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IODE NATIONAL REPORT ON OCEANOGRAPHIC DATA MANAGEMENT AND EXCHANGE FOR RUSSIAN FEDERATION
1. **Name of Data Centre:** Oceanographic Data Centre of Research Institute of Hydrometeorological Information – World Data Centre (RIHMI-WDC), Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), Russian Federation

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4. **Data Centre URL:** [http://www.meteo.ru/nodc](http://www.meteo.ru/nodc), [http://www.oceaninfo.ru](http://www.oceaninfo.ru)

5. **Date of IODE Data Centre Designation:** 1964

6. **Description of national data flow:**

   Currently no less than 20 information systems of 9 Ministries and Services of the Russian Federation are available in the field of marine environment and marine-related activities. Marine data are also collected and used by private companies mainly involved in the offshore oil and gas development and hydrocarbon transportation. The existing systems have the required infrastructure such as observation networks, organizations (centres), computer facilities, communication channels, information technologies and perform data collection, processing and dissemination fairly independently.

   In 2003 operational tests of the Unified System on the State of the World Ocean (ESIMO) began. The system is seen as a “system of systems” and primarily designed to integrate the resources of the existing Russian information systems. ESIMO has been developed since 1999 under the Federal Targeted Programme “The World Ocean”. RIHMI-WDC (Russian NODC) is a coordinator of the ESIMO development.

   In ESIMO marine data and product flows are integrated with the help of the ESIMO Centres – designated organizations of Russian Ministries and Services that provide information and technological interfacing for the systems, complexes and other tools of all the organizations participating in the research, development and exploitation of the World Ocean through (Fig.1)
   - monitoring of information resources (status, location and use) produced by the systems of different Ministries and Services;
   - coordinated preparation of data sets and operational data flows and incorporation of them into the ESIMO system of distributed information resources as well as provision of an access to them according to the agreed technology, procedures and regulation.
The organizational infrastructure of ESIMO is formed by coordination, thematic and regional centres. Currently 11 ESIMO Centres are in test operation (see also 7.2):

The core of ESIMO is a Web-oriented integration technology. It manages the system of distributed information resources on the state of the World Ocean (ESIMO Distributed Information Resource System (DIRS)) (Fig.2) and integrates remote data sources – local data systems of ESIMO Centres and other organizations that support the ESIMO activity.

### Metadata management:

- **At the discovery level (e.g. do you contribute to IOC/IODE MEDI, GCMD, EDMED, another system, none?)**

In ESIMO DIRS search, navigation and access to remote local data sources are provided on the basis of service metadata, containing descriptions of information resources, common codes, a unified dictionary of parameters and other. The SysData and SysAdm services of the ESIMO integration technology are responsible for the registration of data providers – ESIMO Centres and other organizations, development and update of descriptions of resources provided by providers, check of the current status of the resources and acquisition of information on the ESIMO DIRS content. Service metadata are held in centralized metadata bases at the ESIMO Web-portal (http://data.oceaninfo.ru/resource/index.jsp). The ESIMO Web-portal and integration technology services are maintained by the ECIMO Coordination Centre - RIHMI-WDC/Russian NODC.
The SysNavigator, SysView and GisAnalyst services handle user requests and provide information from remote local data sources to end users. On 20 December 2004 ESIMO DIRS held about 600 units of information resources – observation data; climate, diagnostic and prognostic products on various marine disciplines such as hydrometeorology, oceanography, sea ice, bioresources, marine geology-geophysics and other; legal, scientific-technical and socio-economic information on marine activities (Table 1). About 500 users apply to ESIMO DIRS daily.

Table 1. Information resources in ESIMO DIRS by marine disciplines and activities

<table>
<thead>
<tr>
<th>Resource</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Marine disciplines</strong></td>
<td></td>
</tr>
<tr>
<td>Hydrometeorology and oceanography</td>
<td>333</td>
</tr>
<tr>
<td>Sea ice</td>
<td>58</td>
</tr>
<tr>
<td>Pollution</td>
<td>4</td>
</tr>
<tr>
<td>Hydrobiology</td>
<td>5</td>
</tr>
<tr>
<td>Marine geology and geophysics</td>
<td>18</td>
</tr>
<tr>
<td>Cartography</td>
<td>4</td>
</tr>
<tr>
<td><strong>2. Marine activities</strong></td>
<td></td>
</tr>
<tr>
<td>Protection of public</td>
<td>6</td>
</tr>
<tr>
<td>Marine transportation</td>
<td>5</td>
</tr>
<tr>
<td>Exploitation of bioresources</td>
<td>2</td>
</tr>
<tr>
<td>Extraction of minerals</td>
<td>1</td>
</tr>
</tbody>
</table>

Format of ESIMO DIRS resources description has several segments: data content, access specifications etc. The data content description structure is similar to that of IOC/IODE MEDI, GCMD, EDMED metadata. Software applications have been developed to reformat description of ESIMO.
resources to EDMED and Common Data Index (EC SeaSearch project) structures. More than 90 descriptions of ESIMO DIRS resources are presented in the EDMED metadata base as result of Russian NODC activity under EU SeaSearch project.

- **At the Cruise level (e.g. do you contribute to IOC/IODE Cruise Summary Reports (ROSCOPs), other in-house system, none)**

  In Russia in the recent 10-15 years ROSCOP forms actually are not used for ocean data monitoring due to several reasons. For monitoring of the current data flows ESIMO Centres and other organizations use thematic data catalogues. In particular in ocean and coastal hydrometeorology DM practices the remote applications are used ensuring preparation and delivery of information on the performed observations to the RIHMI-WDC/Russian NODC centralized metadata base.

- **For monitoring/operational systems (e.g. EDIOS, regional GOOS systems, etc)**

  The ESIMO integration technology enables integrated management of historical, delay-mode and operational marine observation data as well as climatic diagnostic and prognostic information. Currently more than 30% of ESIMO DIRS information resources belong to the operational data and products (Table 2). According to the decision of the GOOS National Group ESIMO will be used as a key information-technological tool to enable the participation of Russia in such global systems as GOOS, GCOS, GTOS and their regional components.

### Table 2. Content of ESIMO DIRS

<table>
<thead>
<tr>
<th>Organization</th>
<th>Analyses</th>
<th>Forecasts</th>
<th>Climate</th>
<th>Observations</th>
<th>Documents</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESIMO centres (11)</td>
<td>88</td>
<td>59</td>
<td>71</td>
<td>97</td>
<td>78</td>
<td>394</td>
</tr>
<tr>
<td>Other Russian organization – providers of resources (9)</td>
<td>10</td>
<td>40</td>
<td>2</td>
<td>37</td>
<td>6</td>
<td>95</td>
</tr>
<tr>
<td>Foreign organization (7)</td>
<td>25</td>
<td>5</td>
<td>4</td>
<td>87</td>
<td>0</td>
<td>121</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>96</td>
<td>76</td>
<td>220</td>
<td>83</td>
<td>599</td>
</tr>
</tbody>
</table>

В 2003 году проведены испытания ЕСИМО для комплексного информационного обеспечения учений военно-морского флота в Тихом океане. С 2003 года осуществляется опытное использование ESIMO end-user applications аппарата Полномочного представителя Президента Российской Федерации в Северо-Западном федеральном округе. В 2004 году разработана набор приложений ЕСИМО для региональных пользователей (Баренцево, Балтийское, Белое, Каспийское и Черное моря; Арктика и Антарктика) и пользователей федерального уровня - федеральных органов государственной власти для комплексного информационного обеспечения морской деятельности, которые планируется ввести в действие в 2005 году.

In 2003 ESIMO was tested for integrated information support of the Navy training exercises in the Pacific. Since 2003 ESIMO end-user applications have been experimentally used to provide services for the Office of the Plenipotentiary Representative of the RF President in the Northwestern Federal District. In 2004 a set of ESIMO end-user application prototypes to provide integrated information support to marine-related activities was developed for regional (Barents, Baltic, White, Caspian and Black Seas, Arctic and Antarctic) and federal users – federal authorities. They are expected to be in operation in 2005.

**Data tracking:**

- **What systems are in place to track data from collecting organizations through data dissemination?**

В условиях использования ЕСИМО мониторинг потоков данных приобретает особую важность и имеет два основных аспекта: мониторинг тематических данных и мониторинг полноты информационных ресурсов DIRS.
For ESIMO operations the monitoring of data flows becomes of special importance. It has two main aspects: tracking of thematic data and tracking of status of ESIMO DIRS information resources.

Tracking of thematic data is performed by ESIMO Centres according to their responsibility (see Section 7.2). In particular RIHMI-WDC/Russian NODC as a thematic centre responsible for data on oceanography, hydrometeorology and pollution tracks these data from collecting organizations through data dissemination on the basis of the integrated metadata base containing information on observations performed, arriving the data to Russian NODC and data presenting in combined multidisciplinary data sets used to disseminate and acquire products.

To track ESIMO DIRS information resources software applications are used making it possible to check the status of remote local data sources and content of DIRS information resources in order to assess state and completeness of resources and take the appropriate actions.

7. What is the structure of marine data management in your country:

1. How many organizations are involved?
   As was mentioned above in the Russian Federation there are no less than 20 information systems related to marine environment and marine activities covering no less than 120 organizations.

2. Who does what?

   Information systems of Russian Ministries and Services are focused for the most part on the management, use and dissemination of data of some specific discipline – hydrometeorology, ecology, bioresources and other or applied tasks – marine hydrometeor services, ocean studies, navigation assessment and exploitation of ocean resources and other.

   To coordinate and integrate data and product management 11 ESIMO Centres – organizations of marine-related Ministries and Services of Russia have been designated for test operation:

   **(i) Federal Service for Hydrometeorology and Environment Monitoring**
   - Arctic and Antarctic Research Institute (Saint-Petersburg): data and products on sea ice, regional activities in the Arctic and Antarctic regions;
   - State Oceanographic Institute (Moscow): climate information and summarizing of hydrometeorological, hydrophysical, chemical and pollution conditions in the seas of Russian and the World Ocean;
   - Hydrometeorological Centre of Russia: marine hydrometeorological analyses and forecasts;
   - Far East Research Hydrometeorological Institute (Vladivostok): regional activities in the Far East region;
   - Research Centre “Planet” (Moscow): satellite data and products;
   - All Russian Research Institute of Hydrometeorological Information - World Data Centre (Obninsk, Kaluga region): ESIMO centre-coordinator, ESIMO thematic centre - oceanographic, marine hydrometeorological, current meter and pollution data and products;

   **(ii) Ministry of Defense**
   - State Research Institute for Navigation and Hydrography and Navy Center of Ministry of Defense (Saint-Petersburg): oceanographical, hydrometeorological and navigation information, electronic marine maps for ESIMO GIS applications

   **(iii) Ministry of Agriculture**
   - All - Russian Research Institute for Fishery and Oceanography (Moscow): data and products on hydrobiology and bioresources;
   - All - Russian Research Institute for Fishery Economics: data and products on storage and exploitation of bioresources;

   **(iv) Ministry of Natural Resources**
   - Russian Holding of Information/WDC-B for geology-geophysical of Ministry of Natural Resources (Moscow): data and products on marine geology-geophysical, storage and development of hydrocarbons and other non-living resources;

   **(v) Russian Academy of Science**
   - Institute of Global Climate (Moscow) – ecological data and products.

3. What data goes where?
As mentioned above in Russia data and products related to marine environment and activities are managed by organizations of marine Ministries and Services. ESIMO Centres are responsible for tracking and integration of data and products from different disciplines, including coordination of data management in some specific information system and location in ESIMO DIRS of thematic products produced by organizations involved in operation of information systems of Ministries and Services.

RIHMI-WDC/Russian NODC in particular as a thematic centre on oceanography, hydrometeorology and pollution collaborates with more than 30 organizations of various Ministries and Services that provide to the centre relevant data and products. Other ESIMO Centres – on sea ice, bioresources, satellite data, marine geology-geophysics and other collaborate with relevant organizations: the range of collaboration varies from 2-3 to 10-15 organizations.

4. Are there data for which there is no home?

ESIMO system and responsibilities of ESIMO Centres cover virtually all the disciplines and parameters on marine environment. However additional efforts are required to further involve data and products on marine-related activities (marine transportation, protection of public and other) to allow for the full-scale integrated information support provided to research, development and exploitation of the World Ocean.

5. What gets passed on to other organisations?

According to the Russian legislation information resources produced at the cost of Federal Budget and budgets of the Russian Federation’s constituents are provided free of charge, only the costs of information and communication services are recovered.

But in practice there are some problems concerning an access to data and products. In ESIMO the developments are under way to enable dissemination of information in compliance with the Russian legislation.

With regard to the international data exchange, following the IOC data exchange policy supported by the Russian Federation foreign organizations have an access to all the data and related metadata and products produced under IOC programmes including WDC-B data.

6. What regional links and data centres are there?

In the field of hydrometeorological and oceanographic data RIHMI-WDC/Russian NODC has close cooperation with regional organizations of various Ministries and Services: Federal Service for Hydrometeorology and Environment Monitoring (9 regional marine hydrometeorological services, 2 regional institutes), Ministry of Agriculture (3 regional institutes for fishery and oceanography), RAS (3 regional institutes).

Information support provided to regional marine-related activities is an important element of data management. With this in view the ESIMO integration technology services have been developed to classify DIRS information resources by regions (Fig. 3). It allows “virtual” regional segments of ESIMO DIRS data sources to be built and end-user applications to be specified with the respect to the needs of regional users. At present ESIMO DIRS “virtual” segments have been developed for the Northwestern seas of Russia, Black and Caspian Seas and the Arctic region.
In the overall ESIMO architecture regional centres are expected to be established and currently the establishing of regional centres for the Arctic (AARI, Saint-Petersburg) and Far East (FERHI, Vladivostok) regions are under way. But several problems have to be faced as far as cooperation of regional marine organizations of different Ministries and Services is concerned. Therefore at the moment the regional “virtualization” of ESIMO DIRS seems to be most efficient and easy in terms of implementation.

1. **What are the strengths and problems of the present arrangements nationally, regionally and internationally?:**

   **The strengths.** The developed infrastructure in the field of marine data management covers global, regional and national aspects.

   **The problems.** In recent years both information technologies and user requirements changed radically, especially in the context of GOOS and its subject-oriented and regional components as well as new initiatives such as GMA and GEOSS. In this connection the key problems in marine data management at national, regional and international levels are as follows:

   (i) problems of cooperation between organizations operating under numerous national, regional and international programmes on the study of the World Ocean;

   (ii) problems of integration and distributed and coordinated management and use of heterogeneous and poly-discipline marine data and product flows and bases on marine environment and activities, as well as various software and hardware tools of information processing and delivery.

2. **What improvements could be made nationally, regionally and internationally?:**

   The improvement of data management and dissemination at the national level depends primarily on the development of the ESIMO technology services and its use for integration of existing information systems and integrated information support of marine-related activities in the Russian Federation.

   Для эффективного управления морскими данными на международном уровне необходимо предпринять действия по существенному расширению спектра данных и продукции, разработке и использованию современных международных стандартов и технологий распределенного управления, обработки и распространения информации пользователям to provide “end to end” marine data management process, интегрирующий data management activity on national, regional and global
levels. Это имеет особую важность для IODE data centres network так как основные решения и руководства по практической деятельности IODE data centre network были сформулированы давно – последняя редакция Руководства по обмену данными была выпущена в 1992 году, последние технические спецификации по обмену данными (GF-3) – в 1987 году.

At the international level to improve the marine data management it is necessary to significantly expand the range of data and products, to develop and use advanced international standards and technologies of distributed information management, processing and dissemination and to provide “end to end” marine data management process integrating data management activities at national, regional and global levels. It is of special importance for the network of IODE data centres, since the guidelines and guides on activities of the IODE data centre network were formulated long ago – the latest edition of the Guide on International Data Exchange was published in 1992 and the latest technical specifications on data exchange (GF-3) – in 1987.

3. What future national activities are planned?:
  Future national activities are aimed to:
  – adopt the regulatory basis for the ESIMO operation at the federal level, officially designate ESIMO Centres and implement ESIMO for practical information service of marine-related activities in Russia. The RF Government’s Marine Collegium in December 2004 made several important decisions aimed at transition of ESIMO from development and test operation to regular operation in 2005-2007.
  – develop technologies to integrate distributed data sources and other resources on marine environment and activities as well as ESIMO applications for various categories of users.

4. What national, regional or international projects is your NODC involved in (both IODE and non-IODE). Examples: Argo, GTSPP, EDMED, EDIOS, Sea-Search, GODAR,...

Russian Federation is involved in the following projects:

International:
  – GOOS (via projects)
  – Argo
  – GTSPP
  – ETDMP Projects
  – GOSUD
  – CLIVAR
  – GLOSS

Regional:
  – NearGOOS
  – BlackSeaGOOS (ARENA project)
  – BOOS
  – SeaSearch
  – EDIOS
  – EDMED (via SeaSearch)
  – PICES

National: