. Henriet (right) visits MSU, with P. Shashkin

As the result of successful joint training and research activities undertaken by the two universities in 1997 (during the TTR-7 cruise in particular and the follow-up contacts), a Cooperation Agreement was signed on the occasion of the Sixth TTR post-cruise meeting (7 February). Under this agreement, a post-graduate student from the Geology Faculty visited the Catholic University of Leuven and two other students visited the University of Gent and took part in the cruise of the R/V *Belgica*.

Dr. J.-P. Henriet visited Moscow State University in March to agree on the future projects.

After the TTR-8 cruise, Ben de Mol, a Ph.D. student from the University of Gent processed data at the UNESCO-MSU Centre. His research concentrated on the data obtained in the Porcupine Basin area.

From 21 September to 15 October, Maarten Vanneste, a student of the University of Gent visited MSU. Using seismic data obtained during the TTR-8 cruise, he prepared, together with Sergey Bourjak (MSU), a research paper on acoustic anomalies observed at the Vøring Plateau.

Professor Rudy Swennen from the Catholic University of Leuven visited Moscow from 9 to14 October and lectured at the Geology Faculty of Moscow State University. Together with Irina Belenkaya (MSU), he prepared a research paper.

Cooperation between MSU and NIOZ

Under the above cooperation agreement, one post-graduate student from the UNESCO-MSU Centre took part in the expedition of the ENAM programme of the European Commission, processed data in laboratories of The Netherlands Institute for Sea Research (NIOZ) and Free University of Amsterdam.

Cooperation with UNESCO and its IOC.

Meeting with the Director General of UNESCO

On 21 September, UNESCO Director General Federico Mayor visited MSU. A group of researchers and students from the UNESCO Chair was invited to present the results of the Chair's work. This was done in the presence of Prof. V. Sadovnichiy, the MSU Rector, and other senior staff of the University. Lively discussion concentrated on the importance of international co-operation for high-level training of students and young researchers, knowledge-

Welcome on board the 'Floating University', Mr. Director General!

sharing and the role UNESCO plays in peace-building, through the promotion of better understanding between nations, youth in particular. It was recognized that the TTR programme enhances the development of a universal culture of peace and tolerance, fundamental objectives of the United Nations Educational, Scientific and Cultural Organization.

In 1998, the Centre was granted by UNESCO, through its Participation Programme, with US$25.000 in support of training activities.

Meetings with the Executive Secretary of the Intergovernmental Oceanographic Commission

On 27 April, M. Ivanov met in UNESCO (Paris) with Dr. Patricio Bernal, the newly appointed Executive Secretary of the Intergovernmental Oceanographic Commission. He presented the results and plans of the 'Floating University' project. Dr. Bernal agreed to assume membership in the TTR Executive Committee, in place of the past IOC Executive Secretary, Dr. G. Kullenberg. Dr. Bernal expressed his interest in the programme and assured that IOC will continue providing its support.

On 7 October, Prof. V. T. Trofimov, MSU Vice-Rector, and Dr. M. Ivanov met with Dr. P. Bernal and briefed him on the results of the October TTR Executive Committee meeting, as well as on the ongoing activities and future plans. The full support of IOC to TTR was assured once more.

In 1998, IOC provided the TTR programme with the following direct financial support:

- US$30.000 for the TTR-8 cruise,
- US$10.000 for activities of the UNESCO Chair,
- US$5.000 in support of the 1998 post-cruise meeting.

UNESCO Director General Federico Mayor visits Moscow State University with Prof. V.A. Sadovnichiy, MSU Rector (centre), and Dr. M. Ivanov, UNESCO Chairholder (left)

Awards and grants

- G. Akhmanov, A. Akhmetjanov, and S. Bouriak, post-graduate students of the UNESCO-MSU Centre were awarded the Soros Post-Graduate Student Fellowships, granted by the Soros International Science Foundation in support of educational and research activities of the best one thousand young researchers of Russia and other States of the former Soviet Union.
- Graduate students I. Belenkaya, A. Stadnitskaya, A. Volkonskaja, and undergraduate students A. Sautkin and A. Almendinguer were granted the Soros Graduate Student Stipends in recognition of the results and to further support their research.
- A. Akhmetjanov was granted an award from STATOIL Ltd. for the best oral student presentation at the TTR Post Cruise Meeting held in Gent (Belgium).
- In 1997, the Russian Ministry of Higher and Professional Education, in cooperation with the Administration of the President of the Russian Federation started a programme of long-term fellowships provided to the best students to further support their education and in recognition of the results of their research. This prestigious fellowship (amounting to US$20,000) enables the selected young scientists to undertake study visits to the leading research institutions abroad. In 1997, one of the MSU post-graduate students working at the Centre obtained, for the first time, the above grant. In 1998, another student, A. Volkonskaya, was granted the same fellowship. She spent the whole year of 1998 in France working at the 'Laboratoire de Geodynamique Sous-marine de l'Observatoire Oceanologique de Villefranche-sur-Mer' (University Paris-VI).
- E. Kozlova, a researcher of the Centre was awarded a grant from the Russian Foundation for Basic Research. This made possible her presence at the XXIIIth General Assembly of the European Geophysical Society (20 - 24 April, Nice, France), where she made an oral presentation.

Publications

A volume containing the abstracts and summary results of the International Conference on 'Geosphere-Biosphere Coupling' was published in the *IOC Workshop Reports* series as No. 143 (entitled 'Geosphere-Biosphere Coupling: Carbonate Mud Mounds and Cold Water Reefs'). The TTR-7 cruise results were published in the *IOC Technical Series* as No. 58 (entitled 'Cold Water Carbonate Mounds and Sediment Transport on the Northeast Atlantic Margin'). A special issue of the international journal *Geomarine Letters* (vol. 18, No. 2), based on the TTR results obtained in the Mediterranean and Black Seas during the first six years of TTR, was published, entitled 'Mud Volcanism and Sedimentation: Recent TTR Results' (Springer-Verlag, December 1998). One theme of the TTR studies described in the volume is the investigation of sand-dominated margin systems as analogs for hydrocarbon reservoirs. Other themes are tectonics of the eastern Mediterranean, as well as fluid flow, gas in sediments and mud volcanism, sequence stratigraphy and origin of megaturbidites.

Two other publications, containing the most recent TTR results and published in 1998, are: (i) M.S. Stoker, D. Evans, and A. Cramp (Eds.). 'Geological Processes on Continental Margins. Sedimentation, Mass Wasting and Stability'. *Geol. Soc. of London* Spec. Publ., 129 and (ii) Henriet, J.-P. and Mienert, J. (Eds.) 'Gas Hydrates: Relevance to World Margin Stability and Climatic Change'. *Geol. Soc. of London*, Spec. Publ., 137.

The list of the 1998 publications by the researchers and students of the Centre is given in Annex V.

Annex I

LIST OF INSTITUTIONS, WHICH CO-OPERATED IN THE EXECUTION OF THE TTR PROGRAMME IN 1998

BELGIUM
University of Gent (Gent)
University of Leuven (Leuven)

DENMARK
Geological Survey of Denmark and Greenland GEUS (Copenhagen)
University of Aarhus (Aarhus)

FRANCE
Laboratoire de geodynamique sous marine (Villefranche-sur-Mer)
University of Caen (Caen)

IRELAND
University College of Cork (Cork)

ITALY
University of Genoa (Genoa)
University of Milan (Milan)

THE NETHERLANDS
Netherlands Institute for Sea Research (NIOZ, Texel)

POLAND
Gdansk University, Institute of Oceanography (Gdansk)

PORTUGAL
Directorate of EXPO'98 (Lisbon)
Instituto Geologico e Mineiro (Lisbon)

RUSSIAN FEDERATION
Institute of Oil Geology (Moscow)
Ministry of Natural Resources (Moscow)
Ministry of Science and Technology (Moscow)
Moscow State University (Moscow)
National Commission for UNESCO (Moscow)
National Oceanographic Commission (Moscow)
Paleontological Institute, RAS (Moscow)
Polar Marine Geological Exploration Expedition (St. Petersburg)
Research Institute for Geology and Mineral Resources of the Ocean (St. Petersburg)
P.P. Shirshov Institute of Oceanology, RAS (Moscow)

SWITZERLAND
University of Geneva (Geneva)
Zuerich Technical University (Zuerich)

UNITED KINGDOM
Centre for Glaciology, University of Wales (Aberystwyth)
School of Geographical Sciences, University of Beistol (Beistol)
Southampton Oceanography Centre (Southampton)

University of Southampton (Southampton)

OIL COMPANIES
STATOIL Exploration (Ireland) Ltd.
GEMM
Rockall Studies Group

Annex II

EIGHTH TRAINING THROUGH RESEARCH CRUISE
R/V *PROFESSOR LOGACHEV*

LIST OF PARTICIPANTS

BELGIUM
Ben De Mol (University of Gent)

DENMARK
Tove Nielsen (Geological Survey of Denmark and Greenland)
Antoon Kuijpers (Geological Survey of Denmark and Greenland)
Malene Rank (Geological Survey of Denmark and Greenland)
Hilmar Simonsen (University of Aarhus)

FRANCE
Ian Probert (University of Caen)
Giovanni Aloisi (University of Pierre and Marie Curie)

IRELAND
Andy Wheeler (University-College of Cork)
Niamh Connolly (University-College of Cork)

ITALY
Adriano Mazzini (University of Genoa)
Raffaella Brambilla (Milan University)

THE NETHERLANDS
Henk de Haas (Netherlands Sea Research Institute, NIOZ)

POLAND
Katarzyna Stachura (University of Gdansk)

PORTUGAL
Jose Monteiro (Instituto Geologico e Mineiro)
Francisco Teixeira (Instituto Geologico e Mineiro)
Mario Mil-Homens(Instituto Geologico e Mineiro)

RUSSIA
Research staff and students:
Michael Ivanov (Moscow State University)
Sergey Buryak (Moscow State University)
Anna Volkonskaya (Moscow State University)
Alexander Morozov (Moscow State University)
Roman Pevzner (Moscow State University)
Anastasija Furkalo (Moscow State University)
Michail Baturin (Moscow State University)
Alexandr Tischenko (Moscow State University)
Pavel Shashkin (Moscow State University)
Alexey Almendinger (Moscow State University)
Olga Savotina (Moscow State University)
Evgeny Yakovlev (Moscow State University)
Dmitry Isakov (Moscow State University)

Grigorii Akhmanov (Moscow State University)
Andrey Akhmetjanov (Moscow State University)
Elena Kozlova (Moscow State University)
Alexander Sautkin (Moscow State University)
Maxim Kozachenko (Moscow State University)
Inna Mardanyan (Moscow State University)
Alina Stadnitskaya (Moscow State University)
Irina Belenkaya (Moscow State University)
Svetlana Lubentsova (Moscow State University)
Viktoria Krupskaya (St. Petersburg State University)

Technical support staff:
Alexandr Arutyunov (Polar Marine Geosurvey Expedition)
Boris Malin (Polar Marine Geosurvey Expedition)
Alexandr Ashadze (Polar Marine Geosurvey Expedition)
Alexandr Machulin (Polar Marine Geosurvey Expedition)
Evgeny Samsonov (Polar Marine Geosurvey Expedition)
Valery Babanov (Polar Marine Geosurvey Expedition)
Gennady Antipov (Polar Marine Geosurvey Expedition)
Irina Antipova (Polar Marine Geosurvey Expedition)
Victor Sheremet (Polar Marine Geosurvey Expedition)
Boris Smirnov (Polar Marine Geosurvey Expedition)
Valentin Konfetkin (Polar Marine Geosurvey Expedition)
Sergey Luybimov (Polar Marine Geosurvey Expedition)
Alexandr Ivanov (Polar Marine Geosurvey Expedition)
Alexandr Marakulin (Polar Marine Geosurvey Expedition)
Nikolay Kisilev (Polar Marine Geosurvey Expedition)
Mikhail Samovarov (Polar Marine Geosurvey Expedition)
Anatoly Kuznetsov (Polar Marine Geosurvey Expedition)
Vasily Tokmenko (Polar Marine Geosurvey Expedition)
Vyacheslav Gladush (Polar Marine Geosurvey Expedition)
Vladislav Malin (Polar Marine Geosurvey Expedition)
Alexandr Nescheretov (Polar Marine Geosurvey Expedition)

SWITZERLAND
Adrian Gilli (Zuerich Technical University)
Laurent Sommer (Geneva University)

UNITED KINGDOM
Neil Kenyon (Southampton Oceanographic Centre)
Ellis Maginn (Southampton Oceanographic Centre)
Adam Anthony Cook (Southampton Oceanographic Centre)
Joseph Lenham (Southampton Oceanographic Centre)
Silke Severmann(Southampton Oceanographic Centre)
Patrick Friend (Southampton Oceanographic Centre)
Ruth Hale (Southampton Oceanographic Centre)
Justin Taylor (University of Aberystwyth)

Annex III

EIGHTH TRAINING THROUGH RESEARCH CRUISE
R/V *PROFESSOR LOGACHEV*

LIST OF SEMINAR PRESENTATIONS

Leg 1

15 June. Jose Monteiro (Portugal): Continental Margin Sediments off Portugal
16 June. Neil Kenyon (UK): Coarse Sediment Transport:Northwest Atlantic Margins
17 June. Francisco Teixeira (Portugal): Study of the Geological Structure of the Portuguese Continental Shelf off Aveiro Using Geophysical Methods
18 June. Adrian Gilli (Switzerland): The Western Slope of the Great Bahama Bank: Turbidites vs. Background Sediments
19 June. Raffaella Brambilla (Italy): Mediterranean Deep Basin Evolution Documented By Changes in Sedimentation Rates Recorded in the Plio-Pleistocene
20 June. Mario Mil-Homens (Portugal): Barium As a Paleoproductivity Indicator in Cores from the Portuguese Continental Margin
Silke Severmann (UK): Microbially Mediated Mobilisation of Redox-sensitive
Metals in Relict Hydrothermal Sulphide Deposits
21 June. Irina Belenkaya (Russia): Authigenic Mineralization in HC Gas-Saturated Sediments (Black Sea)
Alexander Ashadze (Russia): Hydrothermal Sulphide Ores in the Axia Part of the EPS and Mid-Atlantic Ridge
22 June. Ruth Hale (UK): Quaternary History of the Polar Front in the Scotia Sea: Foraminiferal Evidence
Adam Cook (UK): The Response of Nematodes to Environmental Conditions (Particularly Low Oxygen)
Joseph Lenham (UK): Inter-tidel Archaeology: A Geophysical Survey of Strangford Lough
Ben De Mol (Belgium): Diagenesis of Peri-platform Sediments on the Western Slope of the West Bahama Bank
Discussion on Preliminary Results of the Leg 1 (Report from the Head of Research Teams)

Leg 2

29 June. Tove Nielsen (Denmark): Faroese GEM Network, Geohazard Study
30 June. Antoon Kuijpers (Denmark): Quaternary Sedimentation and Bottom Current Changes Southwest of the Faeroe Islands
1 July. Justin Taylor (UK): Broadscale Description of Late Quaternary Sedimentary Processes on the N.Faeroes Margin
Hilmar Simonsen (Denmark): demonstration of a scientific movie on the Origin and Geological Development of Faroe Islands
2 July. Henk de Haas (the Netherlands): Shelves and Slopes in the Global Carbon Budget, Processes and Products
3 July. Patrick Friend (UK): Microstructure of the Carbonate Mud Mound Sediment-Water Interface
4 July. Tove Nielsen (Denmark): Large Submarine Slides on the NE Faeroe Continental Margin
5 July. Alexsander Sautkin (Russia): Influence of Surface-Water Temperature

Oscillations on the Development of the Deep-Water coral Build-ups in the Porcupine Seabight (North Atlantic)

6 July. Raffaella Brambilla (Italy): Why Paleopalynology Works: a General Introduction and a Detailed Study About Pollen Grains as a Support for Paleoclimatic and Paleoenvironmental Investigation
Alexey Almendinguer (Russia): Preliminary Results of the *Belgika* cruise '98

7 July. Discussion on Preliminary Results of the Leg 2 (Report from the Head of Research Teams)

Leg 3

11 July. Grigorii Akhmanov (Russia): Mud Volcanoes: a Few Introductory Words About a Vast Subject

12 July. Ben De Mol (Belgium): Early Diagenesis in Eocene Carbonate Cemented Sandstones in N. Belgium

13 July. Sergey Buryak (Russia): Manifestations of Shallow Gas on Seismics

14 July. Alina Stadnitskaya (Russia): Geochemical Evidences for Hydrocarbon Gas Seeps

15 July. Giovanni Aloisi (Italy): Isotopic Evidence of Gas Hydrate and Methane-related Diagenesis in the Mud Volcanic Sediments of the Barbados Accretionary Prism

16 July. Viktoria Krupskaja (Russia): Haakon Mostby Mud Breccia Lithology

17 July. Andy Wheeler (Ireland): Contourites and Turbidites in the Anton Dohm Area, Northen Rockall Trough

18 July. Anna Volkonskaya (Russia): Preliminary Results of the PRISMED II Cruise. New Data from the South of Crete and Libyan Margin

19 July. Andrey Akhmetjanov, Pavel Shashkin (Russia): Carbonate Mud Mounds in the Rockall Trough and Porcupine Seabight and Associated Seabed Features

20 July. Elena Kozlova (Russia): Organic Matter of Mud Breccia Clasts from the Eastern Mediterranean Mud Volcanoes

21 July. Sergey Buryak, Andrey Akhmetjanov, Giovanni Aloisi, Irina Belenkaya et al. Big Scientific Discussion of Storegga Slaid Data

22 July. Alexandr Morozov (Russia): Plume-shaped Anomalies on the Subbottom Profiler Records: What is Their Physical Nature?

23 July. Andy Wheeler (Ireland): Geographical Information System (GIS) and Marine Recourse Management

27 July. Grigorii Akhmanov (Russia): ODP Sites 970 and 971: a Deep Look into a Mud Volcano

28 July. Alexander Ashadze (Russia): Hydrothermal Vent Community: a Look of a Geologist

29 July. Roman Pevzner (Russia): Side-scan Sonars Used in the Cruise: General Overview
Eugene Yakovlev, Mikhael Baturin (Russia): Seismic Data: Acquisition and Processing

30 July. Discussion on Preliminary Results of the Leg 3 (Report from the Head of Research Teams)

Annex IV

SEMINAR PRESENTATIONS AT THE UNESCO CHAIR, MSU MADE BY STUDENTS AND YOUNG RESEARCHERS
October, 15 to December, 25

A. Sautkin: Upper Pleistocene-Holocene calcareous nannoplankton stratigraphy and paleoclimate of The Iberian abyssal plain (Northeastern Atlantic)

A.Stadnitskaia: Geochemistry of a Porcupine Margin Carbonate Mound

A. Akhmetzhanov: Strong bottom current induced features in the Eastern and Northern Porcupine Seabight

E. Yakovlev: The morphology and distribution of the diapiric structures above the Vema Dome on the Voring Plateau

I. Mardanian: Sedimentological features related to sliding processes on the North Eastern Faeroe continental margin

I. Belenkaya: Methane derived diagenetic carbonates in the area of the Storrega Slide (SE Voring Plateau). Mineralogical approach

E. Kozlova: Distribution and composition of hydrocarbon gas in the gas saturated seabed sediments of the Voring Plateau (North-East Atlantic)

A. Almendinguer: Onset of the current induced sedimentation in the Northern Porcupine Seabight seismic evidence

M. Kozachenko: Subsurficial diapiric deposits of the Bear Island area, Southwestern Barents Sea

M. Baturin: The structure and origin of large elongate depression at the NE Faeroe Islands Margin

N. Amelin: Automatic seafloor classification system: interpretation of the TTR-7/8 acoustic data

O. Savotina: Slope instability of the Southeastern Faeroe Margin

R. Pevzner: Occurence of BSR and its distribution on the Southwestern Margin of the Bear Island

S. Bouriak: Inferred gas hydrates, shallow gas, and clay diapirs on the Southern edge of the Voring Plateau, Norwegian Sea

S. Lubentsova: Distribution and composition of the organic matter in the sediments from the Voring Plateau (North Atlantic)

V. Krupskaya: Deposits of the Haakon Mosby mud volcano and material of the diapiric structures in the Bear Island Trough (Barents sea Margin)

LIST OF PUBLICATIONS BY RESEARCHERS AND STUDENTS OF THE UNESCO-MSU CENTRE, 1998

Akhmanov G.G. and Woodside J.M. Mud Volcanic Samples in the Content of the Mediterranean Ridge Mud Diapiric Belt. In: Robertson, A.H.F., Emeis, K.-C., Richter, C., and Camerlenghi, A. (Eds.), Proc. ODP, Sci. Results, 160: College Station, TX (Ocean Drilling Program), pp. 597-605, 1998

Akhmanov G.G. Lithology of the Eastern Mediterranean mud volcanic deposits. Papers of the International Scientific Congress of Students and Young Researchers 'Youth and Science Looking into the Third Millennium'. Moscow, NTA 'APFN' (Ser. Professional), v.2, pp.35-38, 1998 (in Russian).

Akhmanov, G., Premoli Silva, I., Erba, E., Cita, M.B. Lithology of mud breccia clasts from the Cobblestone Area (Western part of the Mediterranean Ridge). In: Geosphere-biosphere coupling: Carbonate Mud Mounds and Cold Water Reefs. International Conference and Sixth Post-Cruise Meeting of the Training Through Research Programme, Gent, Belgium, 7-11 February 1998. IOC Workshop Report No.143, UNESCO, p.37, 1998.

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Annex VI

List of Acronyms

AIRS	Atlantic Irish Regional Survey
ANAXIPROBE	The Netherlands Research Foundation programme in the region of the Anaximander Mountains, the Mediterranean Sea
BSR	Bottom Simulating Reflector
CORSAIRES	Coring Stable and Instable Realms in European Seas project
EC DG XII	Directorate General XII of the European Commission
ENAM	European North Atlantic Margins project
ENNEX	ENNEX INTERNATIONAL plc. - Irish resource company
EXPO'98	International Exhibition devoted to the International Year of the Ocean (Portugal, 1998)
GLORIA	long range sidescan sonar system
IOC	Intergovernmental Oceanographic Commission of UNESCO
MAST	Marine Science and Technology Program of the European Commission
MSU	Moscow State University
NIOZ	Netherlands Institute for Sea Research
OKEAN	long range sidescan sonar system
O.R.E.tech	deep towed sidescan sonar system
PRISMED -II	Programme of Mediterranean Ridge accretionary complex scientific exploration- 2nd phase
PSAT	Atlantic Ocean Seismic Profile
RAS	Russian Academy of Science
R/V	Research Vessel
SOC	Southampton Oceanography Centre
STATOIL	STATOIL Exploration Ltd. (Ireland)
TOBI	deep towed sidescan sonar system
TTR	Training-through-Research programme
UNESCO	United Nations Educational, Scientific and Cultural Organization