

# BLACK SEA DATA MANAGEMENT GUIDE



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## 1. INTRODUCTION

The material on the "Black Sea Data Management Guide" are prepared in accordance with the working plans of the IOC Committee on International Data and Information Exchange (IODE) and its regional component in the Black Sea region to assist specialists of the Black Sea countries in the field of Data Management. The Guide includes the following items:

- national oceanographic data centres, designated national agencies, other marine centres and institutions of the Black Sea region countries dealing with problems of oceanographic data;
- current international and national projects and programs of the Black Sea region countries;
- preliminary catalogue marine observation in the Black Sea;
- bibliography of publications of the marine centres and institute of the Black Sea region on problems of the Black Sea data and information published mainly during the past 5 years;
- other information related to oceanographic data and information on the Black Sea.

The compiler of the Guide is Alexander M. Suvorov, Deputy Director of the Marine Hydrophysical Institute of the Ukrainian National Academy of Sciences, national and regional (the Black Sea region) co-ordinator of the IOC IODE Committee, the editor-in-chief is Valery N. Eremeev, Director General of the Oceanological Centre of the Ukrainian National Academy of Sciences, the Chairman of the IOC UNESCO Black Sea Regional Committee, the Chairman of the Steering Committee of the Black Sea Global Observing Oceanographic System (BSGOOS).

## 2. NATIONAL OCEANOGRAPHIC DATA CENTRES, DESIGNATED NATIONAL AGENCIES, OTHER MARINE CENTRES AND INSTITUTIONS OF THE BLACK SEA REGION COUNTRIES DEALING WITH PROBLEMS OF OCEANOGRAPHIC DATA

### 2.1 NATIONAL OCEANOGRAPHIC DATA CENTRES, DESIGNATED NATIONAL AGENCIES

The section below contains information on national oceanographic data centres and designated national agencies operating in the Black Sea region, entering International Oceanographic Data and Information Exchange Committee of Intergovernmental Oceanographic Commission of UNESCO and considered to be national co-ordinators in the field of international oceanographic data and information exchange (Table I).

**Table I. National Oceanographic Data Centres, Designated National Agencies for Black Sea Region**

| Country         | National IODE Co-ordinator   | National Data Centre Information  | Added Information   |
|-----------------|--|---|---|
| <b>BULGARIA</b> | Mr. Stojan Haramiev<br>Head, National Oceanographic Data Centre<br>Institute of Meteorology & Hydrology<br>66, bd. Tsarigradsko chaussee<br>Sofia 1184<br>BULGARIA<br>Tel: +359 (2) 72 22 71/75 Ext. 359<br>Fax: +359 (2) 88 03 80 | NODC<br>66, bd. Tsarigradsko chaussee<br>Sofia 1184<br>BULGARIA<br>Established: 1985<br>Data Centre URL: n/a  |   |
| <b>GEORGIA</b>  | Asst. Prof. Kakhaber Bilashvili<br>Irakli Abashidze Str. 50<br>Tbilisi 380079<br>GEORGIA<br>Tel/Fax: <995> (32) 23 22 93<br>email: wocean@iberiapac.ge   | DNA<br>Irakli Abashidze Str. 50<br>Tbilisi 380079<br>GEORGIA<br>Established: 2000<br>Data Centre URL: n/a   |   |
| <b>ROMANIA</b>  | National IODE Co-ordinator<br>Vasile Diaconu<br>Romanian Marine Research Institute<br>300, Mamaia Blvd.<br>RO - 8700 Constantza<br>ROMANIA   | NODC<br>Romanian Marine Research Institute<br>300, Mamaia Blvd.<br>RO - 8700 Constantza<br>ROMANIA<br>Established: 1970<br>Data Centre URL:<br>http://www.alpha.rmri.ro<br>phone: +40 41 543 288, +40 41 540 870 ext.46<br>fax: +40 41 831274 | <p><u>Data Centre Description.</u> The Data Centre is a distributed structure within the different departments of the Romanian Marine Research Institute.</p> <p><u>Data Centre Services and Products.</u></p> <ul style="list-style-type: none"> <li>• Collection, quality control and archiving of RMRI data;</li> <li>• Monthly statistical syntheses of the meteorological, physical and chemical parameters of the Shore waters, for internal and limited external use;</li> <li>• Oceanographic Year Book, restricted distribution;</li> <li>• Annual Report on the State of the Marine Environment, part of the National Report edited by Ministry of Waters, Forests, and Environmental Protection;</li> <li>• User access to the NATO OceanBase.</li> </ul> <p><u>Data Centre Projects and Activities.</u></p> <ul style="list-style-type: none"> <li>• Provide informational support for the projects included in the National Research and Development Programmes;</li> <li>• Maintain the databases for physical, chemical and biological oceanographic parameters;</li> <li>• Provide sea level data to the Permanent Service for Mean Sea Level;</li> <li>• Provide information for the Environmental Impact Assessment and Environmental Audit;</li> <li>• Maintain a bibliographic data base;</li> <li>• Collaboration with different partners within the frame of international projects;</li> </ul> |



|                                  |   |  |  |
|----------------------------------|---|--|--|
| <p><b>RUSSIAN FEDERATION</b></p> | <p>Mr. N.N. Michailov<br/>         Director, National Oceanographic Data Centre<br/>         All Russian Research Institute of Hydrometeorological Information (RIHMI)<br/>         6, Koroleva Str., Kaluga District Obninsk 249020<br/>         RUSSIAN FEDERATION<br/>         Tel: &lt;7&gt; (08439) 74907<br/>         Fax: &lt;7&gt; (095) 255 22 25<br/>         Tlx: 412633 INFOR SU<br/>         E-mail: nodc@meteo.ru</p> | <p>NODC<br/>         6, Koroleva Str., Kaluga District Obninsk 249020<br/>         RUSSIAN FEDERATION<br/>         Established: 1964<br/>         Data Centre<br/>         URL:<br/> <a href="http://www.meteo.ru/nodc/">http://www.meteo.ru/nodc/</a></p> | <ul style="list-style-type: none"> <li>• Co-operation with environmental NGO's.</li> </ul> <p>The NODC of the Russian Federation was established in 1964 and operated by the All-Russian Research Institute of Hydrometeorological Information - World Data Centre.</p> <p><u>Data Centre Services and Products.</u> The Russian NODC provides:</p> <ul style="list-style-type: none"> <li>• Acquisition, archiving, processing and disseminating of oceanographic (water bottle -</li> <li>• Hydrology/hydro-chemistry, pollution, BT, CTD, current meter, coastal stations, marine ship)</li> <li>• Data from national and international sources, co-ordination of oceanographic data</li> <li>• Management among marine organisations of Russia;</li> <li>• Monitoring of national data flows involved in the international exchange and participation in</li> <li>• International programmes and projects such as IGOSS, GTSPP, GODAR, GLOSS/PSMSL.</li> </ul> <p>The Russian NODC has the responsibility to provide the oceanographic data management under the WDC-B and plays the role of the RNODC for IGOSS to support the activities of IODE:</p> <ul style="list-style-type: none"> <li>• Development of technologies for data acquisition, processing, archiving and dissemination;</li> <li>• Development of data formats for computer-compatible carriers;</li> <li>• Training activity for data management on national (3 training courses in 1994-1995) and</li> <li>• International (IODE training courses in 1991 and 1994) level.</li> </ul> <p><u>Information products and services provided by the Russian NODC.</u> The Russian NODC supports the following products on user requests:</p> <ul style="list-style-type: none"> <li>• Inventories for regions, institutes, parameters and time periods, and the supporting software (Electronic Reference, SHIP v.2.0) for management, sampling and viewing the summarized oceanographic metadata such as data distribution maps and tables, descriptions of marine institutions, R/V ships, results of statistical processing of the data, etc.;</li> <li>• Multi-level derived datasets to study climatic variability of the selected regions of the World Ocean and time-periods:             <ul style="list-style-type: none"> <li>○ space-oriented and time-series data,</li> <li>○ climatic characteristics using robust methods of statistical estimation,</li> <li>○ climatic fields (average and deviation for 5- or 1-degree grid and a month) for</li> </ul> </li> </ul> |
|----------------------------------|---|--|--|

|                |   |   |   |
|----------------|---|---|---|
|                |   |   | <ul style="list-style-type: none"> <li>○ temperature and salinity.</li> <li>• Software for PCs (Information-Reference System, Oceanography v.4.1) for data input, QC, sampling, graphical and textual data viewing, preparing the derived datasets and statistical analysis of oceanographic (water-bottle, BT, current meter, coastal, marine ship) data in an interactive mode and selected oceanographic datasets to start the management the own regional oceanographic data.</li> </ul> <p><u>Data Centre Projects and Activities.</u><br/> <u>Data Holdings.</u> During 1964-1995, the Russian NODC received oceanographic data from over 30,000 R/V cruises for 1890-1995, from 64 countries (including the former Soviet republics). These contain data from over 1,850,000 oceanographic stations (among them 80,000 stations with chemical pollution), 565,000 BT profiles, 25,000 CTD profiles, 4,000 deep-sea current meters and 26,500,000 marine ship observations. The Russian NODC accumulated the coastal hydrometeorological data for 485 stations for 1977-1992 and 283 Russian stations for 1993-1995. In the last 3 years, the Centre began to accumulate new types of observations - surface temperature from satellites, derived maps from satellites, and aircraft observations. The above-mentioned data are placed in 12 archived datasets of the state holdings.</p> |
| <b>TURKEY</b>  | <p>Eng.Lt.CDR. Ahmet Türker<br/>         Dept. of Navigation, Hydrography &amp; Oceanography<br/>         Seyir, ve Ocinoğrafi Hidrografi Daire si Başkanlığı<br/>         81647 Cubuklu-Istanbul<br/>         TURKEY<br/>         Tel: &lt;90&gt; (216) 331 17 98<br/>         Fax: &lt;90&gt; (216) 331 05 25<br/>         Tlx: 29783 DKSH TR<br/>         E-mail: shod.d@servis.net.tr</p> | <p>NODC<br/>         Established: 1993</p>  |   |
| <b>UKRAINE</b> | <p>Dr. Alexander Suvorov<br/>         Head, Dept. of Marine Information Systems &amp; Technologies (MIST Dept.)<br/>         Marine Hydrophysical Institute of the Ukrainian National Academy of Sciences<br/>         2, Kapitanskaya Str.,<br/>         Sevastopol, 99011<br/>         UKRAINE</p>  | <p>DNA<br/>         2, Kapitanskaya Str.,<br/>         Sevastopol, 99011<br/>         UKRAINE<br/>         Established: 1993<br/>         Data Centre URL:<br/> <a href="http://www.mhi.iuf.net/DEPTS/mistdpt.html">http://www.mhi.iuf.net/DEPTS/mistdpt.html</a></p> | <p><u>Profile.</u></p> <ul style="list-style-type: none"> <li>• Developing &amp; creation the national system for compiling, transfer, storage, analysis and dissemination of oceanographic data and information;</li> <li>• Developing &amp; creation the multidisciplinary national marine geo-information system of the Ukraine;</li> <li>• Developing of the scientific basis, algorithms and software for the oceanographic data quality control, processing and database management systems;</li> <li>• Creation, loading and maintenance of the regional special and multidisciplinary oceanographic database;</li> <li>• Creation of computer knowledge and data-based systems, information and</li> </ul>  |

|  |   |  |  |
|--|---|--|--|
|  | <p>Tel: +7 (380 692) 54 52 76<br/>         Fax: +7 (380 692) 55 42 95<br/>         E-mail: suvorov@alpha.mhi.iuf.net;<br/>         suvorov@mhi2.sebastopol.ua</p> |  | <p>decision support systems for marine environmental management;</p> <ul style="list-style-type: none"> <li>• Creation of computer marine atlas &amp; reference book of the Black Sea and Sea of Azov and other regions of World Ocean;</li> <li>• Participating in international and national oceanographic data and information exchange;</li> <li>• Investigations of the climatic variability of marine environment; modelling of marine systems.</li> </ul> <p><u>Staff.</u></p> <ul style="list-style-type: none"> <li>• Scientists - 10</li> <li>• Software engineers - 8</li> <li>• Post-graduate students - 3</li> <li>• Technician - 1</li> </ul> <p><u>Data Centre Services and Products.</u></p> <ul style="list-style-type: none"> <li>• Catalogue of oceanographic data holdings in the Ukrainian Marine Centers for the Black Sea and Mediterranean Sea and other World Ocean regions;</li> <li>• The Black Sea multidisciplinary Digital Atlas;</li> <li>• Climatic Atlas of the Location of the Hydrogen Sulfide Contamination Zone Upper Boundary in the Black Sea;</li> <li>• Information &amp; Analytical System on the Black Sea Level Investigations;</li> <li>• Database Management System for the Black Sea bibliography;</li> <li>• Black Sea Information System;</li> <li>• Oceanographic Database Management System.</li> </ul> <p><u>Data Centre Projects and Activities.</u></p> <p>National Projects. The MIST Dpt is the leading department of the MHI and in the Ukraine of the following projects:</p> <ul style="list-style-type: none"> <li>• Creation of national system for compiling, transfer, storage, analysis and dissemination of oceanographic data and information (project "National bank of oceanological data");</li> <li>• Creation of Computer Marine Atlas &amp; Reference book of the Black Sea and Sea of Azov and other regions of World Ocean (project "Computer marine atlas");</li> <li>• Creation of computer knowledge and data base, marine support decision systems (project "Marine expert systems");</li> <li>• Creation of national integrated systems and technologies of operative monitoring of marine environment (project "Monitoring") All these projects are running in frameworks of National programme of investigation and utilisation of resources of the Black Sea and Sea of Azov and other regions of World Ocean (State Committee of Science and Intellectual Property of the Ukraine)</li> </ul> |
|--|---|--|--|

|  |  |  |  |
|--|--|--|--|
|  |  |  | <ul style="list-style-type: none"> <li>• Developing and creation of conception of national multidisciplinary national marine geo-information system of the Ukraine (State fund of fundamental Investigation of State Committee of Science and Intellectual Property of the Ukraine);</li> <li>• Principles of developing and creation new marine information systems and technologies (Programme of National Academy of Sciences of Ukraine).</li> </ul> <p>International Projects. The MIST Dpt activities in the International Programmes and Projects:</p> <ul style="list-style-type: none"> <li>• IOC International Oceanographic Data and Information Exchange (IODE);</li> <li>• IOC Global Oceanographic Data Archaeology and Rescue Project (GODAR);</li> <li>• MEDAR/ MEDATLAS II Mediterranean Data Archaeology and Rescue &amp; Mediterranean Atlas;</li> <li>• IOC Black Sea Regional Programme in Marine Sciences and Services;</li> <li>• "Black Sea Ecosystem processes and Forecasting / Operational Database Management System" (The project NATO Science for Peace);</li> <li>• Co-operative Marine Science Programme for the Black Sea.</li> </ul> <p>Main Data Holdings of MIST Dpt:</p> <ul style="list-style-type: none"> <li>• All data of the cruises of MHI research vessels which were obtained in digital form or those which were digitised;</li> <li>• Copy of the oceanographic data set of the Soviet (Russian) NODC as for 1981;</li> <li>• Black Sea database, which is compiled from different national and international sources and which is the most complete database for this region;</li> <li>• Oceanological data sets for Mediterranean Sea and for the coastal zone of the Republic Guinea and Guinea sector of the Atlantic Ocean;</li> <li>• Full set of the databases of the CoMSBlack and NATO TU Black Sea Program international surveys in the Black Sea (1991-1995);</li> <li>• Data on CD-ROM's from US NODC, the MEDATLAS Consortium, BODC, MARIS and other sources.</li> </ul> |
|--|--|--|--|

## 2.2 MARINE CENTRES AND INSTITUTIONS OF BLACK SEA REGION COUNTRIES DEALING WITH PROBLEMS OCEANOGRAPHIC DATA

**Table II. Marine Centres and Institutions of Black Sea Region Countries dealing with Oceanographic Data**

| <b>Country</b>            | <b>Marine Centres and Institutions</b>   | <b>Location (Address)</b>                                  |
|---------------------------|--|--|
| <b>UKRAINE</b>            | Marine Hydrophysical Institute (MHI) of the Ukrainian National Academy of Sciences   | 2, Kapitanskaya Str., Sevastopol, 99011, UKRAINE           |
|                           | Institute of Biology of Southern Seas (IBSS) of the Ukrainian National Academy of Sciences   | 2, Nakhimov Av., Sevastopol, 99011, UKRAINE                |
|                           | Institute of Geological Sciences (IGS) of the Ukrainian National Academy of Sciences   | 55, Gonchar Str., Kyiv, 01601, UKRAINE                     |
|                           | Ukrainian Scientific Centre of the Ecology of Sea (UkrSCES) of the Ministry of Nuclear Safety and Environment of the Ukraine                                     | 89, Frantsuzsky Blvd., Odessa, 65009, UKRAINE              |
|                           | Southern Scientific Research Institute of Marine Fisheries and Oceanography (SSRIMFO) of the Ministry for Environmental Protection and Nuclear Safety of Ukraine | 2, Sverdlov Str., Kerch, 98300, UKRAINE                    |
|                           | Marine Branch of Ukrainian Research Hydrometeorological Institute (MB of UkrRHMI) of the Ministry for Environmental Protection and Nuclear Safety of Ukraine     | 61, Sovetskaya Str., Sevastopol, 99011, UKRAINE            |
|                           | Experimental Branch of Marine Hydrophysical Institute (EB of MHI) of the Ukrainian National Academy of Sciences  | Katsiveli, Simeiz, Crimea, 98680 UKRAINE                   |
|                           | Odessa Branch of the Institute of Biology of Southern Seas (OB of IBSS) of the Ukrainian National Academy of Sciences (Odessa).                                  | 37, Pushkinskaya Str., Odessa, 65011, UKRAINE              |
| <b>RUSSIAN FEDERATION</b> | All Russian Research Institute for Hydrometeorological Information (RIHMI)   | 6, Koroleva Str., Kaluga District, Obninsk, 249020, RUSSIA |
|                           | The P. P. Shirshov Institute of Oceanology of the Russian Academy of Sciences  | 23, Nakhimov Av., Moscow, 117850, RUSSIA                   |
|                           | The State Oceanographic Institute  | 6, Kropotkinsky Lane, Moscow, 119838, RUSSIA               |
|                           | The Southern Branch of the P. P. Shirshov Institute of Oceanology of the Russian Academy of Sciences   | Gelendzhik-7, Krasnodar Region, 353470, RUSSIA             |
|                           | Moscow State University  | Vorobjevy Gory, Moscow 117234, RUSSIA                      |
|                           | All-Russia Scientific Research Institute for Fishery and Oceanography  | 17/1, Verchne-Krasnoselskaya Str., Moscow, 107140, RUSSIA  |
|                           | The Azov Research Institute of Fisheries of the Russian Federation State Committee for Fisheries   | Rostov on Don<br>RUSSIA                                    |
| <b>BULGARIA</b>           | The Institute of Oceanology of the Bulgarian Academy of Sciences   | P.B. 152, 9000, Varna, BULGARIA                            |
|                           | Institute of Meteorology & Hydrology of the Bulgarian Academy of Sciences  | 66, bd. Tsarigradsko chaussee Sofia 1184, BULGARIA         |
| <b>GEORGIA</b>            | The Oceanographic Research Centre of the Tbilisi State University  | Irakli Abashidze Str. 50<br>Tbilisi 380079, GEORGIA        |
| <b>ROMANIA</b>            | The Romanian Marine Research Institute (RMRI)  | 300, Mamaia Blvd.<br>RO - 8700 Constantza, ROMANIA         |
| <b>TURKEY</b>             | The Institute of Marine Sciences of the Middle East Technical University   | PO Box 28, Erdemli, 33731, Icel, TURKEY                    |
|                           | The Institute of Marine Sciences and Technology of the Dokuz Eylul University  | PO Box 49, Izmir, 5211, TURKEY                             |

### **3. CURRENT INTERNATIONAL AND NATIONAL PROJECTS AND PROGRAMS OF THE BLACK SEA REGION COUNTRIES IN FRAMEWORK OF WHICH VARIOUS PROBLEMS CONCERNED OCEANOGRAPHIC AND DATA INFORMATION ARE DEVELOPED**

#### **3.1 MEDAR/MEDATLAS II PROJECT**

##### **Mediterranean Data Archaeology and Rescue of Temperature, Salinity and Biochemical Parameters**

The objective of the MEDAR/MEDATLAS II project (1998-2001) is to rescue, safeguard and make available a comprehensive data set of oceanographic parameters collected in the Mediterranean and Black Sea, through a wide co-operation of the Mediterranean and Black Sea countries. It is a European MAST/INCO concerted action and a regional contribution to UNESCO/IOC Global Ocean Data Archaeology and Rescue (GODAR) project.

Participating institutes of the consortium are:

- Institut français de recherche pour l'exploitation de la mer (IFREMER), France
- Instituto Español de Oceanografía (IEO), Spain
- Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Italy
- National Centre for Marine Research, Hellenic National Oceanographic Data Centre (NCMR/IO-HNODC), Greece
- Universite de Liege, GeoHydrodynamics and Environment Research (GHER), Belgium
- Israel Oceanographic and Limnological Research, Department of Physical Oceanography (IOLR), Israel
- Intergovernmental Oceanographic Commission (IOC)
- Consiglio Nazionale Delle Ricerche, Institute of Atmospheric and Oceanic Sciences (CNR/ISAO), Italy
- Ente per le Nuove tecnologie l'Energia e l'Ambiente, Marine Environment Research Centre (ENEA/CRAM), Italy
- International Council for the Exploration of the Sea (ICES)
- Turkish Navy, Department of Navigation, Hydrography and Oceanography (TN-DNHO), Turkey
- Institut National de Recherche, Département d'Océanographie et des Technologies Marines (INRH/DOTM), Maroc
- Institut des Sciences de la Mer et de l'Aménagement du Littoral (ISMAL), Algeria
- University of Malta, Department of Biology, Physical Oceanography Unit, (UM-PO), Malta
- Ministry of Agriculture, Natural Resources and Environment, Cyprus National Oceanography Data Centre, (FD-MANRE/CyNODC), Cyprus
- National Council for Scientific Research, National Centre for Marine Sciences, (NCSR-NCMS), Lebanon
- National Institute of Oceanography and Fisheries, Egyptian National Oceanographic Data Centre, (NIOF/ENODC), Egypt
- All Russian Research Institute of Hydrometeorological Information (World Data Centre), Russian Federation
- Marine Hydrophysical Institute, Department of Marine Information Systems & Technologies, (MHI/MIST), Ukraine
- National Institute of Meteorology and Hydrology (NIMH), Bulgaria

### **Collaborations and scientific advisers:**

GODAR Project (WDC-A), NODC-Croatia, INSTM Tunisia, DNA Georgia, EUROGOOS, IODE Network, SHOM

### **Tasks**

1) To compile, safeguard and make available historical data sets of:

- Temperature
- Salinity
- Oxygen
- Nitrate
- Phosphate
- Alkalinity
- Nitrite
- Total P
- pH
- Ammonia
- Silicate
- H<sub>2</sub>S
- Total Nitrogen
- Chlorophyll-a

The compilation of data from each source laboratory is done by the NODC/DNA of each country. Special attention is given to East, South and coastal areas of the region.

- 2) To make the archived data sets comparable and compatible by using the common MEDATLAS protocol for formatting and quality checking, in accordance with the internationally agreed standards.
- 3) To prepare and disseminate qualified value added products by using an efficient gridding and mapping methodology developed with the Variational Inverse Model of MODB (MAS2-CT93-0075-BE). The objectives analyses are qualified by two expert modelling centres.
- 4) To publish the observed data, gridded data, maps and related documentation on CDROM for further scientific, educational, industrial and governmental use.

## **3.2 PROGRAMME "THE BLACK SEA GOOS" OF IOC BLACK SEA REGIONAL COMMITTEE**

Terms 2001-2005.

Project Participants States:

- TURKEY
- UKRAINE
- RUSSIAN FEDERATION
- BULGARIA
- ROMANIA
- GEORGIA

## **3.3 PROJECT "BLACK SEA ECOSYSTEM PROCESSES AND FORECASTING/ OPERATIONAL DATABASE MANAGEMENT SYSTEM" OF NATO SCIENCE FOR PEACE SUB-PROGRAM**

Terms 1999-2002.

Project Participants:

#### TURKEY

- The Institute of Marine Sciences of the Middle East Technical University (Erdemli).

#### UKRAINE

- The Marine Hydrophysical Institute (MHI) of the Ukrainian National Academy of Sciences (Sevastopol);
- The Institute of Biology of Southern Seas (IBSS) of the Ukrainian National Academy of Sciences (Sevastopol).

#### RUSSIAN FEDERATION

- The P. P. Shirshov Institute of Oceanology of the Russian Academy of Sciences (Moscow);
- The Southern Branch of the P. P. Shirshov Institute of Oceanology of the Russian Academy of Sciences (Gelendjik).

#### BULGARIA

- The Institute of Oceanology of the Bulgarian Academy of Sciences ( Varna).

#### ROMANIA

- The Romanian Marine Research Institute (RMRI) (Constantza).

#### GEORGIA

- The Tbilisi State University, (Tbilisi).

### 3.4 BLACK SEA INTEGRATED COASTAL AND SHELF ZONE MONITORING AND MODELING (INCOM) PROGRAM, NORTH ATLANTIC TREATY ORGANISATIONS (NATO), COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY. SUBPROGRAM OF INCOM - DATABASE - MANAGEMENT PROGRAM

Participating Black Sea research states and institutions:

#### UKRAINE

- The Marine Hydrophysical Institute (MHI) of the Ukrainian National Academy of Sciences (Sevastopol);
- The Institute of Biology of Southern Seas (IBSS) of the Ukrainian National Academy of Sciences (Sevastopol);
- The Research Centre "State Oceanarium" of Ukraine (Sevastopol);
- The Ukrainian Scientific Centre of the Ecology of Sea (UkrSCES), (Odessa).

#### RUSSIAN FEDERATION

- The Southern Production Association for Marine Geological Operations (Yuzhmorgeologiya) of the Ministry of Natural Resources of the Russian Federation (Gelendjik);
- The Azov Research Institute of Fisheries of the Russian Federation State Committee for Fisheries (Rostov on Don)
- The P. P. Shirshov Institute of Oceanology of the Russian Academy of Sciences (Moscow);
- The Southern Branch of the P. P. Shirshov Institute of Oceanology of the Russian Academy of Sciences (Gelendjik);
- Centre "Dynamics of the Near-shore Zone" (Gelendjik).

#### ROMANIA

- The Romanian Marine Research Institute (RMRI) (Constantza).

#### BULGARIA

- The Institute of Oceanology of the Bulgarian Academy of Sciences ( Varna).



- The Central Laboratory of General Ecology (Sofia).

#### GEORGIA

- The Oceanographic Research Centre of the Tbilisi State University

#### TURKEY

- The Institute of Marine Sciences of the Middle East Technical University (Erdemli).

### 3.5 PROJECT "THE BLACK AND AEGEAN SEAS INTERACTION AND EXCHANGE: AND INTEGRATION OF IN-SITU MEASUREMENTS, SATELLITE DATA AND NUMERICAL MODELLING"

Terms 2001-2002.

Project Participants:

#### GREECE

- National Centre for Marine Research, Institute of Oceanography

#### UKRAINE

- Marine Hydrophysical Institute of the Ukrainian National Academy of Sciences (Sevastopol).

### 3.6 PROJECT "NITROGEN CYCLING IN THE OXIC/ANOXIC ENVIRONMENT OF THE BLACK SEA: DATA ANALYSIS AND NUMERICAL SIMULATION"

Terms 2000-2001.

Project Participants:

#### USA

- Woods Hole Oceanographic Institute

#### UKRAINE

- Marine Hydrophysical Institute of the Ukrainian National Academy of Sciences (Sevastopol).

### 3.7 PROJECT "THE DATABASE ON THE BIOLUMINESCENCE FIELD OF THE WORLD OCEAN"

Terms 1999-2001.

Project Participants:

#### UNITED KINGDOM

- Plymouth Marine Laboratory

#### UKRAINE

- Marine Hydrophysical Institute of the Ukrainian National Academy of Sciences (Sevastopol);
- Institute of Biology of Southern Seas (IBSS) of the Ukrainian National Academy of Sciences (Sevastopol);

#### RUSSIAN FEDERATION

- Institute of Biophysics (Krasnoyarsk)

### 3.8 "UNITED INFORMATION SYSTEM ON THE WORLD OCEAN" SUBPROGRAM OF THE "THE WORLD OCEAN" PROGRAM OF THE RUSSIAN FEDERATION

A subprogram "United Information System on the World Ocean (UISWO) is realised in Russia in framework of Federal program "The World Ocean". The goal of the subprogram is to create and introduce into marine practice the United Information System on situation in the World Ocean based on the existing departmental systems and designated for information provision of scientific investigation, assimilation and exploitation of the World Ocean resources, support of making decision on the World Ocean Problems. The Subprogram supposes UISWO will also cover all the seas washing the coastline of Russia including the Black Sea.

Term of the Subprogram fulfilment is 1998-2007.

The main designers of the Subprogram are Hydrometeorological Centre, All Russian Research Institute of Hydrometeorological Information -WDC, and the State Oceanographic Institute.

The main UISWO directions

Direction 1. Construction of the basic elements of the United Information System on situation in the World Ocean, methodical accompaniment of its development and operation.

Direction 2. Development and introduction of methods, means and technologies of observation by direct and remote methods, metrological provision and standardization of observation on condition and contamination of the environment of the World Ocean and coastal territories.

Direction 3. Providing users with current information on situation in the World Ocean for direct implementation of activity of different kind in real time.

Direction 4. Providing consumers with generalized and specialized information on situation in the World Ocean and coastal territories for solution of a set of problems that do not demand an access to data in real time.

Direction 5. Integration, accompaniment and dissemination of information resources on the situation in the World Ocean, providing of telecommunication interaction between the System elements and users, its safety and stability.

Direction 6. Development of the UISWO specialized and regional components.

### 3.9 THE UKRAINE NATIONAL PROJECTS AND PROGRAMS

In Ukraine, activities aimed at the establishment of a national system for compiling, transfer, storage, analysis and dissemination of oceanologic data and information are being conducted in the framework of the projects:

- Creation of National system for compiling, transfer, storage, analysis and dissemination of oceanographic data and information (project "National bank of oceanological data");
- Creation of Computer Marine Atlas & Reference book of the Black Sea and Sea of Azov and other regions of World Ocean (project "Computer marine atlas");
- Creation of computer knowledge and database, marine support decision systems (project "Marine expert systems").

All these projects are running in frameworks of National programme of investigation and utilisation of resources of the Black Sea and Sea of Azov and other regions of World Ocean (Ministry of Education and Science of Ukraine).

The leading institution of the project is

- Marine Hydrophysical Institute (MHI) of the Ukrainian National Academy of Sciences (Sevastopol).

Other participants of the project are:

- Institute of Biology of Southern Seas (IBSS) of the Ukrainian National Academy of Sciences (Sevastopol);
- Institute of Geological Sciences (IGS) of the Ukrainian National Academy of Sciences (Kiev);
- Ukrainian Scientific Centre of the Ecology of Sea (UkrSCES) of the Ministry of Nuclear Safety and Environment of the Ukraine (Odessa);
- Southern Scientific Research Institute of Marine Fisheries and Oceanography (SSRIMFO) of the Ministry for Environmental Protection and Nuclear Safety of Ukraine (Kerch);
- Marine Branch of Ukrainian Research Hydrometeorological Institute (MB of UkrRHMI) of the Ministry for Environmental Protection and Nuclear Safety of Ukraine (Sevastopol);
- Odessa Branch of the Institute of Biology of Southern Seas (OB of IBSS) of the Ukrainian National Academy of Sciences (Odessa).

Programme of National Academy of Sciences of Ukraine.

- Principles of developing and creation new marine information systems and technologies.

Terms 2001-2005.

Project Participants:

- Marine Hydrophysical Institute (MHI) of the Ukrainian National Academy of Sciences (Sevastopol).
- Experimental Branch of MHI (Katsivele, Crimea)

#### 4. PRELIMINARY CATALOGUE OF MARINE OBSERVATIONS IN THE BLACK SEA

This section includes a preliminary catalogue of cruises of research vessels from marine centres and institutes accomplished in the Black Sea and aimed to obtain hydrophysical, hydrochemical and hydrobiological data on the marine environment condition (Table III). This table contains information collected in framework of the international projects WOD98, MEDAR/MEDATLAS II and NATO TU BLACK SEA, supplemented with data we have obtained from different sources.

It should be also taken into account that probably not all the hydrological information on these cruises was kept safe. Data for the catalogue were selected from the cruises reports whereas primary data were held in separate printed volumes that could be either not kept safe or be damaged. Above that, the metadata set for historical cruised is limited. So the information on chiefs of expeditions, devices, etc. is absent practically everywhere.

**Table III. The preliminary catalogue of data obtained from various sources.**

| Ship                     | Ship Code | Cruise | Start Date | Last Date  |
|--------------------------|-----------|--------|------------|------------|
| A. VAVILOV               | 90AV      | 8971   | 02.06.1957 | 05.06.1957 |
| AELITA                   | 90A8      | 8405   | 21.05.1984 | 03.06.1984 |
| AK. KNIPOVICH            | 90KH      | 5      | 16.12.1964 | 16.12.1964 |
| AKADEMIK                 | XXXX      | 1992   | 07.07.1992 | 17.07.1992 |
| AKADEMIK A. KOVALYEVSKIY | 90AK      | 100    | 01.07.1985 | 18.08.1985 |
| AKADEMIK A. KOVALYEVSKIY | 90AK      | 104    | 12.10.1986 | 22.11.1986 |
| AKADEMIK A. KOVALYEVSKIY | 90AK      | 119    | 01.09.1990 | 04.10.1990 |

|                          |      |      |            |            |
|--------------------------|------|------|------------|------------|
| AKADEMIK A. KOVALYEVSKIY | 90AK | 122  | 31.07.1991 | 09.08.1991 |
| AKADEMIK A. KOVALYEVSKIY | 90AK | 8967 | 18.11.1957 | 04.12.1957 |
| AKADEMIK A. KOVALYEVSKIY | 90AK | 8968 | 23.02.1957 | 01.03.1957 |
| AKADEMIK A. KOVALYEVSKIY | 90AK | 91   | 21.04.1981 | 14.06.1981 |
| ARIEL                    | 90AE | 8603 | 27.03.1986 | 12.04.1986 |
| ARSHINTSEVO              | URAR | 9405 | 26.05.1994 | 30.05.1994 |
| ARSHINTSEVO              | URAR | 9611 | 13.11.1996 | 30.11.1996 |
| CANDARLI                 | 89CA | 1    | 11.04.1963 | 26.04.1963 |
| CANDARLI                 | 89CA | 11   | 05.04.1965 | 10.04.1965 |
| CANDARLI                 | 89CA | 122  | 17.11.1982 | 19.11.1982 |
| CANDARLI                 | 89CA | 124  | 07.12.1982 | 09.12.1982 |
| CANDARLI                 | 89CA | 134  | 20.03.1983 | 21.03.1983 |
| CANDARLI                 | 89CA | 135  | 12.04.1983 | 13.04.1983 |
| CANDARLI                 | 89CA | 150  | 21.04.1984 | 26.04.1984 |
| CANDARLI                 | 89CA | 154  | 04.07.1984 | 09.07.1984 |
| CANDARLI                 | 89CA | 17   | 22.05.1968 | 26.06.1968 |
| CANDARLI                 | 89CA | 19   | 12.08.1968 | 16.08.1968 |
| CANDARLI                 | 89CA | 4    | 10.10.1963 | 25.10.1963 |
| CANDARLI                 | 89CA | 48   | 04.06.1973 | 05.06.1973 |
| CANDARLI                 | 89CA | 7    | 24.07.1964 | 02.08.1964 |
| CANDARLI                 | 89CA | 89   | 17.09.1978 | 11.10.1978 |
| CANDARLI                 | 89CA | 94   | 20.08.1979 | 22.08.1979 |
| CARSAMBA                 | 89CR | 10   | 16.01.1965 | 26.01.1965 |
| CARSAMBA                 | 89CR | 100  | 21.08.1980 | 02.09.1980 |
| CARSAMBA                 | 89CR | 12   | 08.03.1966 | 20.03.1966 |
| CARSAMBA                 | 89CR | 129  | 18.01.1983 | 03.02.1983 |
| CARSAMBA                 | 89CR | 139  | 18.05.1983 | 20.05.1983 |
| CARSAMBA                 | 89CR | 16   | 12.04.1968 | 16.04.1968 |
| CARSAMBA                 | 89CR | 18   | 05.06.1968 | 05.07.1968 |
| CARSAMBA                 | 89CR | 2    | 15.07.1963 | 31.07.1963 |
| CARSAMBA                 | 89CR | 22   | 06.12.1968 | 14.12.1968 |
| CARSAMBA                 | 89CR | 35   | 20.01.1971 | 29.01.1971 |
| CARSAMBA                 | 89CR | 47   | 23.11.1972 | 01.12.1972 |
| CARSAMBA                 | 89CR | 6    | 05.04.1964 | 14.04.1964 |
| CHELEKEN                 | 90BH | 1151 | 29.10.1980 | 30.10.1980 |
| CHERNOMOR                | 90CH | 8305 | 15.05.1983 | 08.06.1983 |
| CHERNOMOR                | 90CH | 8310 | 25.10.1983 | 17.11.1983 |
| CHERNOMOR                | 90CH | 8405 | 15.05.1984 | 01.06.1984 |
| CHERNOMORETZ             | 90JN | 1890 | 27.06.1890 | 04.08.1890 |
| CONSTANTA                | XXXX | 1066 | 12.11.1974 | 15.05.1975 |
| CONSTANTA                | XXXX | 1097 | 21.02.1973 | 06.11.1973 |
| CONSTANTA                | XXXX | 1099 | 11.02.1974 | 08.08.1974 |
| CONSTANTA                | XXXX | 1241 | 03.01.1979 | 06.02.1979 |
| CONSTANTA                | XXXX | 1243 | 01.10.1979 | 13.11.1979 |
| CONSTANTA                | XXXX | 1244 | 02.04.1979 | 09.05.1979 |
| CONSTANTA                | XXXX | 1396 | 09.02.1982 | 09.02.1982 |
| CONSTANTA                | XXXX | 6209 | 16.08.1966 | 21.11.1966 |
| CONSTANTA                | XXXX | 6210 | 23.05.1968 | 01.12.1968 |
| CONSTANTA                | XXXX | 6240 | 12.08.1969 | 02.10.1969 |
| CONSTANTA                | XXXX | 6255 | 29.05.1970 | 17.02.1971 |
| CONSTANTA                | XXXX | 6256 | 28.02.1972 | 28.02.1972 |
| CUBUKLU                  | 89CU | 199  | 27.08.1987 | 31.08.1987 |
| CUBUKLU                  | 89CU | 306  | 11.11.1992 | 23.11.1992 |
| CUBUKLU                  | 89CU | 308  | 08.01.1993 | 12.01.1993 |
| CUBUKLU                  | 89CU | 309  | 18.02.1993 | 22.02.1993 |
| CUBUKLU                  | 89CU | 321  | 12.02.1995 | 17.02.1995 |
| CUBUKLU                  | 89CU | 3221 | 18.03.1995 | 19.03.1995 |
| CUBUKLU                  | 89CU | 329  | 03.07.1996 | 05.07.1996 |
| DANILEVSKIY              | XXXX | 6905 | 17.05.1969 | 31.05.1969 |

|                    |      |      |            |            |
|--------------------|------|------|------------|------------|
| DMITRY MENDELEYEV  | 90MD | 1535 | 23.07.1989 | 09.09.1989 |
| DMYTRY STEFANOV    | 9027 | 8804 | 02.04.1988 | 26.04.1988 |
| DMYTRY STEFANOV    | 9027 | 8805 | 07.05.1988 | 20.05.1988 |
| DMYTRY STEFANOV    | 9027 | 8810 | 08.10.1988 | 10.10.1988 |
| DONETZ             | 90ED | 1891 | 29.05.1891 | 22.06.1891 |
| EKSPERIMENT        | UREX | 9606 | 03.06.1996 | 10.06.1996 |
| ELSK               | 9028 | 8602 | 20.02.1986 | 17.03.1986 |
| ERNST KRENKEL      | 90KE | 201  | 18.10.1972 | 17.01.1973 |
| ERNST KRENKEL      | 90KE | 211  | 03.02.1973 | 02.05.1973 |
| ERNST KRENKEL      | 90KE | 483  | 29.01.1975 | 31.01.1975 |
| ERNST KRENKEL      | 90KE | 580  | 18.02.1975 | 18.04.1975 |
| ERNST KRENKEL      | 90KE | 1042 | 12.11.1978 | 25.11.1978 |
| ERNST KRENKEL      | 90KE | 1054 | 13.03.1979 | 22.05.1979 |
| ERNST KRENKEL      | 90KE | 1072 | 13.10.1979 | 21.12.1979 |
| ERNST KRENKEL      | 90KE | 1096 | 20.02.1980 | 20.06.1980 |
| ERNST KRENKEL      | 90KE | 1205 | 27.09.1982 | 28.09.1982 |
| ERNST KRENKEL      | 90KE | 1301 | 26.12.1984 | 14.03.1985 |
| ERNST KRENKEL      | 90KE | 1326 | 25.07.1985 | 10.10.1985 |
| ERNST KRENKEL      | 90KE | 1374 | 08.01.1987 | 09.01.1987 |
| ERNST KRENKEL      | 90KE | 1447 | 21.11.1987 | 08.03.1988 |
| ERNST KRENKEL      | 90KE | 1459 | 31.03.1988 | 17.07.1988 |
| ERNST KRENKEL      | 90KE | 1502 | 09.02.1989 | 06.05.1989 |
| ERNST KRENKEL      | 90KE | 1525 | 18.09.1989 | 18.09.1989 |
| ERNST KRENKEL      | 90KE | 1557 | 18.01.1990 | 07.04.1990 |
| ERNST KRENKEL      | 90KE | 1583 | 17.07.1990 | 18.07.1990 |
| ERNST KRENKEL      | 90KE | 45   | 02.02.1987 | 08.02.1987 |
| ERNST KRENKEL      | 90KE | 49a  | 26.09.1988 | 05.10.1988 |
| ERNST KRENKEL      | 90KE | 57   | 03.07.1992 | 27.07.1992 |
| ERNST KRENKEL      | 90KE | 58   | 11.09.1992 | 01.10.1992 |
| ERNST KRENKEL      | 90KE | 59   | 16.11.1992 | 10.12.1992 |
| ERNST KRENKEL      | 90KE | 6377 | 27.10.1973 | 09.11.1973 |
| ERNST KRENKEL      | 90KE | 7696 | 02.04.1974 | 28.04.1974 |
| F. BELLINGGAUZEN   | 90FB | 1150 | 29.10.1980 | 30.10.1980 |
| FIOLENT            | 90CA | 880  | 22.08.1980 | 23.08.1980 |
| FIOLENT            | 90CA | 8008 | 16.08.1980 | 21.08.1980 |
| GALS               | 9065 | 88   | 24.03.1988 | 20.11.1988 |
| GALS               | 9065 | 89   | 12.01.1989 | 19.11.1989 |
| GALS               | 9065 | 90   | 19.02.1990 | 23.06.1990 |
| GENERAL ARSHINTSEV | 90B6 | 8205 | 15.05.1982 | 23.05.1982 |
| GEORGY USHAKOV     | 90UG | 218  | 19.05.1973 | 15.08.1973 |
| GEORGY USHAKOV     | 90UG | 240  | 25.12.1973 | 28.03.1974 |
| GEORGY USHAKOV     | 90UG | 298  | 27.07.1974 | 24.10.1974 |
| GEORGY USHAKOV     | 90UG | 870  | 25.12.1975 | 18.03.1976 |
| GEORGY USHAKOV     | 90UG | 955  | 29.03.1977 | 29.03.1977 |
| GEORGY USHAKOV     | 90UG | 1011 | 13.07.1977 | 21.09.1977 |
| GEORGY USHAKOV     | 90UG | 1050 | 05.02.1979 | 05.02.1979 |
| GEORGY USHAKOV     | 90UG | 1057 | 27.03.1979 | 21.06.1979 |
| GEORGY USHAKOV     | 90UG | 1091 | 07.02.1980 | 10.05.1980 |
| GEORGY USHAKOV     | 90UG | 1135 | 17.01.1981 | 19.05.1981 |
| GEORGY USHAKOV     | 90UG | 1145 | 10.06.1981 | 18.09.1981 |
| GEORGY USHAKOV     | 90UG | 1195 | 12.05.1982 | 12.05.1982 |
| GEORGY USHAKOV     | 90UG | 1238 | 19.07.1983 | 19.07.1983 |
| GEORGY USHAKOV     | 90UG | 1252 | 11.08.1983 | 17.11.1983 |
| GEORGY USHAKOV     | 90UG | 1263 | 17.02.1984 | 17.02.1984 |
| GEORGY USHAKOV     | 90UG | 1300 | 11.01.1985 | 10.03.1985 |
| GEORGY USHAKOV     | 90UG | 1345 | 08.01.1986 | 08.01.1986 |
| GEORGY USHAKOV     | 90UG | 1359 | 25.04.1986 | 01.08.1986 |
| GEORGY USHAKOV     | 90UG | 1365 | 19.08.1986 | 28.10.1986 |
| GEORGY USHAKOV     | 90UG | 1382 | 22.11.1986 | 10.02.1987 |

|                |      |      |            |            |
|----------------|------|------|------------|------------|
| GEORGY USHAKOV | 90UG | 1421 | 09.10.1987 | 09.10.1987 |
| GEORGY USHAKOV | 90UG | 1448 | 26.01.1988 | 06.04.1988 |
| GEORGY USHAKOV | 90UG | 1508 | 13.04.1989 | 24.06.1989 |
| GEORGY USHAKOV | 90UG | 1558 | 16.12.1989 | 02.03.1990 |
| GEORGY USHAKOV | 90UG | 1570 | 10.06.1990 | 10.06.1990 |
| GEORGY USHAKOV | 90UG | 59a  | 07.09.1991 | 01.10.1991 |
| GEORGY USHAKOV | 90UG | 60   | 18.03.1992 | 07.04.1992 |
| GEORGY USHAKOV | 90UG | 61   | 05.05.1992 | 28.05.1992 |
| GEROI KERCHI   | 90B7 | 8111 | 19.11.1981 | 05.12.1981 |
| GEROI KERCHI   | 90B7 | 8202 | 19.02.1982 | 18.03.1982 |
| GIDROGRAF      | XXXX | 9148 | 04.03.1932 | 18.03.1932 |
| GIDROGRAF      | XXXX | 9165 | 01.02.1935 | 26.03.1935 |
| GIDROGRAF      | XXXX | 9205 | 26.05.1939 | 15.06.1939 |
| GONETS         | 9067 | 5502 | 21.02.1955 | 17.03.1955 |
| GONETS         | 9067 | 5505 | 05.05.1955 | 11.06.1955 |
| GONETS         | 9067 | 5506 | 15.06.1955 | 16.06.1955 |
| GONETS         | 9067 | 5605 | 21.05.1956 | 07.06.1956 |
| GONETS         | 9067 | 5606 | 18.06.1956 | 11.07.1956 |
| GONETS         | 9067 | 5705 | 16.05.1957 | 12.06.1957 |
| GONETS         | 9067 | 5707 | 04.07.1957 | 15.07.1957 |
| GONETS         | 9067 | 5708 | 21.08.1957 | 07.09.1957 |
| GONETS         | 9067 | 5806 | 10.06.1958 | 22.06.1958 |
| GONETS         | 9067 | 5807 | 08.07.1958 | 23.07.1958 |
| GONETS         | 9067 | 5808 | 26.08.1958 | 30.08.1958 |
| GONETS         | 9067 | 6111 | 12.11.1961 | 28.11.1961 |
| GONETS         | 9067 | 6206 | 14.06.1962 | 26.06.1962 |
| GONETS         | 9067 | 6207 | 11.07.1962 | 19.07.1962 |
| GONETS         | 9067 | 6309 | 12.09.1963 | 02.10.1963 |
| GONETS         | 9067 | 6705 | 11.05.1967 | 03.06.1967 |
| GONETS         | 9067 | 6706 | 11.06.1967 | 21.06.1967 |
| GONETS         | 9067 | 6708 | 14.08.1967 | 28.08.1967 |
| GONETS         | 9067 | 6710 | 25.10.1967 | 31.10.1967 |
| GONETS         | 9067 | 6711 | 15.11.1967 | 16.12.1967 |
| GONETS         | 9067 | 6801 | 06.01.1968 | 16.01.1968 |
| GONETS         | 9067 | 6804 | 18.04.1968 | 08.05.1968 |
| GONETS         | 9067 | 6805 | 16.05.1968 | 24.05.1968 |
| GONETS         | 9067 | 6806 | 01.06.1968 | 16.06.1968 |
| GONETS         | 9067 | 6808 | 11.08.1968 | 21.08.1968 |
| GONETS         | 9067 | 6811 | 13.11.1968 | 30.11.1968 |
| GONETS         | 9067 | 6902 | 20.02.1969 | 29.03.1969 |
| GONETS         | 9067 | 6905 | 07.05.1969 | 28.05.1969 |
| GONETS         | 9067 | 6906 | 21.06.1969 | 03.07.1969 |
| GONETS         | 9067 | 6907 | 10.07.1969 | 05.08.1969 |
| GONETS         | 9067 | 6908 | 14.08.1969 | 26.08.1969 |
| GONETS         | 9067 | 7002 | 13.02.1970 | 15.03.1970 |
| GONETS         | 9067 | 8805 | 26.02.1960 | 31.05.1960 |
| GONETS         | 9067 | 8806 | 13.07.1960 | 02.09.1960 |
| GONETS         | 9067 | 8962 | 20.05.1958 | 24.05.1958 |
| GONETS         | 9067 | 9703 | 26.02.1957 | 01.03.1957 |
| GROT           | 90N1 | 5505 | 05.05.1955 | 06.05.1955 |
| GROT           | 90N1 | 5507 | 07.07.1955 | 22.07.1955 |
| GROT           | 90N1 | 5508 | 18.08.1955 | 29.08.1955 |
| GROT           | 90N1 | 5512 | 08.12.1955 | 18.12.1955 |
| GROT           | 90N1 | 5602 | 23.02.1956 | 15.03.1956 |
| GROT           | 90N1 | 5604 | 20.04.1956 | 20.05.1956 |
| GROT           | 90N1 | 5607 | 11.07.1956 | 13.07.1956 |
| GROT           | 90N1 | 5608 | 24.08.1956 | 05.09.1956 |
| GROT           | 90N1 | 5702 | 26.02.1957 | 24.03.1957 |
| GROT           | 90N1 | 5706 | 19.06.1957 | 25.06.1957 |

|                        |      |      |            |            |
|------------------------|------|------|------------|------------|
| GROT                   | 90N1 | 5707 | 04.07.1957 | 27.07.1957 |
| GROT                   | 90N1 | 5708 | 09.08.1957 | 23.08.1957 |
| GROT                   | 90N1 | 5711 | 22.11.1957 | 24.11.1957 |
| GROT                   | 90N1 | 5802 | 16.02.1958 | 11.03.1958 |
| GROT                   | 90N1 | 5805 | 20.05.1958 | 24.05.1958 |
| GROT                   | 90N1 | 5806 | 01.06.1958 | 19.06.1958 |
| GROT                   | 90N1 | 5807 | 09.07.1958 | 24.07.1958 |
| GROT                   | 90N1 | 5808 | 21.08.1958 | 13.09.1958 |
| GROT                   | 90N1 | 6107 | 08.07.1961 | 22.07.1961 |
| GROT                   | 90N1 | 6108 | 12.08.1961 | 30.08.1961 |
| GROT                   | 90N1 | 6211 | 14.11.1962 | 23.11.1962 |
| GROT                   | 90N1 | 6306 | 12.06.1963 | 24.06.1963 |
| GROT                   | 90N1 | 6307 | 14.07.1963 | 25.07.1963 |
| GROT                   | 90N1 | 6801 | 21.01.1968 | 06.02.1968 |
| GROT                   | 90N1 | 6802 | 15.02.1968 | 13.03.1968 |
| GROT                   | 90N1 | 6804 | 02.04.1968 | 04.04.1968 |
| GROT                   | 90N1 | 6805 | 13.05.1968 | 26.05.1968 |
| GROT                   | 90N1 | 6806 | 18.06.1968 | 10.07.1968 |
| GROT                   | 90N1 | 6808 | 10.08.1968 | 28.08.1968 |
| GROT                   | 90N1 | 6904 | 12.04.1969 | 26.04.1969 |
| GROT                   | 90N1 | 6905 | 18.05.1969 | 31.05.1969 |
| GROT                   | 90N1 | 6906 | 16.06.1969 | 25.06.1969 |
| GROT                   | 90N1 | 6908 | 14.08.1968 | 24.08.1969 |
| GROT                   | 90N1 | 6911 | 05.11.1969 | 05.12.1969 |
| GROT                   | 90N1 | 7001 | 18.01.1970 | 26.01.1970 |
| GROT                   | 90N1 | 7005 | 12.05.1970 | 28.05.1970 |
| GROT                   | 90N1 | 7006 | 11.06.1970 | 21.06.1970 |
| GROT                   | 90N1 | 7007 | 14.07.1970 | 29.07.1970 |
| GROT                   | 90N1 | 7009 | 23.09.1970 | 14.10.1970 |
| GROT                   | 90N1 | 7105 | 14.05.1971 | 26.05.1971 |
| GROT                   | 90N1 | 7106 | 11.06.1971 | 16.06.1971 |
| GROT                   | 90N1 | 7108 | 13.08.1971 | 24.08.1971 |
| GROT                   | 90N1 | 7109 | 08.09.1971 | 02.10.1971 |
| GROT                   | 90N1 | 7305 | 14.05.1973 | 28.05.1973 |
| GROT                   | 90N1 | 7308 | 13.08.1973 | 24.08.1973 |
| GROT                   | 90N1 | 7502 | 14.02.1975 | 09.03.1975 |
| GROT                   | 90N1 | 7508 | 12.08.1975 | 22.08.1975 |
| GROT                   | 90N1 | 7605 | 14.05.1976 | 25.05.1976 |
| GROT                   | 90N1 | 7608 | 12.08.1976 | 21.08.1976 |
| GROT                   | 90N1 | 7705 | 18.05.1977 | 27.05.1977 |
| GROT                   | 90N1 | 7805 | 12.05.1978 | 21.05.1978 |
| GROT                   | 90N1 | 7807 | 10.07.1978 | 16.08.1978 |
| GROT                   | 90N1 | 7811 | 16.11.1978 | 03.12.1978 |
| GROT                   | 90N1 | 7905 | 12.05.1979 | 15.05.1979 |
| GROT                   | 90N1 | 7907 | 13.07.1979 | 17.07.1979 |
| GROT                   | 90N1 | 7911 | 15.11.1979 | 09.12.1979 |
| GS-59                  | 90N5 | 7606 | 25.06.1976 | 29.06.1976 |
| IGNAT PAVLUCHENKOV     | URGP | 8709 | 05.09.1987 | 20.10.1987 |
| IGNAT PAVLUCHENKOV     | URGP | 8711 | 15.11.1987 | 12.12.1987 |
| IGNAT PAVLUCHENKOV     | URGP | 8905 | 21.05.1989 | 07.06.1989 |
| IGNAT PAVLUCHENKOV     | URGP | 8906 | 17.06.1989 | 11.07.1989 |
| IGNAT PAVLUCHENKOV     | URGP | 8907 | 24.07.1989 | 23.08.1989 |
| IGNAT PAVLUCHENKOV     | URGP | 8909 | 08.09.1989 | 15.09.1989 |
| IGNAT PAVLUCHENKOV     | URGP | 8910 | 14.10.1989 | 18.10.1989 |
| IGNAT PAVLUCHENKOV     | URGP | 9209 | 13.09.1992 | 07.10.1992 |
| INGUL                  | 90IN | 7197 | 15.02.1923 | 23.08.1923 |
| JOHN PILLSBURY         | 31JP | 73   | 30.07.1965 | 11.08.1965 |
| KARA-DAG               | 90CG | 8211 | 25.11.1982 | 22.12.1982 |
| KERCHENSKY KOMSOMOLETS | 9018 | 8607 | 25.07.1986 | 19.08.1986 |

|                        |      |      |            |            |
|------------------------|------|------|------------|------------|
| KERCHENSKY KOMSOMOLETS | 9018 | 8611 | 12.11.1986 | 11.12.1986 |
| KERCHENSKY KOMSOMOLETS | 9018 | 8702 | 02.02.1987 | 15.03.1987 |
| KERCHENSKY KOMSOMOLETS | 9018 | 8703 | 27.03.1987 | 01.04.1987 |
| KERCHENSKY KOMSOMOLETS | 9018 | 8704 | 07.04.1987 | 17.04.1987 |
| KERCHENSKY KOMSOMOLETS | 9018 | 8902 | 11.02.1989 | 06.03.1989 |
| KERCHENSKY KOMSOMOLETS | 9018 | 8905 | 11.05.1989 | 03.06.1989 |
| KERCHENSKY KOMSOMOLETS | 9018 | 8911 | 12.11.1989 | 04.12.1989 |
| KERCHENSKY KOMSOMOLETS | 9018 | 9006 | 18.06.1990 | 14.07.1990 |
| KERCHENSKY KOMSOMOLETS | 9018 | 9007 | 22.07.1990 | 20.08.1990 |
| KERCHENSKY KOMSOMOLETS | 9018 | 9108 | 10.08.1991 | 28.08.1991 |
| KERCHENSKY RABOCHY     | 908E | 8003 | 06.03.1980 | 25.04.1980 |
| KERCHENSKY RABOCHY     | 908E | 8005 | 23.05.1980 | 30.05.1980 |
| KOMETA GALLEYA         | 9057 | 9007 | 25.07.1990 | 14.08.1990 |
| KONSTANTIN BOLDYREV    | 90D7 | 6304 | 06.04.1963 | 16.04.1963 |
| KONSTANTIN BOLDYREV    | 90D7 | 6408 | 14.08.1964 | 23.08.1964 |
| KONSTANTIN BOLDYREV    | 90D7 | 6505 | 10.05.1965 | 23.05.1965 |
| KONSTANTIN BOLDYREV    | 90D7 | 6506 | 10.06.1965 | 19.06.1965 |
| KONSTANTIN BOLDYREV    | 90D7 | 6507 | 14.07.1965 | 04.08.1965 |
| KONSTANTIN BOLDYREV    | 90D7 | 6508 | 15.08.1965 | 05.09.1965 |
| KONSTANTIN BOLDYREV    | 90D7 | 6602 | 12.02.1966 | 08.03.1966 |
| KONSTANTIN BOLDYREV    | 90D7 | 6603 | 24.03.1966 | 06.04.1966 |
| KONSTANTIN BOLDYREV    | 90D7 | 6708 | 11.08.1967 | 23.08.1967 |
| KONSTANTIN BOLDYREV    | 90D7 | 6904 | 26.04.1969 | 08.05.1969 |
| KONSTANTIN BOLDYREV    | 90D7 | 6905 | 18.05.1969 | 21.05.1969 |
| KONSTANTIN BOLDYREV    | 90D7 | 6909 | 03.09.1969 | 17.09.1969 |
| KONSTANTIN BOLDYREV    | 90D7 | 7104 | 03.04.1971 | 27.04.1971 |
| KONSTANTIN BOLDYREV    | 90D7 | 7105 | 11.05.1971 | 24.05.1971 |
| KONSTANTIN BOLDYREV    | 90D7 | 7106 | 11.06.1971 | 26.06.1971 |
| KONSTANTIN BOLDYREV    | 90D7 | 7108 | 12.08.1971 | 28.08.1971 |
| KONSTANTIN BOLDYREV    | 90D7 | 7111 | 11.11.1971 | 28.11.1971 |
| KONSTANTIN BOLDYREV    | 90D7 | 7202 | 13.02.1972 | 04.03.1972 |
| KONSTANTIN BOLDYREV    | 90D7 | 7205 | 11.05.1972 | 25.05.1972 |
| KONSTANTIN BOLDYREV    | 90D7 | 7206 | 17.06.1972 | 25.06.1972 |
| KONSTANTIN BOLDYREV    | 90D7 | 7207 | 10.07.1972 | 21.07.1972 |
| KONSTANTIN BOLDYREV    | 90D7 | 7208 | 12.08.1972 | 01.09.1972 |
| KONSTANTIN BOLDYREV    | 90D7 | 7305 | 12.05.1973 | 23.05.1973 |
| KONSTANTIN BOLDYREV    | 90D7 | 7306 | 13.06.1973 | 27.06.1973 |
| KONSTANTIN BOLDYREV    | 90D7 | 7307 | 13.07.1973 | 28.07.1973 |
| KONSTANTIN BOLDYREV    | 90D7 | 7308 | 13.08.1973 | 22.08.1973 |
| KONSTANTIN BOLDYREV    | 90D7 | 7311 | 06.11.1973 | 30.11.1973 |
| KONSTANTIN BOLDYREV    | 90D7 | 7402 | 13.02.1974 | 07.03.1974 |
| KONSTANTIN BOLDYREV    | 90D7 | 7405 | 12.05.1974 | 26.05.1974 |
| KONSTANTIN BOLDYREV    | 90D7 | 7406 | 10.06.1974 | 02.07.1974 |
| KONSTANTIN BOLDYREV    | 90D7 | 7407 | 11.07.1974 | 24.07.1974 |
| KONSTANTIN BOLDYREV    | 90D7 | 7408 | 09.08.1974 | 24.08.1974 |
| KONSTANTIN BOLDYREV    | 90D7 | 7411 | 14.11.1974 | 06.12.1974 |
| KONSTANTIN BOLDYREV    | 90D7 | 7508 | 13.08.1975 | 21.08.1975 |
| KONSTANTIN BOLDYREV    | 90D7 | 7511 | 20.11.1975 | 14.12.1975 |
| KONSTANTIN BOLDYREV    | 90D7 | 7602 | 01.02.1976 | 26.02.1976 |
| KONSTANTIN BOLDYREV    | 90D7 | 7603 | 21.03.1976 | 31.03.1976 |
| KONSTANTIN BOLDYREV    | 90D7 | 7604 | 01.04.1976 | 06.04.1976 |
| KONSTANTIN BOLDYREV    | 90D7 | 7605 | 14.05.1976 | 24.05.1976 |
| KONSTANTIN BOLDYREV    | 90D7 | 7611 | 11.11.1976 | 29.11.1976 |
| KONSTANTIN BOLDYREV    | 90D7 | 7702 | 10.02.1977 | 02.03.1977 |
| KONSTANTIN BOLDYREV    | 90D7 | 7711 | 19.11.1977 | 16.12.1977 |
| KONSTANTIN BOLDYREV    | 90D7 | 7802 | 11.02.1978 | 01.03.1978 |
| KONSTANTIN BOLDYREV    | 90D7 | 7805 | 12.05.1978 | 28.05.1978 |
| KONSTANTIN BOLDYREV    | 90D7 | 7808 | 13.08.1978 | 24.08.1978 |
| KONSTANTIN BOLDYREV    | 90D7 | 7905 | 13.05.1979 | 28.05.1979 |



|                     |      |      |            |            |
|---------------------|------|------|------------|------------|
| KONSTANTIN BOLDYREV | 90D7 | 7907 | 14.07.1979 | 23.07.1979 |
| KONSTANTIN BOLDYREV | 90D7 | 7908 | 10.08.1979 | 28.08.1979 |
| KONSTANTIN BOLDYREV | 90D7 | 8005 | 17.05.1980 | 31.05.1980 |
| KONSTANTIN BOLDYREV | 90D7 | 8011 | 18.11.1980 | 19.12.1980 |
| KONSTANTIN BOLDYREV | 90D7 | 8102 | 12.02.1981 | 10.03.1981 |
| KONSTANTIN BOLDYREV | 90D7 | 8105 | 19.05.1981 | 29.05.1981 |
| KONSTANTIN BOLDYREV | 90D7 | 8302 | 09.02.1983 | 26.03.1983 |
| KONSTANTIN BOLDYREV | 90D7 | 8305 | 23.05.1983 | 05.06.1983 |
| KONSTANTIN BOLDYREV | 90D7 | 8402 | 22.02.1984 | 19.03.1984 |
| KONSTANTIN BOLDYREV | 90D7 | 8407 | 16.07.1984 | 08.08.1984 |
| KONSTANTIN BOLDYREV | 90D7 | 8511 | 14.11.1985 | 12.12.1985 |
| KONSTANTIN BOLDYREV | 90D7 | 8605 | 14.05.1986 | 31.05.1986 |
| KONTAKT             | 90Q1 | 6606 | 16.06.1966 | 30.06.1966 |
| KONTAKT             | 90Q1 | 6607 | 13.07.1966 | 23.07.1966 |
| KONTAKT             | 90Q1 | 6608 | 11.08.1966 | 24.08.1966 |
| KONTAKT             | 90Q1 | 6702 | 14.02.1967 | 05.03.1967 |
| KONTAKT             | 90Q1 | 6706 | 13.06.1967 | 22.06.1967 |
| KONTAKT             | 90Q1 | 6707 | 12.07.1967 | 23.07.1967 |
| KONTAKT             | 90Q1 | 7009 | 22.09.1970 | 18.10.1970 |
| KONTAKT             | 90Q1 | 7101 | 18.01.1971 | 26.01.1971 |
| KONTAKT             | 90Q1 | 7102 | 14.02.1971 | 02.03.1971 |
| KONTAKT             | 90Q1 | 7205 | 12.05.1972 | 27.05.1972 |
| KONTAKT             | 90Q1 | 7208 | 09.08.1972 | 20.08.1972 |
| KONTAKT             | 90Q1 | 7405 | 15.05.1974 | 27.05.1974 |
| KONTAKT             | 90Q1 | 7608 | 05.08.1976 | 26.08.1976 |
| KONTAKT             | 90Q1 | 7707 | 15.07.1977 | 28.07.1977 |
| KONTAKT             | 90Q1 | 8695 | 19.03.1963 | 21.05.1963 |
| KONTAKT             | 90Q1 | 8716 | 20.07.1963 | 22.07.1963 |
| KONTAKT             | 90Q1 | 8788 | 02.01.1960 | 25.05.1960 |
| KONTAKT             | 90Q1 | 8792 | 17.02.1962 | 05.06.1962 |
| KONTAKT             | 90Q1 | 8928 | 17.04.1959 | 31.05.1959 |
| KONTAKT             | 90Q1 | 8929 | 06.04.1958 | 12.12.1958 |
| KONTAKT             | 90Q1 | 8930 | 17.09.1958 | 29.10.1958 |
| KONTAKT             | 90Q1 | 8931 | 26.05.1957 | 29.05.1957 |
| KONTAKT             | 90Q1 | 9701 | 18.02.1957 | 05.03.1957 |
| KONTUR              | 90KO | 6405 | 10.05.1964 | 23.05.1964 |
| KONTUR              | 90KO | 6707 | 11.07.1967 | 20.07.1967 |
| KONTUR              | 90KO | 7004 | 03.04.1970 | 23.04.1970 |
| KONTUR              | 90KO | 7005 | 18.05.1970 | 25.05.1970 |
| KONTUR              | 90KO | 7011 | 13.11.1970 | 06.12.1970 |
| KONTUR              | 90KO | 7012 | 18.12.1970 | 19.12.1970 |
| KONTUR              | 90KO | 7206 | 13.06.1972 | 24.06.1972 |
| KONTUR              | 90KO | 7207 | 12.07.1972 | 26.07.1972 |
| KONTUR              | 90KO | 7211 | 12.11.1972 | 06.12.1972 |
| KONTUR              | 90KO | 7705 | 13.05.1977 | 27.05.1977 |
| KOVALEVSKY          | XXXX | 1935 | 01.02.1935 | 15.08.1935 |
| KOVALEVSKY          | XXXX | 9128 | 31.05.1926 | 31.05.1926 |
| KRISTALL            | 90Q3 | 7103 | 13.03.1971 | 29.03.1971 |
| KRISTALL            | 90Q3 | 7104 | 07.04.1971 | 18.04.1971 |
| KRISTALL            | 90Q3 | 7302 | 16.02.1973 | 13.03.1973 |
| KRISTALL            | 90Q3 | 7306 | 13.06.1973 | 20.06.1973 |
| KRISTALL            | 90Q3 | 7307 | 11.07.1973 | 20.07.1973 |
| KRISTALL            | 90Q3 | 7407 | 10.07.1974 | 22.07.1974 |
| KRISTALL            | 90Q3 | 7408 | 10.08.1974 | 23.08.1974 |
| KRISTALL            | 90Q3 | 7505 | 13.05.1975 | 26.05.1975 |
| KRISTALL            | 90Q3 | 7708 | 18.08.1977 | 26.08.1977 |
| KRISTALL            | 90Q3 | 7807 | 15.07.1978 | 30.07.1978 |
| KRISTALL            | 90Q3 | 7808 | 13.08.1978 | 22.08.1978 |
| KRISTALL            | 90Q3 | 7908 | 16.08.1979 | 23.08.1979 |

|           |      |      |            |            |
|-----------|------|------|------------|------------|
| KRISTALL  | 90Q3 | 8782 | 11.01.1960 | 11.04.1960 |
| KRISTALL  | 90Q3 | 8784 | 03.01.1961 | 25.10.1961 |
| KRISTALL  | 90Q3 | 8786 | 26.01.1962 | 28.06.1962 |
| KRISTALL  | 90Q3 | 8941 | 04.01.1959 | 04.01.1960 |
| KUMACHEVO | 908R | 8605 | 21.05.1986 | 07.06.1986 |
| KUMACHEVO | 908R | 9106 | 30.06.1991 | 15.07.1991 |
| LEZAVA    | 909X | 87   | 06.01.1987 | 28.12.1987 |
| LEZAVA    | 909X | 88   | 05.01.1988 | 27.10.1988 |
| LUCH      | 90QB | 8107 | 09.07.1981 | 07.08.1981 |
| LUCH      | 90QB | 8305 | 29.05.1983 | 06.06.1983 |
| M.MAKLAI  | 90DK | 1009 | 01.10.1977 | 20.10.1977 |
| M.MAKLAI  | 90DK | 101  | 04.10.1980 | 15.11.1980 |
| M.MAKLAI  | 90DK | 102  | 28.08.1981 | 05.09.1981 |
| M.MAKLAI  | 90DK | 103  | 21.05.1981 | 08.07.1981 |
| M.MAKLAI  | 90DK | 105  | 11.10.1981 | 23.11.1981 |
| M.MAKLAI  | 90DK | 109  | 22.07.1982 | 01.09.1982 |
| M.MAKLAI  | 90DK | 111  | 08.10.1982 | 10.12.1982 |
| M.MAKLAI  | 90DK | 112  | 24.03.1983 | 28.06.1987 |
| M.MAKLAI  | 90DK | 114  | 25.04.1983 | 09.06.1983 |
| M.MAKLAI  | 90DK | 115  | 16.07.1983 | 03.08.1983 |
| M.MAKLAI  | 90DK | 116  | 25.09.1983 | 28.10.1983 |
| M.MAKLAI  | 90DK | 119  | 09.03.1984 | 16.06.1984 |
| M.MAKLAI  | 90DK | 120  | 12.06.1984 | 22.07.1984 |
| M.MAKLAI  | 90DK | 121  | 16.05.1984 | 26.05.1984 |
| M.MAKLAI  | 90DK | 122  | 03.10.1985 | 05.11.1985 |
| M.MAKLAI  | 90DK | 128  | 28.07.1987 | 02.08.1987 |
| M.MAKLAI  | 90DK | 129  | 29.05.1987 | 27.06.1989 |
| M.MAKLAI  | 90DK | 130  | 12.08.1987 | 19.08.1987 |
| M.MAKLAI  | 90DK | 136  | 06.07.1988 | 13.07.1988 |
| M.MAKLAI  | 90DK | 139  | 16.09.1988 | 25.10.1988 |
| M.MAKLAI  | 90DK | 141  | 17.03.1989 | 25.04.1989 |
| M.MAKLAI  | 90DK | 142  | 02.06.1989 | 06.06.1989 |
| M.MAKLAI  | 90DK | 144  | 28.06.1989 | 08.08.1989 |
| M.MAKLAI  | 90DK | 42   | 09.12.1969 | 22.12.1969 |
| M.MAKLAI  | 90DK | 47   | 08.08.1970 | 13.09.1970 |
| M.MAKLAI  | 90DK | 48   | 20.10.1970 | 29.10.1970 |
| M.MAKLAI  | 90DK | 49   | 07.06.1971 | 24.06.1971 |
| M.MAKLAI  | 90DK | 51   | 20.08.1971 | 30.08.1971 |
| M.MAKLAI  | 90DK | 52   | 08.03.1972 | 21.03.1972 |
| M.MAKLAI  | 90DK | 54   | 23.08.1972 | 05.09.1972 |
| M.MAKLAI  | 90DK | 57   | 09.09.1973 | 09.09.1997 |
| M.MAKLAI  | 90DK | 58   | 18.11.1973 | 24.11.1973 |
| M.MAKLAI  | 90DK | 61   | 26.04.1974 | 28.04.1974 |
| M.MAKLAI  | 90DK | 62   | 16.05.1974 | 03.06.1974 |
| M.MAKLAI  | 90DK | 63   | 25.06.1974 | 28.09.1974 |
| M.MAKLAI  | 90DK | 64   | 25.11.1974 | 26.11.1974 |
| M.MAKLAI  | 90DK | 66   | 27.04.1972 | 27.04.1975 |
| M.MAKLAI  | 90DK | 67   | 16.05.1975 | 22.05.1975 |
| M.MAKLAI  | 90DK | 69   | 18.06.1975 | 25.06.1975 |
| M.MAKLAI  | 90DK | 70   | 10.07.1975 | 12.07.1975 |
| M.MAKLAI  | 90DK | 71   | 25.07.1975 | 31.07.1975 |
| M.MAKLAI  | 90DK | 72   | 18.08.1972 | 19.08.1975 |
| M.MAKLAI  | 90DK | 73   | 11.09.1975 | 20.09.1975 |
| M.MAKLAI  | 90DK | 75   | 18.09.1975 | 13.10.1976 |
| M.MAKLAI  | 90DK | 76   | 11.12.1976 | 21.12.1976 |
| M.MAKLAI  | 90DK | 77   | 17.04.1977 | 28.04.1977 |
| M.MAKLAI  | 90DK | 78   | 17.05.1977 | 22.05.1977 |
| M.MAKLAI  | 90DK | 79   | 13.06.1977 | 16.06.1977 |
| M.MAKLAI  | 90DK | 80   | 24.08.1977 | 03.09.1977 |

|           |      |      |            |            |
|-----------|------|------|------------|------------|
| M.MAKLAI  | 90DK | 82   | 23.11.1977 | 23.11.1977 |
| M.MAKLAI  | 90DK | 83   | 14.05.1978 | 19.05.1978 |
| M.MAKLAI  | 90DK | 84   | 28.05.1978 | 12.06.1978 |
| M.MAKLAI  | 90DK | 86   | 12.07.1978 | 13.07.1988 |
| M.MAKLAI  | 90DK | 89   | 21.04.1979 | 24.04.1979 |
| M.MAKLAI  | 90DK | 90   | 13.06.1979 | 24.07.1979 |
| M.MAKLAI  | 90DK | 92   | 28.09.1979 | 04.11.1979 |
| M.MAKLAI  | 90DK | 94   | 31.08.1979 | 08.09.1979 |
| M.MAKLAI  | 90DK | 97   | 25.06.1980 | 12.07.1980 |
| MARLIN    | 90MR | 8108 | 12.08.1981 | 22.08.1981 |
| MECHNIKOV | URME | 145  | 28.08.1990 | 30.09.1990 |
| MECHNIKOV | URME | 146  | 09.08.1991 | 29.08.1991 |
| MECHNIKOV | URME | 147  | 07.07.1992 | 12.07.1992 |
| MECHNIKOV | URME | 148  | 09.10.1992 | 14.10.1992 |
| MERAC     | 908P | 9002 | 15.02.1990 | 08.03.1990 |
| MESAHA1   | 89M1 | 332  | 01.11.1996 | 02.11.1996 |
| MESAHA1   | 89M1 | 335  | 24.01.1997 | 24.01.1997 |
| MESAHA1   | 89M1 | 343  | 24.10.1997 | 27.10.1997 |
| MESAHA2   | 89M2 | 327  | 11.04.1996 | 10.05.1996 |
| MESAHA2   | 89M2 | 328  | 03.06.1996 | 03.06.1996 |
| MESAHA2   | 89M2 | 333  | 15.12.1996 | 15.12.1996 |
| MGLA      | 90MG | 277  | 29.05.1973 | 01.06.1973 |
| MGLA      | 90MG | 749  | 15.03.1975 | 27.04.1975 |
| MGLA      | 90MG | 860  | 03.07.1975 | 11.08.1975 |
| MGLA      | 90MG | 77   | 21.01.1977 | 31.08.1977 |
| MGLA      | 90MG | 78   | 18.04.1978 | 02.10.1978 |
| MGLA      | 90MG | 79   | 14.03.1979 | 01.04.1979 |
| MGLA      | 90MG | 8303 | 08.02.1972 | 14.02.1972 |
| MGLA      | 90MG | 8586 | 19.01.1966 | 29.06.1966 |
| MGLA      | 90MG | 8588 | 12.08.1967 | 17.08.1967 |
| MGLA      | 90MG | 8685 | 10.04.1963 | 13.05.1963 |
| MGLA      | 90MG | 8687 | 25.07.1964 | 26.12.1964 |
| MGLA      | 90MG | 8813 | 13.01.1961 | 30.05.1961 |
| MOKSHA    | 90QF | 685  | 18.06.1985 | 26.06.1985 |
| MOKSHA    | 90QF | 785  | 03.07.1985 | 06.07.1985 |
| MOKSHA    | 90QF | 885  | 04.04.1985 | 05.08.1985 |
| MOKSHA    | 90QF | 8207 | 25.07.1982 | 22.08.1982 |
| MOKSHA    | 90QF | 8506 | 18.06.1985 | 06.07.1985 |
| MOKSHA    | 90QF | 9005 | 26.05.1990 | 07.06.1990 |
| MOREVED   | 90MO | 8937 | 17.06.1957 | 23.12.1957 |
| MRSR      | 9099 | 8509 | 20.09.1985 | 30.09.1985 |
| MRSR      | 9099 | 8608 | 02.08.1986 | 14.08.1986 |
| MUSSON    | 90MU | 200  | 26.01.1973 | 26.01.1973 |
| MUSSON    | 90MU | 283  | 06.05.1974 | 06.05.1974 |
| MUSSON    | 90MU | 484  | 13.11.1974 | 05.02.1975 |
| MUSSON    | 90MU | 648  | 19.02.1975 | 19.05.1975 |
| MUSSON    | 90MU | 805  | 11.06.1975 | 21.08.1975 |
| MUSSON    | 90MU | 861  | 09.09.1975 | 19.11.1975 |
| MUSSON    | 90MU | 918  | 24.09.1976 | 25.09.1976 |
| MUSSON    | 90MU | 1047 | 13.10.1978 | 21.12.1978 |
| MUSSON    | 90MU | 1085 | 13.11.1979 | 10.12.1979 |
| MUSSON    | 90MU | 1136 | 17.03.1981 | 22.06.1981 |
| MUSSON    | 90MU | 1153 | 15.07.1981 | 03.11.1981 |
| MUSSON    | 90MU | 1168 | 18.11.1981 | 23.02.1982 |
| MUSSON    | 90MU | 1268 | 11.01.1984 | 11.01.1984 |
| MUSSON    | 90MU | 1293 | 03.01.1985 | 03.01.1985 |
| MUSSON    | 90MU | 1303 | 30.01.1985 | 13.05.1985 |
| MUSSON    | 90MU | 1335 | 05.10.1985 | 22.12.1985 |
| MUSSON    | 90MU | 1360 | 08.08.1986 | 09.08.1986 |

|                 |      |      |            |            |
|-----------------|------|------|------------|------------|
| MUSSON          | 90MU | 1418 | 10.06.1987 | 26.08.1987 |
| MUSSON          | 90MU | 1450 | 16.01.1988 | 25.04.1988 |
| MUSSON          | 90MU | 1461 | 10.05.1988 | 11.05.1988 |
| MUSSON          | 90MU | 1490 | 27.02.1989 | 27.02.1989 |
| MUSSON          | 90MU | 1546 | 14.11.1989 | 14.11.1989 |
| MUSSON          | 90MU | 4142 | 25.11.1990 | 25.11.1990 |
| MUSSON          | 90MU | 51A  | 11.10.1986 | 19.10.1986 |
| MUSSON          | 90MU | 53   | 09.02.1987 | 15.02.1987 |
| MUSSON          | 90MU | 58a  | 18.03.1989 | 31.03.1989 |
| MUSSON          | 90MU | 9808 | 12.04.1977 | 25.04.1977 |
| MYS OSTROVSKOGO | 90DL | 8309 | 13.09.1983 | 05.10.1983 |
| NEON            | XXXX | 1.2  | 06.12.1990 | 07.12.1990 |
| NEPTUN          | URQH | 89   | 04.07.1989 | 25.12.1989 |
| NEPTUN          | URQH | 90   | 08.01.1990 | 27.12.1990 |
| NEPTUN          | URQH | 91   | 08.07.1991 | 24.12.1991 |
| NEPTUN          | URQH | 92   | 10.01.1992 | 22.12.1992 |
| NEPTUN          | URQH | 93   | 05.01.1993 | 28.12.1993 |
| NEPTUN          | URQH | 94   | 05.01.1994 | 28.12.1994 |
| NEPTUN          | URQH | 95   | 05.01.1995 | 13.12.1995 |
| NEPTUN          | URQH | 96   | 09.01.1996 | 27.12.1996 |
| NEPTUN          | URQH | 97   | 08.01.1997 | 25.12.1997 |
| NEPTUN          | URQH | 98   | 19.01.1998 | 30.06.1998 |
| OKEANOGRAF      | 90OG | 86   | 23.01.1986 | 27.12.1986 |
| OSIPENKO        | UROS | 9205 | 25.05.1992 | 10.06.1992 |
| OSIPENKO        | UROS | 9206 | 23.06.1992 | 04.07.1992 |
| OSIPENKO        | UROS | 9210 | 22.10.1992 | 06.11.1992 |
| OSIPENKO        | UROS | 9310 | 17.10.1993 | 21.10.1993 |
| PAMIAT MERKURYA | 90BI | 7602 | 10.02.1976 | 23.02.1976 |
| PASSAT          | 90PT | 217  | 05.05.1973 | 01.08.1973 |
| PASSAT          | 90PT | 225  | 17.08.1973 | 24.10.1973 |
| PASSAT          | 90PT | 261  | 12.11.1973 | 09.02.1974 |
| PASSAT          | 90PT | 751  | 21.03.1975 | 17.06.1975 |
| PASSAT          | 90PT | 863  | 10.10.1975 | 18.12.1975 |
| PASSAT          | 90PT | 1018 | 29.11.1977 | 29.11.1977 |
| PASSAT          | 90PT | 1045 | 16.09.1978 | 16.09.1978 |
| PASSAT          | 90PT | 1066 | 15.05.1979 | 16.05.1979 |
| PASSAT          | 90PT | 1085 | 13.01.1980 | 13.01.1980 |
| PASSAT          | 90PT | 1133 | 12.02.1981 | 12.02.1981 |
| PASSAT          | 90PT | 1191 | 10.04.1982 | 10.04.1982 |
| PASSAT          | 90PT | 1201 | 29.06.1982 | 19.09.1982 |
| PASSAT          | 90PT | 1214 | 06.10.1982 | 06.10.1982 |
| PASSAT          | 90PT | 1249 | 29.07.1983 | 23.10.1983 |
| PASSAT          | 90PT | 1261 | 09.11.1983 | 22.01.1984 |
| PASSAT          | 90PT | 1292 | 04.10.1984 | 14.01.1985 |
| PASSAT          | 90PT | 1333 | 29.12.1985 | 29.12.1985 |
| PASSAT          | 90PT | 1466 | 15.09.1988 | 15.09.1988 |
| PASSAT          | 90PT | 1493 | 08.01.1989 | 22.03.1989 |
| PASSAT          | 90PT | 1565 | 22.02.1990 | 22.02.1990 |
| PASSAT          | 90PT | 1625 | 04.06.1991 | 04.06.1991 |
| PATRIOT         | 90TB | 8809 | 11.09.1988 | 19.09.1988 |
| PATRIOT         | 90TB | 8907 | 29.07.1989 | 17.08.1989 |
| POISKOVIK       | URD4 | 186  | 05.01.1986 | 13.01.1986 |
| POISKOVIK       | URD4 | 583  | 17.05.1983 | 08.06.1983 |
| POISKOVIK       | URD4 | 586  | 13.05.1986 | 10.06.1986 |
| POISKOVIK       | URD4 | 1185 | 24.11.1985 | 26.12.1985 |
| POISKOVIK       | URD4 | 8205 | 15.05.1982 | 05.06.1982 |
| POISKOVIK       | URD4 | 8505 | 15.05.1985 | 04.06.1985 |
| POISKOVIK       | URD4 | 8511 | 24.11.1985 | 13.01.1986 |
| POISKOVIK       | URD4 | 8605 | 16.05.1986 | 14.06.1986 |

|                       |      |      |            |            |
|-----------------------|------|------|------------|------------|
| POISKOVIK             | URD4 | 8607 | 02.07.1986 | 25.07.1986 |
| POISKOVIK             | URD4 | 8708 | 01.08.1987 | 11.08.1987 |
| POISKOVIK             | URD4 | 8709 | 02.09.1987 | 07.10.1987 |
| POISKOVIK             | URD4 | 8711 | 27.11.1987 | 27.12.1987 |
| POISKOVIK             | URD4 | 8801 | 14.01.1988 | 05.02.1988 |
| POISKOVIK             | URD4 | 8805 | 21.05.1988 | 21.06.1988 |
| POISKOVIK             | URD4 | 8807 | 14.07.1988 | 31.07.1988 |
| POISKOVIK             | URD4 | 8811 | 27.11.1988 | 22.12.1988 |
| POISKOVIK             | URD4 | 8901 | 14.01.1989 | 16.01.1989 |
| POISKOVIK             | URD4 | 8904 | 06.04.1989 | 16.04.1989 |
| POISKOVIK             | URD4 | 8905 | 19.05.1989 | 13.07.1989 |
| POISKOVIK             | URD4 | 8907 | 23.07.1989 | 17.08.1989 |
| POISKOVIK             | URD4 | 9004 | 15.04.1990 | 25.04.1990 |
| POISKOVIK             | URD4 | 9005 | 20.05.1990 | 09.07.1990 |
| POISKOVIK             | URD4 | 9011 | 14.11.1990 | 23.12.1990 |
| POISKOVIK             | URD4 | 9101 | 15.01.1991 | 02.02.1991 |
| POISKOVIK             | URD4 | 9102 | 15.02.1991 | 09.03.1991 |
| POISKOVIK             | URD4 | 9104 | 06.04.1991 | 05.05.1991 |
| POISKOVIK             | URD4 | 9105 | 21.05.1991 | 03.07.1991 |
| POISKOVIK             | URD4 | 9201 | 03.01.1992 | 15.01.1992 |
| POISKOVIK             | URD4 | 9204 | 19.04.1992 | 07.05.1992 |
| POISKOVIK             | URD4 | 9205 | 16.05.1992 | 08.06.1992 |
| POISKOVIK             | URD4 | 9309 | 06.09.1993 | 14.09.1993 |
| POISKOVIK             | URD4 | 9410 | 11.10.1994 | 12.10.1994 |
| POISKOVIK             | URD4 | 9506 | 12.06.1995 | 04.07.1995 |
| POISKOVIK             | URD4 | 9507 | 22.07.1995 | 04.08.1995 |
| POISKOVIK             | URD4 | 9806 | 25.06.1998 | 14.07.1998 |
| POISKOVIK             | URD4 | 9809 | 08.09.1998 | 15.09.1998 |
| PORYV                 | 90PB | 147  | 09.04.1972 | 07.07.1972 |
| PORYV                 | 90PB | 213  | 23.03.1973 | 23.03.1973 |
| PORYV                 | 90PB | 224  | 11.07.1973 | 07.10.1973 |
| PRIBOY                | 90PY | 87   | 24.04.1987 | 10.11.1987 |
| PRIBOY                | 90PY | 88   | 14.04.1988 | 12.11.1988 |
| PRIBOY                | 90PY | 89   | 25.04.1989 | 11.10.1989 |
| PRIBOY                | 90PY | 90   | 04.04.1990 | 18.10.1990 |
| PRIBOY                | 90PY | 91   | 02.04.1991 | 19.09.1991 |
| PROFESSOR VODYANITSKY | 90V2 | 12   | 12.05.1982 | 25.05.1982 |
| PROFESSOR VODYANITSKY | 90V2 | 17   | 07.06.1984 | 24.10.1984 |
| PROFESSOR VODYANITSKY | 90V2 | 19   | 07.07.1985 | 24.07.1985 |
| PROFESSOR VODYANITSKY | 90V2 | 22   | 08.12.1986 | 23.12.1986 |
| PROFESSOR VODYANITSKY | 90V2 | 23A  | 26.05.1987 | 16.06.1987 |
| PROFESSOR VODYANITSKY | 90V2 | 25   | 03.12.1987 | 18.01.1988 |
| PROFESSOR VODYANITSKY | 90V2 | 27   | 17.07.1988 | 08.09.1988 |
| PROFESSOR VODYANITSKY | 90V2 | 28   | 03.04.1989 | 29.08.1989 |
| PROFESSOR VODYANITSKY | 90V2 | 31   | 13.06.1990 | 07.08.1990 |
| PROFESSOR VODYANITSKY | 90V2 | 32   | 19.08.1990 | 12.09.1990 |
| PROFESSOR VODYANITSKY | 90V2 | 33   | 03.06.1991 | 19.06.1991 |
| PROFESSOR VODYANITSKY | 90V2 | 34   | 08.08.1991 | 31.08.1991 |
| PROFESSOR VODYANITSKY | 90V2 | 35   | 02.11.1991 | 23.11.1991 |
| PROFESSOR VODYANITSKY | 90V2 | 36   | 12.01.1992 | 12.01.1992 |
| PROFESSOR VODYANITSKY | 90V2 | 37   | 04.07.1992 | 22.07.1992 |
| PROFESSOR VODYANITSKY | 90V2 | 38   | 04.08.1991 | 16.08.1992 |
| PROFESSOR VODYANITSKY | 90V2 | 40   | 11.10.1991 | 17.10.1991 |
| PROFESSOR VODYANITSKY | 90V2 | 41   | 04.04.1993 | 13.04.1993 |
| PROFESSOR VODYANITSKY | 90V2 | 45   | 18.06.1994 | 27.06.1994 |
| PROFESSOR VODYANITSKY | 90V2 | 48   | 19.07.1995 | 26.08.1995 |
| PROFESSOR VODYANITSKY | 90V2 | 49   | 15.04.1997 | 24.05.1997 |
| PROFESSOR VODYANITSKY | 90V2 | 51   | 03.05.1998 | 07.06.1998 |
| PROFESSOR VODYANITSKY | 90V2 | 52   | 11.09.1998 | 21.09.1998 |

|                     |      |      |            |            |
|---------------------|------|------|------------|------------|
| RAZVEDCHIKI         | URD5 | 8606 | 30.06.1986 | 30.07.1986 |
| RAZVEDCHIKI         | URD5 | 9211 | 22.11.1992 | 22.11.1992 |
| REYKA               | 90QS | 74   | 25.01.1974 | 26.12.1974 |
| RIFT                | 90C1 | 1366 | 23.09.1985 | 06.11.1985 |
| RIFT                | 90C1 | 1367 | 19.05.1986 | 29.06.1986 |
| SEMEN VOLKOV        | 908C | 8802 | 18.02.1988 | 19.03.1988 |
| SEVASTOPOLSKY RYBAK | 902S | 8105 | 12.05.1981 | 15.05.1981 |
| SHKVAL              | 90SK | 182  | 16.06.1972 | 12.09.1972 |
| SKIF                | 90C4 | 683  | 30.06.1983 | 30.07.1983 |
| SKIF                | 90C4 | 883  | 12.08.1983 | 31.08.1983 |
| SKIF                | 90C4 | 1077 | 23.03.1979 | 29.04.1979 |
| SKIF                | 90C4 | 8306 | 30.06.1983 | 28.07.1983 |
| SKIF                | 90C4 | 8308 | 12.08.1983 | 29.08.1983 |
| SREDNYAYA KOSA      | 9025 | 585  | 31.05.1985 | 19.06.1985 |
| SREDNYAYA KOSA      | 9025 | 685  | 27.06.1985 | 02.07.1985 |
| SREDNYAYA KOSA      | 9025 | 885  | 05.08.1985 | 25.08.1985 |
| SREDNYAYA KOSA      | 9025 | 985  | 08.09.1985 | 04.10.1985 |
| SREDNYAYA KOSA      | 9025 | 8408 | 24.08.1984 | 10.09.1984 |
| SREDNYAYA KOSA      | 9025 | 8508 | 05.08.1985 | 25.08.1985 |
| SREDNYAYA KOSA      | 9025 | 8509 | 08.09.1985 | 18.09.1985 |
| SREDNYAYA KOSA      | 9025 | 8705 | 20.05.1987 | 09.06.1987 |
| SREDNYAYA KOSA      | 9025 | 8707 | 22.07.1987 | 02.08.1987 |
| SRTR                | 90D6 | 5905 | 17.05.1959 | 23.05.1959 |
| SRTR                | 90D6 | 5906 | 29.06.1959 | 17.07.1959 |
| SRTR                | 90D6 | 5911 | 14.11.1959 | 28.11.1959 |
| THOMPSON T. G.      | 31TT | 1140 | 20.02.1970 | 22.02.1970 |
| THOR                | 06TA | 9117 | 10.08.1910 | 11.08.1910 |
| TSHCH-810           | XXXX | 8973 | 22.05.1957 | 29.05.1957 |
| TSIKLON             | 90JH | 90   | 15.10.1990 | 20.11.1990 |
| TSIKLON             | 90JH | 91   | 17.01.1991 | 17.10.1991 |
| UNKNOWN TURKEY      | XXXX | 9398 | 13.09.1993 | 13.11.1998 |
| V.VOROBYEV          | 90VV | 6805 | 13.05.1968 | 22.05.1968 |
| V.VOROBYEV          | 90VV | 6807 | 01.07.1968 | 07.07.1968 |
| V.VOROBYEV          | 90VV | 7005 | 13.05.1970 | 28.05.1970 |
| V.VOROBYEV          | 90VV | 7006 | 11.06.1970 | 27.06.1970 |
| V.VOROBYEV          | 90VV | 7007 | 12.07.1970 | 24.07.1970 |
| VICTOR BUGAEV       | 90VC | 581  | 04.01.1975 | 01.04.1975 |
| VICTOR BUGAEV       | 90VC | 1012 | 07.06.1977 | 23.09.1977 |
| VICTOR BUGAEV       | 90VC | 1037 | 01.09.1978 | 01.09.1978 |
| VICTOR BUGAEV       | 90VC | 1056 | 21.12.1978 | 22.12.1978 |
| VICTOR BUGAEV       | 90VC | 1128 | 22.04.1981 | 22.04.1981 |
| VICTOR BUGAEV       | 90VC | 1206 | 11.08.1982 | 11.08.1982 |
| VICTOR BUGAEV       | 90VC | 1272 | 03.04.1984 | 04.04.1984 |
| VICTOR BUGAEV       | 90VC | 1286 | 24.10.1984 | 24.10.1984 |
| VICTOR BUGAEV       | 90VC | 1328 | 23.07.1985 | 24.09.1985 |
| VICTOR BUGAEV       | 90VC | 1387 | 17.02.1987 | 17.02.1987 |
| VICTOR BUGAEV       | 90VC | 1489 | 10.12.1988 | 10.12.1988 |
| VICTOR BUGAEV       | 90VC | 1507 | 13.03.1989 | 16.06.1989 |
| VICTOR BUGAEV       | 90VC | 1522 | 11.07.1989 | 22.09.1989 |
| VICTOR BUGAEV       | 90VC | 1543 | 27.01.1990 | 28.01.1990 |
| VICTOR BUGAEV       | 90VC | 30   | 24.04.1982 | 24.04.1982 |
| VICTOR BUGAEV       | 90VC | 39   | 29.03.1985 | 04.07.1985 |
| VICTOR BUGAEV       | 90VC | 4224 | 18.04.1988 | 19.04.1988 |
| VICTOR BUGAEV       | 90VC | 42a  | 01.07.1986 | 05.07.1986 |
| VICTOR BUGAEV       | 90VC | 54a  | 19.07.1990 | 29.07.1990 |
| VICTOR BUGAEV       | 90VC | 54b  | 21.09.1990 | 13.10.1990 |
| VICTOR BUGAEV       | 90VC | 56   | 25.01.1993 | 18.02.1993 |
| VICTOR BUGAEV       | 90VC | 57   | 15.09.1993 | 10.10.1993 |
| VICTOR BUGAEV       | 90VC | 8315 | 15.11.1974 | 03.12.1974 |

|                  |      |      |            |            |
|------------------|------|------|------------|------------|
| VIKHR            | 90VH | 4003 | 03.02.1972 | 04.02.1972 |
| VITYAZ           | 90VI | 1085 | 26.09.1978 | 30.10.1978 |
| VITYAZ           | 90VI | 1287 | 22.04.1984 | 28.05.1984 |
| VITYAZ           | 90VI | 1640 | 07.11.1991 | 12.11.1991 |
| VITYAZ           | 90VI | 1670 | 28.09.1992 | 14.10.1992 |
| VITYAZ           | 90VI | 1671 | 28.09.1992 | 17.10.1992 |
| VLADIMIR PARSHIN | 902B | 1    | 25.07.1989 | 29.07.1989 |
| VLADIMIR PARSHIN | 902B | 10   | 30.11.1992 | 09.12.1992 |
| VLADIMIR PARSHIN | 902B | 11   | 05.01.1993 | 13.01.1993 |
| VLADIMIR PARSHIN | 902B | 15   | 20.08.1994 | 25.08.1994 |
| VLADIMIR PARSHIN | 902B | 16   | 05.05.1995 | 09.05.1995 |
| VLADIMIR PARSHIN | 902B | 1600 | 03.11.1990 | 15.11.1990 |
| VLADIMIR PARSHIN | 902B | 1630 | 20.08.1991 | 23.08.1991 |
| VLADIMIR PARSHIN | 902B | 2    | 03.09.1989 | 28.10.1989 |
| VLADIMIR PARSHIN | 902B | 3    | 17.11.1989 | 23.12.1989 |
| VLADIMIR PARSHIN | 902B | 4    | 07.04.1990 | 08.04.1990 |
| VLADIMIR PARSHIN | 902B | 4141 | 11.06.1990 | 11.06.1990 |
| VLADIMIR PARSHIN | 902B | 6a   | 19.12.1990 | 23.12.1990 |
| VLADIMIR PARSHIN | 902B | 7b   | 25.02.1992 | 04.03.1992 |
| VLADIMIR PARSHIN | 902B | 8    | 18.04.1992 | 30.04.1992 |
| VOLNA            | 90VB | 1362 | 22.10.1986 | 23.10.1986 |
| VOLNA            | 90VB | 1389 | 17.04.1987 | 19.04.1987 |
| VOLNA            | 90VB | 1417 | 12.05.1987 | 03.08.1987 |
| VOLNA            | 90VB | 1430 | 27.08.1987 | 24.12.1987 |
| VOLNA            | 90VB | 1451 | 20.01.1988 | 20.01.1988 |
| VOLNA            | 90VB | 1480 | 13.12.1988 | 13.12.1988 |
| VOLNA            | 90VB | 1506 | 06.05.1989 | 06.05.1989 |
| VOLNA            | 90VB | 1584 | 23.08.1990 | 25.08.1990 |
| VYDVIZHENETZ     | XXXX | 735  | 05.06.1938 | 25.12.1938 |
| YAKOV GAKKEL     | 90YG | 1001 | 04.08.1976 | 07.10.1976 |
| YAKOV GAKKEL     | 90YG | 1010 | 01.07.1977 | 15.09.1977 |
| YAKOV GAKKEL     | 90YG | 1041 | 18.05.1978 | 15.07.1978 |
| YAKOV GAKKEL     | 90YG | 1043 | 21.09.1978 | 27.11.1978 |
| YAKOV GAKKEL     | 90YG | 1048 | 12.02.1977 | 09.04.1977 |
| YAKOV GAKKEL     | 90YG | 1086 | 25.08.1979 | 21.10.1979 |
| YAKOV GAKKEL     | 90YG | 1131 | 25.10.1980 | 22.12.1980 |
| YAKOV GAKKEL     | 90YG | 1142 | 04.02.1981 | 03.04.1981 |
| YAKOV GAKKEL     | 90YG | 1158 | 02.09.1981 | 30.10.1981 |
| YAKOV GAKKEL     | 90YG | 1192 | 18.02.1982 | 16.04.1982 |
| YAKOV GAKKEL     | 90YG | 1207 | 30.06.1982 | 12.08.1982 |
| YAKOV GAKKEL     | 90YG | 1212 | 30.10.1982 | 25.11.1982 |
| YAKOV GAKKEL     | 90YG | 1223 | 02.09.1982 | 14.10.1982 |
| YAKOV GAKKEL     | 90YG | 1253 | 02.08.1983 | 02.08.1983 |
| YAKOV GAKKEL     | 90YG | 1254 | 19.04.1983 | 13.06.1983 |
| YAKOV GAKKEL     | 90YG | 1280 | 10.07.1984 | 18.07.1984 |
| YAKOV GAKKEL     | 90YG | 1288 | 04.07.1981 | 14.08.1981 |
| YAKOV GAKKEL     | 90YG | 1291 | 03.01.1985 | 05.01.1985 |
| YAKOV GAKKEL     | 90YG | 1327 | 11.07.1985 | 11.07.1985 |
| YAKOV GAKKEL     | 90YG | 1330 | 27.11.1985 | 29.11.1985 |
| YAKOV GAKKEL     | 90YG | 1347 | 04.03.1986 | 06.03.1986 |
| YAKOV GAKKEL     | 90YG | 1361 | 09.08.1986 | 22.08.1986 |
| YAKOV GAKKEL     | 90YG | 1386 | 01.01.1987 | 10.02.1987 |
| YAKOV GAKKEL     | 90YG | 1409 | 02.07.1983 | 19.07.1983 |
| YAKOV GAKKEL     | 90YG | 1424 | 31.08.1987 | 26.10.1987 |
| YAKOV GAKKEL     | 90YG | 1432 | 13.11.1987 | 27.12.1987 |
| YAKOV GAKKEL     | 90YG | 1456 | 04.03.1988 | 24.06.1988 |
| YAKOV GAKKEL     | 90YG | 1559 | 26.01.1985 | 11.02.1985 |
| YAKOV GAKKEL     | 90YG | 1560 | 26.02.1985 | 24.03.1985 |
| YAKOV GAKKEL     | 90YG | 1561 | 18.05.1985 | 19.06.1985 |

|                    |      |      |            |            |
|--------------------|------|------|------------|------------|
| YAKOV GAKKEL       | 90YG | 1562 | 29.10.1985 | 12.11.1985 |
| YAKOV GAKKEL       | 90YG | 1563 | 08.02.1986 | 21.02.1986 |
| YAKOV GAKKEL       | 90YG | 1660 | 11.11.1989 | 12.11.1989 |
| YAKOV GAKKEL       | 90YG | 28B  | 18.06.1987 | 06.07.1987 |
| YAKOV GAKKEL       | 90YG | 33   | 22.02.1989 | 10.04.1989 |
| YAKOV GAKKEL       | 90YG | 34A  | 01.07.1989 | 26.07.1989 |
| YAKOV GAKKEL       | 90YG | 35a  | 02.12.1989 | 17.12.1989 |
| YAKOV GAKKEL       | 90YG | 36   | 23.01.1990 | 12.04.1990 |
| YAKOV GAKKEL       | 90YG | 38A  | 30.11.1990 | 14.12.1990 |
| YAKOV GAKKEL       | 90YG | 38B  | 07.09.1991 | 28.09.1991 |
| YUNAUA SMENA       | 908Q | 9005 | 17.05.1990 | 09.06.1990 |
| ZAPOROZHETZ        | 90B5 | 1891 | 04.08.1891 | 27.08.1891 |
| ZELEZNIY POTOK     | 90WE | 8705 | 20.05.1987 | 19.06.1987 |
| ZELEZNIY POTOK     | 90WE | 8707 | 31.07.1987 | 27.08.1987 |
| ZELEZNIY POTOK     | 90WE | 8709 | 08.09.1987 | 11.09.1987 |
| ZELEZNIY POTOK     | 90WE | 8805 | 15.05.1988 | 06.06.1988 |
| ZELEZNIY POTOK     | 90WE | 8807 | 23.07.1988 | 19.08.1988 |
| ZELEZNIY POTOK     | 90WE | 8810 | 13.10.1988 | 03.11.1988 |
| ZELEZNIY POTOK     | 90WE | 8811 | 17.11.1988 | 11.12.1988 |
| ZHELEZNYAKOV       | 9026 | 1283 | 18.12.1983 | 24.12.1983 |
| ZHELEZNYAKOV       | 9026 | 8104 | 09.04.1981 | 19.04.1981 |
| ZHELEZNYAKOV       | 9026 | 8105 | 11.05.1981 | 16.05.1981 |
| ZHELEZNYAKOV       | 9026 | 8311 | 20.11.1983 | 27.12.1983 |
| ZHELEZNYAKOV       | 9026 | 8401 | 14.01.1984 | 04.02.1984 |
| ZHELEZNYAKOV       | 9026 | 8404 | 19.04.1984 | 05.05.1984 |
| ZHELEZNYAKOV       | 9026 | 8502 | 14.02.1985 | 12.03.1985 |
| ZHELEZNYAKOV       | 9026 | 8505 | 22.05.1985 | 07.06.1985 |
| AKADEMIK VERNADSKY | 90VE | 13   | 13.06.1977 | 16.06.1977 |
| AKADEMIK VERNADSKY | 90VE | 14   | 17.12.1976 | 19.12.1976 |
| AKADEMIK VERNADSKY | 90VE | 14 1 | 20.03.1977 | 28.03.1977 |
| AKADEMIK VERNADSKY | 90VE | 15   | 13.06.1977 | 17.06.1977 |
| AKADEMIK VERNADSKY | 90VE | 23 1 | 05.11.1980 | 01.12.1980 |
| AKADEMIK VERNADSKY | 90VE | 27 1 | 26.05.1983 | 29.06.1983 |
| AKADEMIK VERNADSKY | 90VE | 28   | 29.11.1983 | 11.05.1984 |
| AKADEMIK VERNADSKY | 90VE | 29 1 | 16.06.1984 | 14.07.1984 |
| AKADEMIK VERNADSKY | 90VE | 31   | 12.10.1985 | 30.10.1985 |
| AKADEMIK VERNADSKY | 90VE | 33   | 30.05.1986 | 30.05.1986 |
| AKADEMIK VERNADSKY | 90VE | 34 1 | 14.06.1986 | 30.07.1986 |
| AKADEMIK VERNADSKY | 90VE | 37 1 | 05.04.1988 | 19.04.1988 |
| AKADEMIK VERNADSKY | 90VE | 37 2 | 27.04.1988 | 07.05.1988 |
| AKADEMIK VERNADSKY | 90VE | 37 3 | 17.05.1988 | 23.05.1988 |
| AKADEMIK VERNADSKY | 90VE | 37 4 | 08.06.1988 | 27.06.1988 |
| AKADEMIK VERNADSKY | 90VE | 44   | 09.05.1992 | 16.05.1992 |
| AKADEMIK VERNADSKY | 90VE | 6 1  | 11.07.1972 | 10.08.1972 |
| AKADEMIK VERNADSKY | 90VE | 7 1  | 17.03.1973 | 05.04.1973 |
| AKADEMIK VERNADSKY | 90VE | 8 1  | 03.11.1973 | 24.11.1973 |
| AKADEMIK VERNADSKY | 90VE | 9    | 10.10.1974 | 11.10.1974 |
| AYTODOR            | 90AY | 2    | 06.06.1979 | 26.06.1979 |
| AYTODOR            | 90AY | 3 1  | 27.03.1982 | 25.04.1982 |
| AYTODOR            | 90AY | 3 A  | 15.07.1979 | 07.08.1979 |
| AYTODOR            | 90AY | 4    | 04.07.1982 | 07.08.1982 |
| AYTODOR            | 90AY | 5 1  | 02.09.1982 | 11.11.1982 |
| EKSPERIMENT        | UREX | 1    | 01.09.1995 | 28.09.1995 |
| KIEV               | URKI | 1    | 19.12.1994 | 20.12.1994 |
| KIEV               | URKI | 2    | 20.01.1995 | 23.01.1995 |
| KIEV               | URKI | 3    | 05.04.1995 | 09.04.1995 |
| KIEV               | URKI | 4    | 02.08.1995 | 20.08.1995 |
| KIEV               | URKI | 5    | 12.11.1995 | 01.12.1995 |
| MIKHAIL LOMONOSOV  | 90ML | 10   | 09.03.1961 | 09.03.1961 |



|                      |      |      |            |            |
|----------------------|------|------|------------|------------|
| MIKHAIL LOMONOSOV    | 90ML | 14   | 13.08.1963 | 27.11.1963 |
| MIKHAIL LOMONOSOV    | 90ML | 15   | 19.04.1964 | 01.08.1964 |
| MIKHAIL LOMONOSOV    | 90ML | 16   | 20.08.1964 | 16.09.1964 |
| MIKHAIL LOMONOSOV    | 90ML | 17   | 16.11.1964 | 16.11.1964 |
| MIKHAIL LOMONOSOV    | 90ML | 18   | 01.10.1965 | 02.10.1965 |
| MIKHAIL LOMONOSOV    | 90ML | 19   | 30.04.1966 | 01.05.1966 |
| MIKHAIL LOMONOSOV    | 90ML | 21 1 | 23.03.1968 | 05.04.1968 |
| MIKHAIL LOMONOSOV    | 90ML | 22   | 26.12.1968 | 26.12.1968 |
| MIKHAIL LOMONOSOV    | 90ML | 22 1 | 31.10.1968 | 03.11.1968 |
| MIKHAIL LOMONOSOV    | 90ML | 24   | 09.04.1970 | 09.04.1970 |
| MIKHAIL LOMONOSOV    | 90ML | 25   | 30.07.1970 | 30.07.1970 |
| MIKHAIL LOMONOSOV    | 90ML | 27   | 15.12.1972 | 15.12.1972 |
| MIKHAIL LOMONOSOV    | 90ML | 30   | 18.04.1976 | 25.08.1976 |
| MIKHAIL LOMONOSOV    | 90ML | 32   | 05.06.1977 | 29.09.1977 |
| MIKHAIL LOMONOSOV    | 90ML | 33   | 04.02.1978 | 10.02.1978 |
| MIKHAIL LOMONOSOV    | 90ML | 35   | 27.07.1978 | 21.08.1978 |
| MIKHAIL LOMONOSOV    | 90ML | 43 1 | 07.09.1984 | 16.09.1984 |
| MIKHAIL LOMONOSOV    | 90ML | 43 2 | 12.10.1984 | 17.11.1984 |
| MIKHAIL LOMONOSOV    | 90ML | 44 1 | 08.06.1985 | 17.06.1985 |
| MIKHAIL LOMONOSOV    | 90ML | 44 2 | 20.06.1985 | 01.08.1985 |
| MIKHAIL LOMONOSOV    | 90ML | 44 3 | 07.08.1985 | 14.09.1985 |
| MIKHAIL LOMONOSOV    | 90ML | 44 4 | 18.10.1985 | 29.10.1985 |
| MIKHAIL LOMONOSOV    | 90ML | 49 1 | 06.03.1988 | 27.03.1988 |
| MIKHAIL LOMONOSOV    | 90ML | 51   | 12.11.1989 | 14.12.1989 |
| MIKHAIL LOMONOSOV    | 90ML | 53   | 15.06.1990 | 25.06.1990 |
| MIKHAIL LOMONOSOV    | 90ML | 53 A | 26.09.1990 | 02.11.1990 |
| MIKHAIL LOMONOSOV    | 90ML | 54   | 19.11.1991 | 12.12.1991 |
| MIKHAIL LOMONOSOV    | 90ML | 55   | 01.10.1992 | 05.10.1992 |
| MIKHAIL LOMONOSOV    | 90ML | 9    | 05.10.1960 | 25.10.1960 |
| PROFESSOR KOLESNIKOV | 90CK | 10   | 03.02.1985 | 07.02.1985 |
| PROFESSOR KOLESNIKOV | 90CK | 11   | 07.03.1985 | 15.03.1985 |
| PROFESSOR KOLESNIKOV | 90CK | 12 1 | 27.07.1985 | 30.07.1985 |
| PROFESSOR KOLESNIKOV | 90CK | 12 2 | 02.09.1985 | 14.10.1985 |
| PROFESSOR KOLESNIKOV | 90CK | 14 1 | 08.08.1986 | 01.11.1986 |
| PROFESSOR KOLESNIKOV | 90CK | 14 2 | 21.11.1986 | 25.12.1986 |
| PROFESSOR KOLESNIKOV | 90CK | 16   | 08.07.1987 | 14.07.1987 |
| PROFESSOR KOLESNIKOV | 90CK | 17 1 | 03.10.1987 | 25.10.1987 |
| PROFESSOR KOLESNIKOV | 90CK | 17 2 | 13.11.1987 | 19.12.1987 |
| PROFESSOR KOLESNIKOV | 90CK | 18   | 11.04.1988 | 25.05.1988 |
| PROFESSOR KOLESNIKOV | 90CK | 19   | 03.08.1988 | 16.08.1988 |
| PROFESSOR KOLESNIKOV | 90CK | 20   | 17.11.1988 | 03.03.1989 |
| PROFESSOR KOLESNIKOV | 90CK | 21   | 01.04.1989 | 13.05.1989 |
| PROFESSOR KOLESNIKOV | 90CK | 22 1 | 06.06.1989 | 14.06.1989 |
| PROFESSOR KOLESNIKOV | 90CK | 22 2 | 17.06.1989 | 10.07.1989 |
| PROFESSOR KOLESNIKOV | 90CK | 23   | 05.08.1989 | 01.10.1989 |
| PROFESSOR KOLESNIKOV | 90CK | 25   | 29.08.1990 | 11.09.1990 |
| PROFESSOR KOLESNIKOV | 90CK | 27 1 | 18.06.1991 | 23.06.1991 |
| PROFESSOR KOLESNIKOV | 90CK | 27 2 | 05.07.1991 | 12.07.1991 |
| PROFESSOR KOLESNIKOV | 90CK | 27 3 | 20.07.1991 | 23.08.1991 |
| PROFESSOR KOLESNIKOV | 90CK | 28   | 08.09.1991 | 14.10.1991 |
| PROFESSOR KOLESNIKOV | 90CK | 29   | 01.07.1992 | 02.08.1992 |
| PROFESSOR KOLESNIKOV | 90CK | 30   | 04.04.1993 | 29.04.1993 |
| PROFESSOR KOLESNIKOV | 90CK | 31   | 19.11.1993 | 12.01.1994 |
| PROFESSOR KOLESNIKOV | 90CK | 32   | 26.11.1994 | 26.12.1994 |
| PROFESSOR KOLESNIKOV | 90CK | 33   | 17.03.1995 | 05.04.1995 |
| PROFESSOR KOLESNIKOV | 90CK | 5 2  | 30.12.1982 | 06.01.1983 |
| PROFESSOR KOLESNIKOV | 90CK | 6 2  | 02.08.1983 | 22.08.1983 |
| PROFESSOR KOLESNIKOV | 90CK | 7    | 02.09.1983 | 11.11.1983 |
| PROFESSOR KOLESNIKOV | 90CK | 9    | 21.06.1984 | 21.09.1984 |

|                       |      |       |            |            |
|-----------------------|------|-------|------------|------------|
| TREPANG               | URTR | 10    | 17.05.1992 | 23.05.1992 |
| TREPANG               | URTR | 15    | 21.10.1993 | 07.11.1993 |
| TREPANG               | URTR | 16    | 07.06.1996 | 22.06.1996 |
| TREPANG               | URTR | 9     | 19.03.1992 | 28.03.1992 |
| AKADEMIK SIDORENKO    | XXXX | 1993  | 30.04.1993 | 12.05.1993 |
| AKVANAVT              | 90KC | 10    | 24.08.1994 | 07.09.1994 |
| AKVANAVT              | 90KC | 11    | 11.09.1994 | 19.09.1994 |
| AKVANAVT              | 90KC | 12    | 30.09.1994 | 06.10.1994 |
| AKVANAVT              | 90KC | 12A   | 14.10.1994 | 19.10.1994 |
| AKVANAVT              | 90KC | 13    | 18.03.1995 | 31.03.1995 |
| AKVANAVT              | 90KC | 1988  | 20.04.1988 | 23.04.1988 |
| AKVANAVT              | 90KC | 2     | 27.03.1990 | 25.04.1990 |
| AKVANAVT              | 90KC | 3     | 13.05.1990 | 31.05.1990 |
| AKVANAVT              | 90KC | 4     | 15.08.1990 | 18.08.1990 |
| AKVANAVT              | 90KC | 5     | 13.06.1991 | 03.07.1991 |
| AKVANAVT              | 90KC | 6     | 03.10.1992 | 10.10.1992 |
| AKVANAVT              | 90KC | 7     | 26.05.1993 | 27.05.1993 |
| AKVANAVT              | 90KC | 8     | 16.06.1993 | 17.06.1993 |
| AKVANAVT              | 90KC | 9     | 26.05.1994 | 11.06.1994 |
| ATLANTIS II           | 31AN | 1969  | 22.03.1969 | 30.04.1969 |
| BILIM                 | 89BL | 1986  | 25.01.1986 | 30.09.1986 |
| BILIM                 | 89BL | 1987  | 21.04.1987 | 28.08.1987 |
| BILIM                 | 89BL | 1988  | 07.06.1988 | 12.09.1988 |
| BILIM                 | 89BL | 1989  | 10.01.1989 | 04.12.1989 |
| BILIM                 | 89BL | 1990  | 08.02.1990 | 04.10.1990 |
| BILIM                 | 89BL | 1991  | 01.06.1991 | 23.09.1991 |
| BILIM                 | 89BL | 1992  | 06.01.1992 | 26.07.1992 |
| BILIM                 | 89BL | 1993  | 02.04.1993 | 20.12.1993 |
| BILIM                 | 89BL | 1994  | 24.04.1994 | 15.05.1994 |
| BILIM                 | 89BL | 1995  | 18.03.1995 | 10.04.1995 |
| DONUZLAV              | XXXX | 1995  | 23.07.1995 | 26.07.1995 |
| GYDROOPTIK            | 90B8 | 25    | 02.05.1994 | 15.05.1994 |
| KNORR                 | 316N | 1988  | 21.04.1988 | 27.07.1988 |
| PEKTAS                | XXXX | 1957  | 30.06.1957 | 07.08.1957 |
| PROFESSOR SHTOCKMAN   | 90P4 | 5     | 03.03.1981 | 23.03.1981 |
| PROFESSOR VODYANITSKY | 90V2 | 20    | 22.01.1986 | 27.01.1986 |
| PROFESSOR VODYANITSKY | 90V2 | 20B   | 14.03.1986 | 25.03.1986 |
| RIFT                  | 90C1 | 7     | 22.09.1985 | 08.11.1985 |
| RIFT                  | 90C1 | 8     | 28.05.1986 | 20.06.1986 |
| RMRI                  | XXXX | 1993  | 25.03.1993 | 15.04.1993 |
| RMRI                  | XXXX | 1994  | 15.04.1994 | 05.05.1994 |
| RMRI                  | XXXX | 1995  | 01.03.1995 | 31.03.1995 |
| RMRI                  | XXXX | 60E   | 18.02.1963 | 12.11.1969 |
| RMRI                  | XXXX | 7075E | 20.04.1970 | 12.12.1975 |
| RMRI                  | XXXX | 70S   | 02.03.1971 | 14.10.1974 |
| RMRI                  | XXXX | 7680E | 20.01.1976 | 12.12.1980 |
| RMRI                  | XXXX | 7780D | 22.04.1977 | 02.09.1980 |
| RMRI                  | XXXX | 80S   | 11.02.1981 | 23.06.1985 |
| RMRI                  | XXXX | 8184E | 11.02.1981 | 07.12.1984 |
| RMRI                  | XXXX | 8491L | 14.05.1984 | 25.10.1989 |
| RMRI                  | XXXX | 8589E | 01.02.1985 | 16.06.1989 |
| RMRI                  | XXXX | 9095D | 10.07.1991 | 20.10.1995 |
| RMRI                  | XXXX | 90E   | 15.03.1990 | 28.06.1995 |
| RMRI                  | XXXX | 90S   | 20.03.1991 | 08.09.1995 |
| RMRI                  | XXXX | 9495  | 22.04.1994 | 26.04.1994 |
| YANTAR                | XXXX | 1989  | 09.02.1989 | 23.03.1989 |
| YANTAR                | XXXX | 1995  | 18.03.1995 | 07.09.1995 |
| YANTAR                | XXXX | 1996A | 25.06.1996 | 06.07.1996 |
| YANTAR                | XXXX | 1996B | 21.03.1996 | 06.04.1996 |

|             |      |       |            |            |
|-------------|------|-------|------------|------------|
| YANTAR      | XXXX | 1996C | 29.08.1996 | 29.08.1996 |
| YUGMORGEO   | XXXX | 1996  | 01.09.1996 | 08.09.1996 |
| CALYPSO     | 35CA | 1955  | 07.08.1955 | 08.08.1955 |
| CHAIN       | 31CI | 20    | 18.10.1961 | 18.10.1961 |
| PIRI        | XXXX | 1992  | 04.07.1992 | 18.07.1992 |
| PIRI        | XXXX | 1993  | 02.04.1993 | 15.04.1993 |
| PIRI        | XXXX | 1995  | 19.03.1995 | 21.03.1995 |
| THOR        | 06TA | 1910  | 11.08.1910 | 11.08.1910 |
| UNKNOWN     | XXXX | 1923  | 15.06.1923 | 25.11.1923 |
| UNKNOWN     | XXXX | 1924  | 04.01.1924 | 02.12.1924 |
| UNKNOWN     | XXXX | 1925  | 06.01.1925 | 28.12.1925 |
| UNKNOWN     | XXXX | 1926  | 16.01.1926 | 22.12.1926 |
| UNKNOWN     | XXXX | 1927  | 23.06.1927 | 03.11.1927 |
| UNKNOWN     | XXXX | 1957  | 23.12.1957 | 24.12.1957 |
| UNKNOWN     | XXXX | 1958  | 10.03.1958 | 11.03.1958 |
| UNKNOWN     | XXXX | 1972  | 18.09.1972 | 16.12.1972 |
| UNKNOWN     | XXXX | 1973  | 07.07.1973 | 22.12.1973 |
| UNKNOWN     | XXXX | 1974  | 19.03.1974 | 16.11.1974 |
| UNKNOWN     | XXXX | 1975  | 11.02.1975 | 12.02.1975 |
| UNKNOWN     | XXXX | 1976  | 07.02.1976 | 10.09.1976 |
| UNKNOWN     | XXXX | 1977  | 12.09.1977 | 21.12.1977 |
| UNKNOWN     | XXXX | 1978  | 15.01.1978 | 06.12.1978 |
| UNKNOWN     | XXXX | 1979  | 13.02.1979 | 18.10.1979 |
| UNKNOWN     | XXXX | 1980  | 12.04.1980 | 21.10.1980 |
| UNKNOWN     | XXXX | 1981  | 10.10.1981 | 22.10.1981 |
| UNKNOWN     | XXXX | 1982  | 16.01.1982 | 21.01.1982 |
| UNKNOWN     | XXXX | 1983  | 20.09.1983 | 22.12.1983 |
| UNKNOWN     | XXXX | 1984  | 27.05.1984 | 10.09.1984 |
| UNKNOWN     | XXXX | 1995  | 29.06.1995 | 07.08.1995 |
| VITYAZ      | 90VI | 15b   | 05.03.1988 | 25.03.1988 |
| VITYAZ      | 90VI | 21    | 09.02.1991 | 07.04.1991 |
| VITYAZ      | 90VI | 27    | 03.11.1993 | 16.11.1993 |
| A.ZERNOV    | XXXX | 1937  | 09.05.1937 | 10.12.1937 |
| A.ZERNOV    | XXXX | 1948  | 11.06.1948 | 25.07.1948 |
| BEREZAN     | XXXX | 1975  | 15.02.1975 | 08.03.1975 |
| BO201       | XXXX | 1949  | 24.08.1949 | 14.09.1949 |
| CHEKIST     | XXXX | 1949  | 25.08.1949 | 30.11.1949 |
| DANILEVSKIY | XXXX | 1948  | 30.11.1948 | 30.11.1948 |
| DELTA       | XXXX | 1948  | 03.12.1948 | 12.12.1948 |
| DELTA       | XXXX | 1949  | 29.09.1949 | 27.12.1949 |
| DONUZLAV    | XXXX | 1992  | 01.04.1992 | 10.08.1992 |
| DONUZLAV    | XXXX | 1993  | 25.02.1993 | 16.07.1993 |
| DOOB        | XXXX | 1954  | 18.06.1954 | 03.07.1954 |
| DOROTEYA    | XXXX | 1929  | 11.02.1929 | 15.02.1929 |
| DREIF       | XXXX | 1950  | 04.05.1950 | 27.09.1950 |
| EKVATOR     | 90EK | 1975  | 01.08.1975 | 21.08.1975 |
| G727        | XXXX | 1958  | 12.08.1958 | 17.09.1958 |
| G728        | XXXX | 1957  | 08.06.1957 | 10.06.1957 |
| G731        | XXXX | 1952  | 04.07.1952 | 30.09.1952 |
| G734        | XXXX | 1954  | 20.04.1954 | 14.10.1954 |
| GARPUN      | XXXX | 1948  | 01.11.1948 | 03.12.1948 |
| GIDROLOG    | XXXX | 1982  | 09.04.1982 | 02.07.1982 |
| GK32        | XXXX | 1948  | 03.08.1948 | 12.08.1948 |
| GLUBINA     | XXXX | 1938  | 30.06.1938 | 07.12.1938 |
| GLUBINA     | XXXX | 1949  | 22.09.1949 | 27.12.1949 |
| GLUBOMETR   | XXXX | 1948  | 19.08.1948 | 31.08.1948 |
| GLUBOMETR   | XXXX | 1949  | 23.08.1949 | 18.09.1949 |
| GMS42       | XXXX | 1945  | 17.07.1945 | 18.07.1945 |
| GORIZONT    | 90GO | 1963  | 28.09.1963 | 11.10.1963 |

|                 |      |      |            |            |
|-----------------|------|------|------------|------------|
| GORIZONT        | 90GO | 1965 | 05.03.1965 | 30.10.1965 |
| GORIZONT        | 90GO | 1975 | 08.08.1975 | 25.08.1975 |
| GORIZONT        | 90GO | 1976 | 19.11.1976 | 16.12.1976 |
| GORIZONT        | 90GO | 1979 | 09.05.1979 | 08.06.1979 |
| GORIZONT        | 90GO | 2    | 07.05.1998 | 04.06.1998 |
| GPB165          | XXXX | 1957 | 30.10.1957 | 02.11.1957 |
| GPB329          | XXXX | 1954 | 18.06.1954 | 13.07.1954 |
| GPB512          | XXXX | 1954 | 26.07.1954 | 26.08.1954 |
| GPB512          | XXXX | 1955 | 29.08.1955 | 10.09.1955 |
| GPB512          | XXXX | 1956 | 08.08.1956 | 28.10.1956 |
| GPB512          | XXXX | 1957 | 23.03.1957 | 24.03.1957 |
| GRAD            | XXXX | 1940 | 11.06.1940 | 19.12.1940 |
| GRAD            | XXXX | 1941 | 09.02.1941 | 19.06.1941 |
| GRUNT           | XXXX | 1955 | 15.07.1955 | 19.07.1955 |
| GS-402          | XXXX | 1982 | 09.02.1982 | 22.02.1982 |
| GUIS            | XXXX | 1938 | 12.06.1938 | 28.11.1938 |
| GUIS            | XXXX | 1939 | 14.04.1939 | 11.09.1939 |
| GUIS            | XXXX | 1940 | 23.03.1940 | 13.07.1940 |
| GUIS            | XXXX | 1941 | 23.03.1941 | 19.06.1941 |
| GUIS            | XXXX | 1954 | 19.01.1954 | 21.12.1954 |
| KOVALEVSKY      | XXXX | 1922 | 01.03.1922 | 25.11.1922 |
| KOVALEVSKY      | XXXX | 1924 | 08.01.1924 | 27.12.1924 |
| KOVALEVSKY      | XXXX | 1928 | 20.01.1928 | 15.12.1928 |
| KOVALEVSKY      | XXXX | 1933 | 01.08.1933 | 19.10.1933 |
| KT526           | XXXX | 1951 | 18.01.1951 | 03.02.1951 |
| KT782           | XXXX | 1951 | 10.07.1951 | 26.08.1951 |
| LIMAN           | XXXX | 1975 | 06.04.1975 | 13.04.1975 |
| MK248           | XXXX | 1948 | 04.06.1948 | 15.07.1948 |
| MO422           | XXXX | 1948 | 06.08.1948 | 12.08.1948 |
| OGNEVOY         | XXXX | 1950 | 25.10.1950 | 30.10.1950 |
| OKEAN           | 90OK | 1975 | 07.08.1975 | 08.12.1975 |
| OKEANOLOG       | 90OC | 1950 | 16.06.1950 | 28.06.1950 |
| PAMIAT MERKURYA | 90BI | 1976 | 20.11.1976 | 02.12.1976 |
| PAMIAT MERKURYA | 90BI | 1982 | 05.06.1982 | 28.06.1982 |
| PERVOYE MAYA    | 90PM | 1923 | 25.11.1923 | 30.11.1923 |
| PERVOYE MAYA    | 90PM | 1929 | 03.05.1929 | 11.11.1929 |
| PERVOYE MAYA    | 90PM | 1930 | 29.04.1930 | 22.07.1930 |
| PERVOYE MAYA    | 90PM | 1931 | 11.06.1931 | 14.07.1931 |
| PERVOYE MAYA    | 90PM | 1932 | 06.06.1932 | 11.09.1932 |
| RADUGA          | 90RA | 1949 | 28.04.1949 | 26.07.1949 |
| RATMANOV        | XXXX | 1950 | 01.08.1950 | 15.10.1950 |
| REIS            | XXXX | 1950 | 21.07.1950 | 28.07.1950 |
| RIF             | XXXX | 1947 | 26.06.1947 | 28.06.1947 |
| RIF             | XXXX | 1948 | 05.03.1948 | 30.10.1948 |
| RIF             | XXXX | 1949 | 27.09.1949 | 30.09.1949 |
| RIF             | XXXX | 1963 | 07.01.1963 | 15.11.1963 |
| RIF             | XXXX | 1965 | 07.05.1965 | 10.12.1965 |
| RIF             | XXXX | 1967 | 25.03.1967 | 07.05.1967 |
| RIF             | XXXX | 1970 | 09.01.1970 | 05.12.1970 |
| RIF             | XXXX | 1971 | 21.01.1971 | 17.11.1971 |
| RIF             | XXXX | 1972 | 03.08.1972 | 20.08.1972 |
| RIF             | XXXX | 1978 | 10.09.1978 | 01.10.1978 |
| RK715           | XXXX | 1951 | 08.09.1951 | 21.12.1951 |
| RK715           | XXXX | 1952 | 04.01.1952 | 31.10.1952 |
| RK715           | XXXX | 1953 | 12.01.1953 | 08.12.1953 |
| RK715           | XXXX | 1954 | 23.04.1954 | 17.09.1954 |
| RK727           | XXXX | 1953 | 16.07.1953 | 30.07.1953 |
| RUMB            | XXXX | 1949 | 13.09.1949 | 27.12.1949 |
| RUMB            | XXXX | 1950 | 24.04.1950 | 06.06.1950 |

|                       |      |      |            |            |
|-----------------------|------|------|------------|------------|
| RUMB                  | XXXX | 1951 | 11.05.1951 | 30.06.1951 |
| SAMORODOK             | 90SA | 1923 | 24.05.1923 | 26.08.1923 |
| SHKHUNA               | XXXX | 1940 | 15.05.1940 | 24.06.1940 |
| T199                  | XXXX | 1947 | 22.10.1947 | 12.12.1947 |
| T202                  | XXXX | 1951 | 26.07.1951 | 27.07.1951 |
| T711                  | XXXX | 1955 | 27.05.1955 | 27.12.1955 |
| T914                  | XXXX | 1949 | 13.09.1949 | 13.10.1949 |
| T917                  | XXXX | 1949 | 24.08.1949 | 14.09.1949 |
| T924                  | XXXX | 1950 | 14.09.1950 | 05.12.1950 |
| TSHCH-190             | XXXX | 1950 | 23.10.1950 | 25.10.1950 |
| TSHCH-743             | XXXX | 1955 | 14.09.1955 | 30.09.1955 |
| TSHCH-783             | XXXX | 1955 | 22.05.1955 | 09.06.1955 |
| TUMAN                 | XXXX | 1948 | 02.11.1948 | 03.12.1948 |
| TUMAN                 | XXXX | 1949 | 16.08.1949 | 07.09.1949 |
| VASILYIY GOLOVNIN     | 90VG | 1975 | 30.03.1975 | 24.08.1975 |
| VOSTOK                | XXXX | 1948 | 12.11.1948 | 30.11.1948 |
| VOSTOK                | XXXX | 1950 | 30.05.1950 | 30.12.1950 |
| VOSTOK                | XXXX | 1951 | 10.02.1951 | 23.06.1951 |
| ZAPAD                 | XXXX | 1948 | 26.06.1948 | 23.07.1948 |
| ZAPAD                 | XXXX | 1949 | 09.07.1949 | 30.07.1949 |
| ZAPAD                 | XXXX | 1950 | 21.09.1950 | 26.09.1950 |
| ZAPAD                 | XXXX | 1951 | 20.04.1951 | 30.12.1951 |
| ZAPAD                 | XXXX | 1952 | 02.07.1952 | 03.07.1952 |
| ZENIT                 | XXXX | 1937 | 16.05.1937 | 18.09.1937 |
| ZENIT                 | XXXX | 1948 | 03.09.1948 | 11.09.1948 |
| ZENIT                 | XXXX | 1949 | 24.05.1949 | 30.05.1949 |
| ZENIT                 | XXXX | 1950 | 12.05.1950 | 25.10.1950 |
| ZENIT                 | XXXX | 1951 | 20.01.1951 | 02.04.1951 |
| ZYUID-WEST            | XXXX | 1934 | 06.05.1934 | 20.09.1934 |
| ZYUID-WEST            | XXXX | 1940 | 29.02.1940 | 31.12.1940 |
| PROFESSOR VODYANITSKY | 90V2 | 55   | 11.07.2000 | 10.10.2000 |
| PROFESSOR VODYANITSKY | 90V2 | 9    | 20.08.1980 | 18.09.1980 |
| BATUMI HMS            | XXXX | 1935 | 28.03.1935 | 26.12.1935 |
| BATUMI HMS            | XXXX | 1936 | 28.01.1936 | 15.10.1936 |
| BATUMI HMS            | XXXX | 1937 | 25.03.1937 | 17.08.1937 |
| BATUMI HMS            | XXXX | 1939 | 26.03.1939 | 27.12.1939 |
| BATUMI HMS            | XXXX | 1940 | 07.02.1940 | 24.02.1940 |
| BATUMI HMS            | XXXX | 1955 | 20.09.1955 | 29.09.1955 |
| BURUN                 | XXXX | 1980 | 18.05.1980 | 11.07.1980 |
| BURUN                 | XXXX | 1983 | 17.04.1983 | 25.10.1983 |
| BURUN                 | XXXX | 1986 | 29.05.1986 | 05.11.1986 |
| GALS                  | 9065 | 1938 | 02.04.1938 | 06.11.1938 |
| GALS                  | 9065 | 1939 | 01.09.1939 | 16.09.1939 |
| GALS                  | 9065 | 1953 | 03.10.1953 | 16.10.1953 |
| GALS                  | 9065 | 1954 | 27.05.1954 | 29.12.1954 |
| GALS                  | 9065 | 1955 | 16.01.1955 | 29.11.1955 |
| GALS                  | 9065 | 1970 | 20.05.1970 | 27.11.1970 |
| GALS                  | 9065 | 1971 | 19.05.1971 | 17.11.1971 |
| GALS                  | 9065 | 1973 | 23.03.1973 | 30.11.1973 |
| GALS                  | 9065 | 1974 | 12.02.1974 | 19.11.1974 |
| GALS                  | 9065 | 1975 | 02.01.1975 | 22.11.1975 |
| GALS                  | 9065 | 1976 | 28.01.1976 | 13.11.1976 |
| GALS                  | 9065 | 1977 | 11.01.1977 | 06.12.1977 |
| GALS                  | 9065 | 1978 | 15.02.1978 | 03.06.1978 |
| GALS                  | 9065 | 1979 | 31.01.1979 | 24.10.1979 |
| GALS                  | 9065 | 1980 | 19.03.1980 | 18.11.1980 |
| GALS                  | 9065 | 1981 | 13.01.1981 | 20.10.1981 |
| GALS                  | 9065 | 1982 | 30.03.1982 | 24.10.1982 |
| GALS                  | 9065 | 1983 | 12.01.1983 | 22.10.1983 |

|              |      |      |            |            |
|--------------|------|------|------------|------------|
| GALS         | 9065 | 1984 | 14.05.1984 | 23.10.1984 |
| GALS         | 9065 | 1985 | 25.05.1985 | 27.10.1985 |
| GALS         | 9065 | 1986 | 13.05.1986 | 04.11.1986 |
| GIDROZOND    | XXXX | 1963 | 30.01.1963 | 19.04.1963 |
| GIDROZOND    | XXXX | 1967 | 19.08.1967 | 13.11.1967 |
| GLOBUS       | XXXX | 1960 | 18.05.1960 | 16.11.1960 |
| GORIZONT     | XXXX | 1957 | 01.11.1957 | 19.11.1957 |
| GORIZONT     | XXXX | 1958 | 15.01.1958 | 24.06.1958 |
| GORIZONT     | XXXX | 1960 | 08.01.1960 | 29.11.1960 |
| GORIZONT     | XXXX | 1961 | 29.03.1961 | 07.12.1961 |
| GROM         | XXXX | 1960 | 14.04.1960 | 12.12.1960 |
| IHTIANDR     | XXXX | 1993 | 03.02.1993 | 18.02.1993 |
| ISSLEDOVATEL | XXXX | 1960 | 07.12.1960 | 22.12.1960 |
| IZOGALINA    | XXXX | 1960 | 07.01.1960 | 23.12.1960 |
| KERCH HMS    | XXXX | 1956 | 02.06.1956 | 23.09.1956 |
| KRYMMORGEO   | XXXX | 2001 | 24.05.2001 | 26.05.2001 |
| LEZAVA       | 909X | 1981 | 13.06.1981 | 25.06.1981 |
| LEZAVA       | 909X | 1982 | 24.02.1982 | 15.12.1982 |
| LEZAVA       | 909X | 1984 | 05.01.1984 | 25.12.1984 |
| LEZAVA       | 909X | 1985 | 04.01.1985 | 27.12.1985 |
| LEZAVA       | 909X | 1986 | 06.01.1986 | 26.12.1986 |
| MERIDIAN     | XXXX | 1980 | 25.03.1980 | 30.03.1980 |
| MERKURIY     | XXXX | 1975 | 24.01.1975 | 24.12.1975 |
| MERKURIY     | XXXX | 1976 | 06.01.1976 | 27.12.1976 |
| MERKURIY     | XXXX | 1977 | 22.01.1977 | 17.12.1977 |
| MERKURIY     | XXXX | 1978 | 04.01.1978 | 30.10.1978 |
| METEL        | XXXX | 1988 | 05.07.1988 | 25.09.1988 |
| MGLA         | 90MG | 1960 | 23.02.1960 | 17.12.1960 |
| MGLA         | 90MG | 1963 | 28.09.1963 | 16.10.1963 |
| MGLA         | 90MG | 1965 | 21.01.1965 | 22.04.1965 |
| MGLA         | 90MG | 1969 | 17.02.1969 | 10.09.1969 |
| MGLA         | 90MG | 1972 | 02.08.1972 | 18.08.1972 |
| MGLA         | 90MG | 1973 | 12.03.1973 | 30.11.1973 |
| MGLA         | 90MG | 1974 | 02.06.1974 | 06.10.1974 |
| MGLA         | 90MG | 1975 | 06.03.1975 | 07.10.1975 |
| MGLA         | 90MG | 1976 | 16.12.1976 | 25.12.1976 |
| MGLA         | 90MG | 1977 | 19.11.1977 | 15.12.1977 |
| MGLA         | 90MG | 1978 | 12.01.1978 | 25.01.1978 |
| MOREVED      | 90MO | 1957 | 30.07.1957 | 02.10.1957 |
| MOREVED      | 90MO | 1969 | 03.01.1969 | 05.12.1969 |
| MUKSUN       | XXXX | 1980 | 06.09.1980 | 30.09.1980 |
| NAUKA        | 90NH | 1970 | 10.02.1970 | 11.11.1970 |
| NAUKA        | 90NH | 1973 | 13.02.1973 | 13.11.1973 |
| NAUKA        | 90NH | 1974 | 13.02.1974 | 01.11.1974 |
| NAUKA        | 90NH | 1975 | 14.02.1975 | 19.11.1975 |
| NAUKA        | 90NH | 1976 | 22.01.1976 | 19.11.1976 |
| NAUKA        | 90NH | 1977 | 12.01.1977 | 08.12.1977 |
| NAUKA        | 90NH | 1978 | 19.01.1978 | 05.10.1978 |
| NAUKA        | 90NH | 1979 | 09.09.1979 | 22.11.1979 |
| NAUKA        | 90NH | 1980 | 14.01.1980 | 16.12.1980 |
| NAUKA        | 90NH | 1983 | 07.01.1983 | 23.12.1983 |
| NEPTUN       | URQH | 1972 | 16.02.1972 | 13.10.1972 |
| NEPTUN       | URQH | 1973 | 05.02.1973 | 26.10.1973 |
| NEPTUN       | URQH | 1974 | 17.01.1974 | 20.12.1974 |
| NEPTUN       | URQH | 1975 | 15.01.1975 | 17.11.1975 |
| NEPTUN       | URQH | 1976 | 08.01.1976 | 20.11.1976 |
| NEPTUN       | URQH | 1977 | 12.01.1977 | 17.12.1977 |
| NEPTUN       | URQH | 1981 | 11.05.1981 | 27.12.1981 |
| NEPTUN       | URQH | 1982 | 14.01.1982 | 22.12.1982 |

|                |      |      |            |            |
|----------------|------|------|------------|------------|
| NEPTUN         | URQH | 1983 | 12.01.1983 | 16.09.1983 |
| NEPTUN         | URQH | 1986 | 06.01.1986 | 25.12.1986 |
| NEPTUN         | URQH | 2000 | 11.07.2000 | 15.07.2000 |
| OCHAKOV HMS    | XXXX | 1940 | 23.07.1940 | 12.12.1940 |
| ODESSA HMS     | XXXX | 1934 | 15.07.1934 | 16.09.1934 |
| ODESSA HMS     | XXXX | 1935 | 29.09.1935 | 20.12.1935 |
| ODESSA HMS     | XXXX | 1938 | 22.04.1938 | 23.09.1938 |
| ODESSA HMS     | XXXX | 1939 | 17.04.1939 | 21.10.1939 |
| ODESSA HMS     | XXXX | 1940 | 10.04.1940 | 11.12.1940 |
| ODESSA HMS     | XXXX | 1947 | 27.05.1947 | 21.08.1947 |
| ODESSA HMS     | XXXX | 1948 | 14.10.1948 | 14.10.1948 |
| ODESSA HMS     | XXXX | 1949 | 05.03.1949 | 02.07.1949 |
| ODESSA HMS     | XXXX | 1950 | 17.03.1950 | 28.03.1950 |
| ODESSA HMS     | XXXX | 1951 | 21.06.1951 | 24.10.1951 |
| ODESSA HMS     | XXXX | 1957 | 07.04.1957 | 29.10.1957 |
| OKEANOGRAF     | 90OG | 1960 | 03.06.1960 | 03.11.1960 |
| OKEANOGRAF     | 90OG | 1962 | 23.01.1962 | 14.12.1962 |
| OKEANOGRAF     | 90OG | 1973 | 29.01.1973 | 24.11.1973 |
| OKEANOGRAF     | 90OG | 1978 | 03.01.1978 | 31.05.1978 |
| OKEANOGRAF     | 90OG | 1980 | 11.08.1980 | 19.12.1980 |
| OKEANOGRAF     | 90OG | 1987 | 05.01.1987 | 20.12.1987 |
| OKEANOGRAF     | 90OG | 1988 | 04.01.1988 | 28.12.1988 |
| PORYV          | 90PB | 1975 | 24.04.1975 | 26.12.1975 |
| PORYV          | 90PB | 1976 | 29.01.1976 | 20.10.1976 |
| PORYV          | 90PB | 3    | 01.08.1972 | 30.10.1972 |
| PRIBOY         | 90PY | 1965 | 08.07.1965 | 18.11.1965 |
| PRIBOY         | 90PY | 1970 | 10.07.1970 | 08.12.1970 |
| PRIBOY         | 90PY | 1971 | 25.05.1971 | 29.10.1971 |
| PRIBOY         | 90PY | 1972 | 14.05.1972 | 29.05.1972 |
| PRIBOY         | 90PY | 1973 | 25.04.1973 | 30.10.1973 |
| PRIBOY         | 90PY | 1974 | 26.04.1974 | 14.11.1974 |
| PRIBOY         | 90PY | 1975 | 19.06.1975 | 02.10.1975 |
| PRIBOY         | 90PY | 1976 | 12.05.1976 | 19.11.1976 |
| PRIBOY         | 90PY | 1977 | 19.04.1977 | 28.11.1977 |
| PRIBOY         | 90PY | 1978 | 10.04.1978 | 23.11.1978 |
| PRIBOY         | 90PY | 1979 | 23.05.1979 | 30.11.1979 |
| PRIBOY         | 90PY | 1980 | 03.08.1980 | 21.08.1980 |
| PRIBOY         | 90PY | 1981 | 12.05.1981 | 17.10.1981 |
| PRIBOY         | 90PY | 1982 | 02.04.1982 | 10.11.1982 |
| PRIBOY         | 90PY | 1983 | 01.04.1983 | 27.11.1983 |
| PRIBOY         | 90PY | 1984 | 17.04.1984 | 15.11.1984 |
| PRIBOY         | 90PY | 1986 | 17.04.1986 | 17.11.1986 |
| PRILIV         | 90PI | 2    | 21.03.1970 | 21.03.1970 |
| RASSVET        | XXXX | 1960 | 07.12.1960 | 19.12.1960 |
| REYKA          | 90QS | 1940 | 30.05.1940 | 29.12.1940 |
| REYKA          | 90QS | 1941 | 15.05.1941 | 19.06.1941 |
| REYKA          | 90QS | 1948 | 10.06.1948 | 25.11.1948 |
| REYKA          | 90QS | 1954 | 27.06.1954 | 13.07.1954 |
| REYKA          | 90QS | 1960 | 21.01.1960 | 27.12.1960 |
| REYKA          | 90QS | 1962 | 12.01.1962 | 30.11.1962 |
| REYKA          | 90QS | 1963 | 01.02.1963 | 10.04.1963 |
| REYKA          | 90QS | 1965 | 15.01.1965 | 22.12.1965 |
| REYKA          | 90QS | 1970 | 16.01.1970 | 28.12.1970 |
| REYKA          | 90QS | 1973 | 03.01.1973 | 25.12.1973 |
| SEVASTOPOL HMS | XXXX | 1922 | 14.10.1922 | 19.10.1922 |
| SEVASTOPOL HMS | XXXX | 1923 | 01.03.1923 | 28.12.1923 |
| SEVASTOPOL HMS | XXXX | 1926 | 05.01.1926 | 24.12.1926 |
| SEVASTOPOL HMS | XXXX | 1929 | 15.01.1929 | 27.12.1929 |
| SEVASTOPOL HMS | XXXX | 1930 | 17.01.1930 | 09.04.1930 |

|                |      |      |            |            |
|----------------|------|------|------------|------------|
| SEVASTOPOL HMS | XXXX | 1931 | 14.06.1931 | 21.10.1931 |
| SEVASTOPOL HMS | XXXX | 1934 | 29.01.1934 | 17.12.1934 |
| SEVASTOPOL HMS | XXXX | 1935 | 27.02.1935 | 02.10.1935 |
| SEVASTOPOL HMS | XXXX | 1936 | 20.04.1936 | 21.12.1936 |
| SEVASTOPOL HMS | XXXX | 1937 | 13.01.1937 | 02.02.1937 |
| SEVASTOPOL HMS | XXXX | 1939 | 18.02.1939 | 19.12.1939 |
| SEVASTOPOL HMS | XXXX | 1940 | 20.01.1940 | 19.11.1940 |
| SEVASTOPOL HMS | XXXX | 1941 | 21.02.1941 | 23.02.1941 |
| SEVASTOPOL HMS | XXXX | 1947 | 07.07.1947 | 08.07.1947 |
| SEVASTOPOL HMS | XXXX | 1956 | 17.08.1956 | 20.08.1956 |
| SEVASTOPOL HMS | XXXX | 1957 | 12.03.1957 | 13.03.1957 |
| SEVASTOPOL HMS | XXXX | 1958 | 02.07.1958 | 18.12.1958 |
| TANTAL         | 90C7 | 1980 | 10.01.1980 | 08.12.1980 |
| TANTAL         | 90C7 | 1981 | 12.08.1981 | 26.12.1981 |
| TANTAL         | 90C7 | 1982 | 24.01.1982 | 21.09.1982 |
| TANTAL         | 90C7 | 1984 | 23.05.1984 | 27.11.1984 |
| TANTAL         | 90C7 | 1985 | 07.04.1985 | 22.12.1985 |
| TAYFUN         | 90T3 | 1960 | 19.01.1960 | 21.01.1960 |
| TAYFUN         | 90T3 | 1984 | 23.05.1984 | 30.10.1984 |
| TAYFUN         | 90T3 | 1985 | 07.05.1985 | 02.11.1985 |
| TAYFUN         | 90T3 | 1986 | 11.04.1986 | 17.11.1986 |
| TAYFUN         | 90T3 | 1987 | 14.04.1987 | 22.11.1987 |
| TAYFUN         | 90T3 | 1988 | 17.04.1988 | 03.11.1988 |
| TAYFUN         | 90T3 | 1989 | 12.04.1989 | 03.11.1989 |
| TAYFUN         | 90T3 | 1990 | 12.04.1990 | 13.11.1990 |
| TAYFUN         | 90T3 | 1991 | 13.06.1991 | 14.11.1991 |
| TSIKLON        | 90JH | 1978 | 07.09.1978 | 01.10.1978 |
| URAGAN         | 90U6 | 1975 | 18.05.1975 | 02.10.1975 |
| URAGAN         | 90U6 | 1976 | 13.04.1976 | 22.10.1976 |
| URAGAN         | 90U6 | 1978 | 07.09.1978 | 20.10.1978 |
| URAGAN         | 90U6 | 1979 | 08.06.1979 | 01.11.1979 |
| URAGAN         | 90U6 | 1980 | 04.09.1980 | 03.10.1980 |
| URAGAN         | 90U6 | 1981 | 21.05.1981 | 03.10.1981 |
| URAGAN         | 90U6 | 1982 | 22.04.1982 | 16.09.1982 |
| URAGAN         | 90U6 | 1985 | 21.05.1985 | 25.12.1985 |
| URAGAN         | 90U6 | 1986 | 06.01.1986 | 25.12.1986 |
| URAGAN         | 90U6 | 1987 | 05.01.1987 | 22.12.1987 |
| URAGAN         | 90U6 | 1988 | 05.01.1988 | 23.12.1988 |
| VEGA           | XXXX | 1991 | 08.01.1991 | 24.06.1991 |
| VLASOV         | XXXX | 1966 | 12.01.1966 | 21.12.1966 |
| VOLNA          | 90VR | 1974 | 04.01.1974 | 28.12.1974 |
| VOLNA          | 90VR | 1975 | 20.01.1975 | 23.10.1975 |
| VOLNA          | 90VR | 1976 | 11.05.1976 | 27.12.1976 |
| VOLNA          | 90VR | 1977 | 10.01.1977 | 16.12.1977 |
| VOLNA          | 90VR | 1978 | 09.06.1978 | 21.12.1978 |
| VOLNA          | 90VR | 1979 | 10.01.1979 | 20.12.1979 |
| VOLNA          | 90VR | 1980 | 03.01.1980 | 07.08.1980 |
| VOLNA          | 90VR | 1985 | 03.01.1985 | 26.12.1985 |
| VOLNA          | 90VR | 1986 | 20.03.1986 | 07.04.1986 |
| VYDVIZHENETZ   | XXXX | 1938 | 16.10.1938 | 17.10.1938 |
| MECHNIKOV      | URME | 9    | 02.04.1993 | 06.04.1993 |
| GONETS         | 9067 | 1959 | 24.02.1959 | 26.11.1959 |
| GONETS         | 9067 | 1960 | 15.06.1960 | 17.09.1960 |
| GONETS         | 9067 | 1961 | 09.04.1961 | 20.08.1961 |
| GONETS         | 9067 | 1962 | 09.08.1962 | 23.11.1962 |
| GONETS         | 9067 | 1963 | 18.02.1963 | 01.09.1963 |
| GONETS         | 9067 | 1964 | 12.05.1964 | 04.12.1964 |
| GONETS         | 9067 | 1965 | 12.02.1965 | 28.08.1965 |
| GROT           | 90N1 | 1959 | 11.05.1959 | 16.09.1959 |



|                        |      |      |            |            |
|------------------------|------|------|------------|------------|
| GROT                   | 90N1 | 1960 | 12.05.1960 | 26.07.1960 |
| GROT                   | 90N1 | 1961 | 18.02.1961 | 01.06.1961 |
| GROT                   | 90N1 | 1962 | 24.02.1962 | 29.06.1962 |
| GROT                   | 90N1 | 1963 | 10.05.1963 | 29.11.1963 |
| GROT                   | 90N1 | 1966 | 17.06.1966 | 26.08.1966 |
| GROT                   | 90N1 | 1977 | 15.07.1977 | 26.07.1977 |
| GROT                   | 90N1 | 1980 | 21.02.1980 | 13.03.1980 |
| KERCHENSKY KOMSOMOLETS | 9018 | 1986 | 06.08.1986 | 14.09.1986 |
| KONSTANTIN BOLDYREV    | 90D7 | 7902 | 15.02.1979 | 03.03.1979 |
| KONSTANTIN BOLDYREV    | 90D7 | 7903 | 12.03.1979 | 13.03.1979 |
| KONSTANTIN BOLDYREV    | 90D7 | 7904 | 17.04.1979 | 22.04.1979 |
| KONTAKT                | 90Q1 | 1960 | 11.02.1960 | 11.02.1960 |
| KONTUR                 | 90KO | 1957 | 22.08.1957 | 23.08.1957 |
| KONTUR                 | 90KO | 1960 | 16.06.1960 | 10.08.1960 |
| KONTUR                 | 90KO | 1961 | 03.01.1961 | 24.12.1961 |
| KONTUR                 | 90KO | 1962 | 07.07.1962 | 26.11.1962 |
| KONTUR                 | 90KO | 1966 | 13.11.1966 | 01.12.1966 |
| KRISTALL               | 90Q3 | 1960 | 29.09.1960 | 11.12.1960 |
| KRISTALL               | 90Q3 | 1961 | 30.11.1961 | 08.12.1961 |
| KRISTALL               | 90Q3 | 1962 | 11.05.1962 | 13.07.1962 |
| KRISTALL               | 90Q3 | 1964 | 11.02.1964 | 05.03.1964 |
| KRISTALL               | 90Q3 | 1965 | 11.11.1965 | 04.12.1965 |
| KRISTALL               | 90Q3 | 1966 | 12.04.1966 | 30.05.1966 |
| V.VOROBYEV             | 90VV | 1948 | 01.07.1948 | 11.10.1948 |
| ZHELEZNYAKOV           | 9026 | 1984 | 26.11.1984 | 29.11.1984 |
| ZHELEZNYAKOV           | 9026 | 1985 | 27.07.1985 | 06.08.1985 |
| ERNST KRENKEL          | 90KE | 13a  | 13.06.1976 | 23.09.1976 |
| ERNST KRENKEL          | 90KE | 60   | 13.05.1997 | 14.05.1997 |
| GEORGY USHAKOV         | 90UG | 10a  | 05.06.1975 | 09.06.1975 |
| GEORGY USHAKOV         | 90UG | 10b  | 13.12.1975 | 18.12.1975 |
| GEORGY USHAKOV         | 90UG | 20a  | 13.02.1979 | 10.03.1979 |
| GEORGY USHAKOV         | 90UG | 38   | 22.06.1984 | 26.06.1984 |
| GEORGY USHAKOV         | 90UG | 59   | 13.06.1991 | 15.06.1991 |
| MUSSON                 | 90MU | 12a  | 19.01.1974 | 05.02.1974 |
| PASSAT                 | 90PT | 10   | 03.10.1972 | 27.11.1972 |
| PASSAT                 | 90PT | 1977 | 29.11.1977 | 29.11.1977 |
| PASSAT                 | 90PT | 19a  | 07.04.1976 | 21.04.1976 |
| VLADIMIR PARSHIN       | 902B | 4a   | 11.05.1990 | 15.05.1990 |
| VOLNA                  | 90VB | 42a  | 12.06.1986 | 21.06.1986 |
| YAKOV GAKKEL           | 90YG | 11b  | 12.05.1981 | 06.06.1981 |
| YAKOV GAKKEL           | 90YG | 13a  | 19.11.1981 | 09.12.1981 |
| YAKOV GAKKEL           | 90YG | 14b  | 26.05.1982 | 12.06.1982 |
| YAKOV GAKKEL           | 90YG | 18   | 13.01.1983 | 16.01.1983 |
| YAKOV GAKKEL           | 90YG | 18a  | 11.03.1983 | 02.04.1983 |
| YAKOV GAKKEL           | 90YG | 20a  | 13.11.1983 | 23.11.1983 |
| YAKOV GAKKEL           | 90YG | 22V  | 07.04.1985 | 21.04.1985 |
| YAKOV GAKKEL           | 90YG | 28a  | 13.05.1987 | 03.06.1987 |
| YAKOV GAKKEL           | 90YG | 28v  | 25.07.1987 | 10.08.1987 |
| YAKOV GAKKEL           | 90YG | 30a  | 15.01.1988 | 30.01.1988 |
| YAKOV GAKKEL           | 90YG | 31   | 19.02.1988 | 21.02.1988 |
| YAKOV GAKKEL           | 90YG | 33a  | 13.04.1989 | 04.05.1989 |
| YAKOV GAKKEL           | 90YG | 34   | 29.05.1989 | 14.06.1989 |
| YAKOV GAKKEL           | 90YG | 36a  | 12.05.1990 | 19.05.1990 |
| YAKOV GAKKEL           | 90YG | 37   | 02.06.1990 | 12.07.1990 |
| YAKOV GAKKEL           | 90YG | 38   | 04.11.1990 | 05.11.1990 |
| YAKOV GAKKEL           | 90YG | 3a   | 07.05.1977 | 29.05.1977 |
| YAKOV GAKKEL           | 90YG | 4a   | 30.09.1977 | 03.12.1977 |
| YAKOV GAKKEL           | 90YG | 4g   | 15.02.1978 | 29.03.1978 |
| YAKOV GAKKEL           | 90YG | 5    | 09.08.1978 | 09.08.1978 |

|              |      |    |            |            |
|--------------|------|----|------------|------------|
| YAKOV GAKKEL | 90YG | 5a | 01.08.1978 | 31.08.1978 |
| YAKOV GAKKEL | 90YG | 77 | 09.08.1992 | 16.08.1992 |
| YAKOV GAKKEL | 90YG | 9a | 28.11.1979 | 21.12.1979 |

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## **7. OTHER INFORMATION RELATED TO OCEANOGRAPHIC DATA AND INFORMATION ON THE BLACK SEA**

This section contains materials on Black Sea GOOS Data and Data-Products prepared by Editing Committee of the Black Sea GOOS Programme. The materials can be of interest for specialists solving the problems of the Black Sea Marine Information Systems and Technologies and are published with kind permission of Valery N. Eremeev, Director General of the Oceanological Centre of the National Academy of Sciences of Ukraine, the Chairman of the IOC UNESCO Black Sea Regional Committee, the Chairman of the Steering Committee of the Black Sea Global Observing Oceanographic System.

### **MARINE SERVICE MODULE (MSM)**

The MSM will be guided by the basic principles, which is the observing system will produce dataproducts that address a broad spectrum of user needs:

- Observation will be designed to address specific problems that occur in the basin and affect human activities at several different levels.

- The users of the data and data-products will interact with both technical experts and scientists to drive the process of designing, operating and improving the system in response to the evolving needs of user groups.

*The development of MSM involves a cost-effective use of existing data; expertise and infrastructure i.e., the entire process from measurements to products will be cost-effective:*

- MSM will incorporate, enhance and supplement existing programmes as appropriate. It will develop a comprehensive system of observations through shared use of infrastructure from measurement systems and platforms to communication networks, data management systems, assimilation techniques, and modelling.
- Measurements will be routine (uninterrupted flow of data of known quality) and data will be assimilated, analysed and transformed into products in a timely fashion.
- Products will ensure social and economic benefits that will largely compensate the operational costs of the observation system.

*Process-oriented scientific research that leads to new knowledge, improved technologies, and more powerful models is of critical importance to the development of MSM:*

- MSM will enable a constructive and timely synergy between process-oriented research and the generation of information and products in response to user needs.
- The observing system must be both integrated and sustained. The successful achievement of the goals of MSM requires that it capture a wide spectrum of environmental responses (the temporal and spatial dimensions of variability) to external forcing.
- Observations will be sustained to capture episodic events and long-term trends (i.e. to document both high and low frequency variability), enhance scientific analysis, and support model predictions.
- The observing system will cover from synoptic measurements of physical, biological and chemical properties over a broad range of time and space scales to data management (multiple data types from disparate sources) and analyses that are consistent with the needs of end-users.
- MSM will be designed and implemented in collaboration with EuroGOOS.

The following types of measurements are carried out within the frame of MSM:

- (a) Standard hydrometeorology observations.
- (b) Small vessels for monthly measurements across selected transects from coastal areas to shelf and continental slopes.
- (c) Ships-of-opportunity measurements along selected sections (using self-contained, autologging instrumentation packages on merchant vessels and ferries).
- (d) Drifters and floats.
- (e) Satellite.

### **Standard hydrometeorology observations and services**

Wind, temperature, humidity, cloud cover, precipitation, and evaporation are among the measurements routinely conducted at the Black Sea coastal meteorological stations. A tide gauge network around the Black Sea is essential to calibrate the satellite altimeter data. All these data should be made available to Black Sea GOOS on a real- or near-real-time basis.

National Meteorological/Hydrometeorological Services of the coastal countries maintain 46 coastal marine meteorological stations (Bulgaria – 6, Georgia – 8, Ukraine – 16, Romania – 4, Russian Federation – 5, Turkey – 7. For example Ukrainian main components of Marine observations network is shown on Fig 9). According to the WMO Technical Regulations they monitor with three hours interval the following parameters: air and sea water temperature, direction and speed of wind, height, period and direction of waves, atmospheric pressure, solar radiation, visibility, precipitation, humidity. Limited number of stations observes sea level, some chemical parameters, air pollution, etc. Some coastal marine meteorological stations have more than 50-year long series of observations of certain elements. At all the stations observations are made manually.

In addition, there are three automatic stations in Varna (Bulgaria), Constanta and Gloria (Romania) with limited number of sensors.

Coastal stations report their observations so as messages with coded data are collected at National Meteorological Centres as a rule not later than 20 minutes after time of observation.

Marine operational forecasting systems for the Black Sea have been developed in several countries around the sea. They typically contain:

- An meso-scale atmospheric model (limited area model) covering the region of the Black Sea.
- An wave model taking the wind input from the atmospheric model.
- Visualization system for different weather and wave parameters.
- Verification procedures.

Rapid advances being made in the atmospheric modelling, the operational used models cover the Black Sea region with horizontal resolution of about 10 km; sophisticated physics describing the atmospheric and surface soil physical processes is included. Two National Meteorological Services (Bulgaria and Romania) are using the ALADIN limited area model coupled with the French global model ARPEGE.

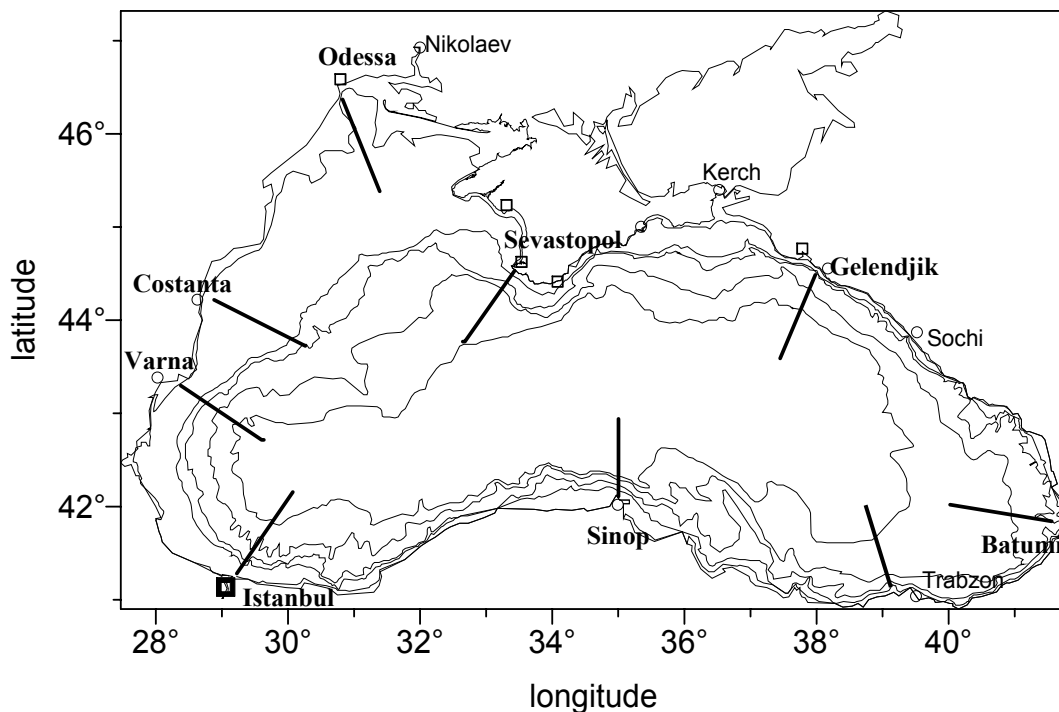
Other components underlie the operational marine hydrometeorological services of Ukraine, Turkey, Russia and Georgia. Short description is presented in Annexe 3.

### **Small-vessel observation program**

This program involves continuous measurements, as shown in Table 5.1, at selected transects across the shelf, from the coast to the interior basin, performed within a day or so biweekly. The narrowness and steepness of most of the Black Sea shelf regions will permit efficient and nested monitoring observations through limited area coverage. The measurements are carried out within a day or so across the coastal and shelf areas, and continental margins over weekly time periods. A number of small research vessels will collect data along a transect within pilot areas located around the basin and off their own ports (to minimize costs for ship time). The program also takes advantage of the fact that major marine institutes of the Black Sea own small research vessels designed for coastal and shelf studies. The program is expected to provide the needed time series data to be assimilated in the nested coupled biological and hydrodynamic models. Such a program is affordable only with small vessels, in terms of cost, practicability, and vessel availability for the participating institutions. (See the proposed network in Figure 5.1) This program is expected to provide unique time-series data annually over the entire basin, which is crucial to assessing the fate of environmental parameters monitored and investigated.

At present, all of the major Black Sea marine institutes possess Sea Bird Electronics CTD probes with rosette samplers, also equipped with fluorometers, transmissometers, a beam attenuation

coefficient sensor, a sensor for pH, and standard biological sampling equipment. A good number of research vessels are capable of operating in the Black Sea. Sediment traps may also be deployed at several critical locations for certain periods of time to obtain data on the particle fluxes sinking from the surface layer.



**Figure 5.1.** Location of transects for small vessel observation program in the Black Sea (~100 km, 6 to 8 oceanographic stations)

**Table 5.1.** Parameters to be measured by small-vessels program

|                                  |   |
|----------------------------------|---|
| <b>Meteorological variables:</b> | Barometric pressure, wind speed and direction, air-sea fluxes of heat, freshwater flux (evaporation-precipitation) cloudiness, air temperature, surface spectral radiation. |
| <b>Physical variables:</b>       | Temperature, salinity, current, light transmission, and PAR at depth and its attenuation.   |
| <b>General variables:</b>        | TSS, pH, BOD1, BOD5, particulate and dissolved TOC, alkalinity, H <sub>2</sub> S, and redox potential (eH).   |
| <b>Nutrients:</b>                | Orthophosphate, total phosphorus, ammonium, nitrate, nitrite, total nitrogen, and silicate.   |
| <b>Metals:</b>                   | Cd, Hg, and Pb.   |
| <b>Biological:</b>               | Chlorophyll-a (Chl-a), phyto plankton and zooplankton abundances, primary production, and bacterial biomass, fluorescence.  |
| <b>Other substances:</b>         | POPs, plastics and litter, oil slicks, and petroleum hydrocarbons, contaminant level on biota.  |

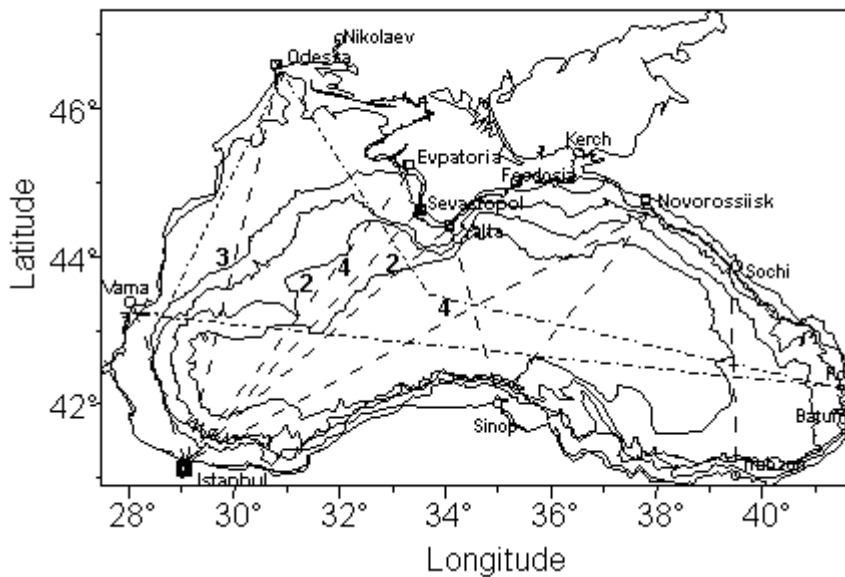
## Ship-of-opportunity measurements

These measurements constitute the most important element of MSM's measurement system. Regularly scheduled launchings of XBTs/XCTDs, together with various discrete and continuous samplings/measurements complement efforts to monitor the large-scale physical and biogeochemical structure of the sea. Platforms used may include merchant, fishing, military, or small oceanographic vessels. It is envisaged that the ship-of-opportunity based measuring system for BS GOOS, if ideally organized, will suffice for continuous monitoring of atmospheric forcing (curl of the wind, heat flux), intensity of general circulation and sub-basin scale features, optical parameters, concentrations of nutrients, and primary production levels at the sea surface.

Specifically, ship-of-opportunity observations will include:

- Regular meteorological observations by means of autonomous logging meteorological stations.
- Observations of upper layer water column stratification through XBT or XCTD launches.
- continuous measurements of sea surface temperature, conductivity, and bio-optical variables with a standard CTD probe by means of continuous pumping of water through a reservoir with a volume of approximately  $0.5 \text{ m}^3$ ;
- observations of currents, sea surface temperature, and atmospheric pressure by means of drifting buoys launched from ship-of-opportunity;
- observations of currents, sea surface temperature, and atmospheric pressure, and temperature profiles within the upper 200 m (thermocline topography) by means of diving drifters also launched from ship-of-opportunity;
- discrete sampling for measurements of concentrations of various biogeochemical variables on board using express analyzer technique or concentrations of pollutants;
- discrete biological sampling (phyto- and zooplankton abundance) from the sea surface;
- continuous plankton recorder observations;
- Ferrybox.

Figure 5.2 depicts the common ship routes in the Black Sea; for each route, the number indicates the fewest ships regularly operating on that route. The crews of these ships are generally well acquainted with oceanographic fieldwork. These ships operate on a regular weekly basis from Odessa, Evpatoria, Sevastopol, Yalta, and Novorossiisk. At speeds of 9 to 11 knots, it takes about 20 to 35 hours from the western ports and about 45 hours from Novorossiisk to reach Istanbul. This means that every 3 to 4 days each ship crosses the circulation features of the basin. It is logical therefore to recruit one ship-of-opportunity vessel each from Odessa, Evpatoria, Sevastopol, Yalta, and Novorossiisk. The ship-of-opportunity based measurement system, when ideally organized, may thus provide an excellent opportunity to monitor the basin, sub-basin, and mesoscale features of the system. The measurements will be selected from the list in Table 5.1, depending on the capabilities and opportunities, and may vary from vessel to vessel.



**Figure 5.2.** *Common ship routes in the Black Sea.*

### **Drifting buoys and floats.**

A new technology for monitoring water masses over seasonal-annual time scales, provide a Lagrangian picture of the flow fields as they move with prevailing currents. Drifter data provide a unique opportunity to understand the dynamics of the Rim Current structure and associated mesoscale circulation characteristics of the system. They may be deployed either at fixed-depth or fixed-density levels. The use of drifters and drogues for biological studies is relatively recent. Drifting buoys, consisting of a spectro-radiometer, a fluorometer, a beam transmissometer, acoustic doppler current profiler, thermistors, and conductivity sensors, are available and are used successfully in various observational programs. The drifting buoys may even consist of an automated water sampler from which water is collected at 6-hour intervals for plankton and nutrient analysis. Another type of drifter, ALACE Float, is able to operate both vertically and horizontally in the water column, providing a three-dimensional picture. The main advantage of drifters over other platforms is that they provide a relatively inexpensive means for obtaining broad geographical in situ sampling.

The temperature measurements from surface drifters may be used to calibrate the satellite SST data, particularly when and where ship observations are sparse or nonexistent. When they are equipped with thermistor chains measuring water temperature down to about 300 m or programmed to undulate, they will also allow a cost-effective way of complementing hydrographic cross-sections taken by research vessels or by ships of opportunity XBTs.

Another advantage of the drifters is that they can be deployed from research vessels as well as from the ships of opportunity, thereby allowing a flexible network of observations.

### **Remote-sensing measurements.**

In-situ measurements of oceanographic properties using moorings, drifters, and samplings on stations by research vessels and ships of opportunity are complemented by satellite remote-sensing data, which provide quasi-synoptic, basin-, and sub-basin-scale knowledge of enhanced biological production and plant biomass (via SeaWiFS), sea-surface temperature (via Advanced Very High Resolution Radiometer (AVHRR)) and sea-surface height (via Topex-Poseidon and ERS2 altimeter



measurements). The latter two techniques help determine large-scale and mesoscale near-surface current patterns, which are important for the advection of living and nonliving constituents and the identification of shelf-sea fronts, topographic features (banks and ridges), shelf edges, and other upwelling zones, where zooplankton and fish populations are known to accumulate for feeding, spawning, and early life development. LANDSAT images are also useful for identifying pollution sources and tracking land-use changes.

Moreover, NSCAT scatterometer provides data on the wind speed to within 2 m/s and on wind direction to within 20 degrees, with 50 km spatial resolution and 2-day sampling interval. This data has been available since late 1996.

The remote sensing and in situ observations must be considered simultaneously. Together they can provide a virtually complete set of sampling strategies covering the full spectrum of time and space scales. The remote sensing technology gives quasi-synoptic snapshots of a large area with fine spatial resolution, which is practically impossible with the use of drifters and other in situ techniques. On the other hand, conventional oceanographic measurements provide high resolution data within the water column and time and a much wider range of measurements of biological, biochemical, and physical properties, which can not be obtained by remote sensing methods. The synergy between in situ and remote sensing measurements is thus vital.

### **Data management program**

Efficiency of the data flow is essential for an operational forecasting system. The relevant data sets, which are planned to be assimilated in the operational prediction systems, must be received, assembled, quality controlled, processed, and transmitted in near real time. The data sets and derived products must then be disseminated to the user community and archived. The database for Black Sea GOOS must include not only the standard oceanographic and marine environmental data, but also the meteorological time series and the remotely sensed observations such as the SeaWiFS, AVHRR, and TOPEX/POSEIDON altimetry data. Some selected model results that would be useful for comparison and later studies should also be included in the database.

The Black Sea Data and Information Management System (BS-DIMS ) will be developed on a highly based on contribution by marine and meteorological organizations and institutes, data centres in the Black Sea Region. Various international as well as national and regional Black Sea programmes under development have different data and information management strategies encompassed physical, chemical, biological and hydrometeorological observation. Initial implementation of Black Sea data and information management will be accomplished in an interactive fashion by connecting the existing data banks.

The diversity of the existing systems and lack of specific details in regard to the future requirements prohibiting implementation of a centralized data management system with strict control of formats, quality control procedures, accuracy and precision standards, and data products “certification” in the near future. Thus the BS-DIMS is designed to outline a set of guiding principles on data management practices for the programmes contributing to the Black Sea GOOS. .

There are two other important items that must be included in the design of the BS-DIMS . There is a need to connect the programmes and the participating data and science centres under a unified and centralized “information services system”. This contributes information about the programmes and observations how to access to the data. The second item is the requirement carefully designed and automated self-controlled data and information flow. They can thus be cheked periodically whether or not the system is working and if not to locate where the problem lie.

There are three general classes of users for the Black Sea GOOS data and information:

- Operational users.

- Authorities and managers of large - scale projects.
- Scientists, engineers, and economists doing special research, strategic design studies, and other studies to advance the application and usefulness of the Black Sea GOOS data and information.

The operational users analyse the data that have been collected and produce a prediction about weather, sea state, or the sea level to warn for a severe storm to implement a regulation such as the closure of a fishery for a specific health danger.

The authorities or managers of large - scale projects need timely oceanographic information, which includes regular statistics and climatic trends. This information could be available with some delay in time but should be generalized and interdisciplinary as rule.

Scientists, engineers, and social scientists require accurate, long term data sets for research in physical, biological, and chemical oceanographic processes; model development and testing; design criteria for ships, structures and marine facilities; studies of the effect of climate change on economies and populations, etc. For these types of works accuracy and completeness of the data sets are more important than having the data in real or near real time.

The requirements for BS-DIMS management are for a series of intersecting end-to-end that must:

- Ingest various versions of in situ and satellite data and metadata.
- Apply the appropriate level of quality control based on the delivery time for each data set or product.
- Provide the best available copy of the data, metadata and products at several elapsed times after observation to a variety of users.
- Provide for the archival of the best available final copy of the data, meta data and products for future users with updates of the archives if re-analyses are done or better copies of the data and information become available.
- Provide feedback on data-related problems to data acquisition groups on the usefulness of the data and products to users to the developers of the systems, and on the timeliness and completeness of the data flows to data collectors and managers of the data flows.

The most of the systems in operation today have been targeted for one class of users, for example the weather services or the physical oceanographic researches. The products have generally been left to these users. The Black Sea GOOS as well as GOOS needs a different paradigm, the service chain.

The service chain embodies the idea of a distributed system that takes data, performs quality control, analyses it if necessary, delivers product to a broad community at various times after collection, and archives the data for continuing service to the research and engineering community .

Electronic networks will play an increasing role in the development of BS-DIMS.

Therefore existing communication capabilities must be improved significantly at the initial stages of Black Sea GOOS. Faster Internet connections in the region is crucially important for the successful implementation of the Black Sea GOOS.

The oceanographic institutions participating in the Black Sea GOOS program have long-standing experience with data handling procedures. The software and hardware capabilities, however, need to be updated for handling large volumes of data flow from satellite-tracked observation systems and for archiving. The software also needs to be extended to provide the means for joint processing and analysis of a variety of data. A specific data base policy must be developed and approved by all the participants.

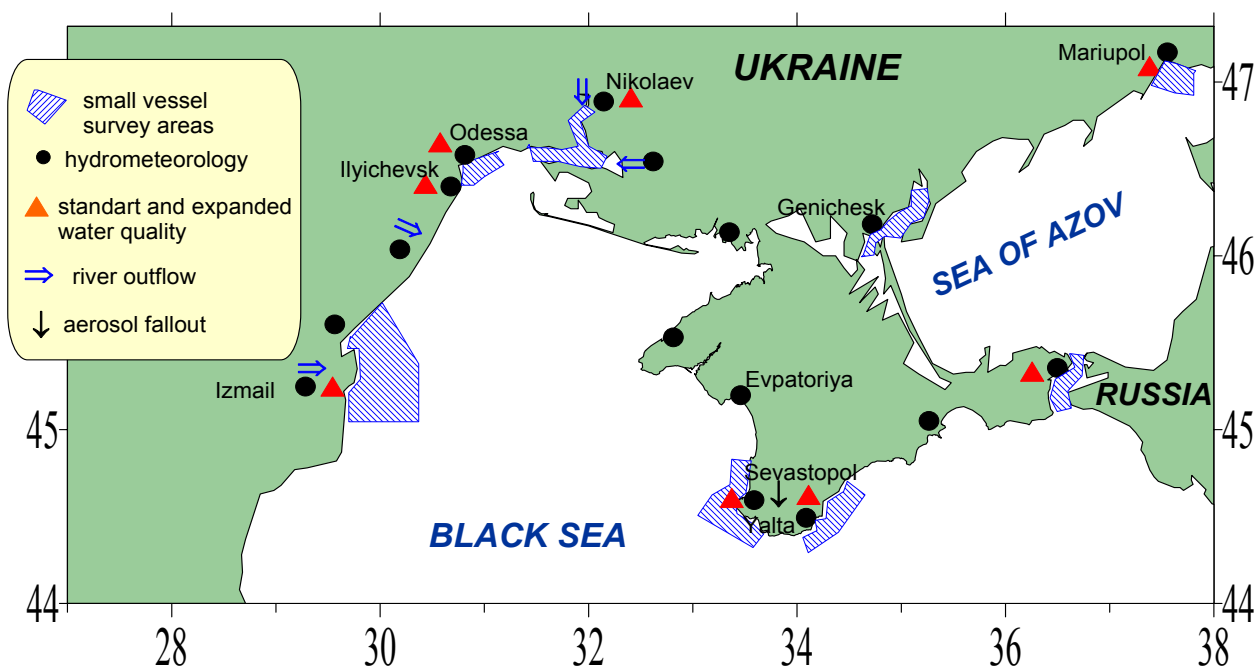
A critically important topic is relevant metadata collection. Metadata is crucial if data are to be interpreted properly and readily used across disciplines. All possible efforts must be spent to provide, at a minimum, concise metadata with all historical data sets. Recent data must be supplied with full metadata in all cases. Metadata has to be in a form that can be used efficiently by all data analysts.

Data quality has a fundamental importance for the Black Sea GOOS. Attention must be paid to data quality control and arrangement of data sets with pertinent and internationally accepted quality flags throughout the data flow process. The proper protocols for data collection and treatment should be defined (especially for biogeochemical data). Accepted international standards should be used to the greatest extent possible for media, formats, processing, and transmission of data sets.

Quality time series and climatic data sets must be created in the Black Sea GOOS. Special software should be designed to provide easy and comfortable user access to this type of data.

The Black Sea GOOS data system must facilitate the exchange and distribution of data and ensure the long-term existence of the collected data set. For this purpose the participating data centers and institutions must be organized for the long-term collection and safeguarding of data. The near-real-time data and metadata dissemination to the scientific community will be achieved through a series of dedicated file transfer protocol (FTP) sites and powerful World Wide Web (WWW) servers. Rapid electronic publishing of bulletins, new metadata, and scientific results as well as an information flow for the public and mass media should be carried out through the same WWW servers.

All the BS-DIMS data sets, operational and historical, will be collected and managed. Most data systems implemented in BS-DIMS will have operational data flows. The management of model data will be one of the fundamental elements of BS-DIMS because all the aspects of climate and global change of the Black Sea state will come through models that assimilate data and produce fields interpolated in space and time, in either nowcast or predictive modes.



**Figure 5.3.** Marine observations network (main components) of the Ukrainian Hydrometeorological Service

## **Strategic plan of the Marine Service Module development on 2002– 2006.**

### ***General terms.***

The near-future mission in MSM is to identify the addresses and personal contacts for at least 50 potential customers and user agencies for operational oceanographic information and forecasts in each country in the Black Sea region. Identification of customers and describing their requirements for operational information and data products is definitely possible but not easy. There are different classes of customers for each level of processing of the data, starting with raw observational data, and working through stages of data quality control, assembly, gridding, assimilation, modelling, and high level products generation. Each industrial, commercial or governmental sector also requires different parameters and variables, processed in different combinations, predicting different impacts.

### ***Short-term objectives for 2002-2004***

A special Working Group on operational marine services needs to be established first. It comprises scientists, technical experts and end-users. They should to identify the needs for marine data and forecasts.

The successful operational marine service is not possible without appropriate infrastructure for the Black Sea GOOS. This infrastructure includes all kind of required regular observations, information technology for telecommunications and data management as well as the technologies for data processing and creation of real products with their distribution to the end-users. The Working Group on operational marine services should investigate what improvement of the operational observing network could be realized in near future on follows:

- Regular observations along several routes in open sea (on ferryboats) including the sea temperature, salinity and atmospheric elements.
- Marine observations in coastal marine observing stations.
- Observations by regular “time-series” stations.
- Small vessels observations in the coastal zone.
- Satellite remote sensing data (SST and surface currents).

A special Task Team should realise a pilot study of the operational oceanographic information system (Intranet) for the Black Sea region providing:

- Real-time telecommunications between operational observing stations and processing centres and agencies.
- Access of most important end-users to up-to-date operational oceanographic services.

The Working Group on operational marine services should provide all necessary actions for the research and creation of the most appropriate operational models for the forecasts and predictions concerning Weather, Waves, Warnings, Sea ice, Temperature, Salinity, Sea level, Oil drift, etc. The Working Group should maintain close corporation and coordination with other teams on up-to-date forecasts and prediction models for the sea-atmosphere circulation and ecological models.

The Working Group on operational marine services should prepare and organize demonstration activities with end-users in every country.

The Working Group on operational marine services should create possibilities for establishment of close cooperation with EuroGOOS.

The Working Group on operational marine services should investigate the possibilities to involve external investments for the creation of Black Sea GOOS infrastructure collaborating with the programmes developed by EU, IOC, WMO, GEF, NATO-ESAD, etc.

***Medium term objectives for 2004– 2006***

The Working Group on operational marine services should develop a routine system of customer identification. A regular schedule of dialogues with customers and user groups should be developed.

The Working Group on operational marine services should create the infrastructure for the Black Sea GOOS including the most appropriate forecasts and prediction models as well as data management with up-to-date distribute technologies. A full realization of the operational oceanographic information system (Intranet) for the Black Sea region providing:

- Real-time telecommunications between operational observing stations and processing centres and agencies;
- Access of most important end-users to up-to-date operational oceanographic services should be realised.

The Working Group on operational marine services should broaden the customer base by strengthening links to climate variability forecasting.

The Working Group on operational marine services should prepare and organize on continuous demonstration activities with end-users in every country.

Similar to the Short Term objectives, there will be a collective investment and external funding by projects with international organizations and agencies.