Intergovernmental Oceanographic Commission
Training Course Reports
30

Original

IOC Training Course on Oceanographic Data Management for Black Sea Countries

Obninsk, Russian Federation
1-12 August 1994

UNESCO

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1. INTRODUCTION AND OBJECTIVES

The Training Course on oceanographic data management for the Black Sea countries was held at the NODC of Russia (RIHMI-WDC) in Obninsk, Kaluga Region, 1-12 August 1994. The Training Course was organized according to the decision of the Fourteenth Session of the IOC Committee on I ODE (Paris, 1-9 December 1992) adopted by the Seventeenth Session of the IOC Assembly in March 1993. The decision was taken in response to the kind offer of the Delegate of the Russian Federation to host the Training Course. The Programme of the Course is presented in Annex 1.

The objective of the Training Course was to develop facilities of the Black Sea countries for oceanographic data acquisition, management and processing, using modem methods, technologies and software, and make participants acquainted with the IODE methods, tools and mechanics (GF3, OceanPC and other means).

This Training Course was the second organized in the Russian Federation under the auspices of the National Oceanographic Data Centre. The first Training Course in 1990 was dedicated to the GF-3 Formatting System. The programme of the present Training Course was much wider and covered practically all aspects of data management - from the methods of data collection to the methods of producing climatic characteristics and other products.

2. PARTICIPANTS

Fourteen trainees from 5 countries of the Black Sea region - Bulgaria, Georgia, Romania, Russia and Ukraine, participated in the Training Course.

The specialists from the NODC of Russia delivered lectures and provided practical training. The Deputy-Director of RIHMI-WDC, the Vice-Chairman of the IOC Committee on IODE, Dr. V.I. Smirnov, gave a talk on different aspects of data exchange in IODE.

The IOC Senior Assistant Secretary, Dr. I. Oliounine, who contributed to organizing the course, planning and formulating the course programme, delivered lectures on the IODE and GOOS systems, as well as on the Black Sea investigations and the state of oceanographic data holdings in the region and status of their international exchange.

The List of Participants and Lecturers is given in Annex II.

3. TRAINING COURSE

3.1 OPENING

The Training Course on oceanographic data management for the countries from the Black Sea region was opened on 1 August 1994 by the Deputy-Director of RIHMI-WDC, Dr. Smirnov. In his opening address, the Deputy-Director welcomed the participants and emphasized the importance of a wider use of modem methods and technology of oceanographic data management, that would considerably influence the level and efficiency of the marine environment investigation.

Mr. N.N. Mikhailov (Director, NODC, Russia) welcomed the participants on behalf of the staff of the National Oceanographic Data Centre (NODC) and expressed his hope that the knowledge gained by the participants in the venue of the course would be effectively used to facilitate international data exchange in the Black Sea region.

Speaking on behalf of the IOC Secretary, Dr. I. Oliounine welcomed the participants of the course and expressed appreciation to the Government of the Russian Federation and the RIHMI-WDC Administration for hosting the Course and providing the necessary facilities. Dr. Oliounine stressed the importance of advertising widely IODE methods and pointed out that more attention in training course programmes should be given to practical training and products development. He expressed a strong belief that the Training Course would be an important step in this direction.

In response to the wish of the participants of the Course, lectures were delivered and the practical training was provided in Russian. Simultaneous interpretation of all lectures from Russian into English was provided for one of the Course participants.

3.2 OUTLINE OF THE COURSE

The participants had an opportunity to get acquainted with the Course programme a few months before the official opening through the IOC Circular Letter N° 1412 of 5 May 1994. On arrival in Obninsk, all participants received a set of documents including a final version of the Course programme, brief descriptions of lectures and instructions for practical training. These materials were very useful for the participants, helping them during the course to be ready for lectures and practical training.

The Course programme covered all aspects of oceanographic data management - data acquisition and preprocessing, data manipulation and processing, as well as the problems of the accumulated databases to produce climatic characteristics of the processes and fields, and oceanographic data use in expert systems.

Practical training was provided almost after each lecture and usually it was oriented on software demonstration and acquisition of skills in using software by working on PCs. For this purpose, 3 personal computers with all the necessary software were provided at the disposal of the participants by the NODC of Russia. One PC had a tape drive and a CD-ROM drive.

During the Training Course the participants received copies of publications and software in the form of hard copies and files on PC diskettes. The list of materials and software, received by the participants, is given in Annex IV and includes 17 titles.

3.2.1 International Oceanographic Data Exchange System and GOOS: IOC Participation in the Black Sea Research. Technology Used at RIHMI-WDC for Oceanographic Data Management

Two lectures were given on general problems related to the IODE system, its status and objectives, and major principles of data management and exchange. Information relating to the GOOS status and plans for development was presented.

Methods and techniques of oceanographic data acquisition, accumulation, processing and storage, used at RIHMI-WDC, were discussed at 4 lectures. Finally a lecture was given containing information on the IOC programmes related to the Black Sea research which aroused a considerable interest among the participants of the Course.

3.2.2 Oceanographic Data Formatting

The problems of oceanographic data formatting were considered in close detail. Formatting systems and formats, which are widely used for the international data exchange, were analyzed. In particular, the descriptions and examples of the use of the following means of oceanographic and hydrometeorological data formatting were given - GF3, GTSPP, JGOFS, HDDL (Russia), BUFR, ICES, Punch Card, ICES-Blue Print.

Materials, prepared by the experts from the IOC GETADE, were widely used during the lectures on oceanographic data formatting.

Major principles, technical specifications and peculiarities of the use of GF-3 formatting system and GF-3 Proc software were discussed during 2 days (5 lectures).

The participants of the Course believed that the understanding of GF-3 principles and methods of data formatting on technical media with the help of the system is very important, both for the international data exchange and the practical realization of data management schemes at a data centre.

The new developments in data formatting methods were considered, using the formats, as an example, which are under development by the IOC GETADE.

3.2.3 Quality Control of Oceanographic Data

The participants got acquainted with the methods of oceanographic data quality control, given in the IOC-CEC Manual N° 26 on *"Quality Control Procedures for the Validation of Oceanographic Data"*.

3.2.4 Methods, Technology and Software for oceanographic Data and Information Management and Processing on PCS.

Lectures were given on the basic principles of oceanographic data management with the help of PCs. For more than 4 days, the participants got acquainted with the following software and systems used in oceanographic data processing.

(i) OceanPC;
(ii) CD-ROMs (NODC/WDCA, TOGA, JGOFS) and data access software;
(iii) Reference systems for cruise oceanographic data (CATOD/NODC, Russia);
(iv) Computerized integrated specialized systems (OCEANOGRAPHIA/NODC, Russia).

All lectures were accompanied by software demonstrations. During practical studies, the participants discussed the advantages and disadvantages of using the above-mentioned systems. Most of the participants favoured the unification of the systems developed by the IOC to facilitate their incorporation into the national data management schemes. The participants demonstrated software developed and used at their data centres:

(i) Software for the user's interface while working with GF3 Proc on PCS (Bulgaria, Institute of Oceanology);
(ii) System for the development of cruise data banks (Ukraine, Marine Hydrophysical Institute);
(iii) Software package for the Black Sea hydrological-hydrochemical data management and processing (Russia, Institute of Oceanology, South Branch, Academy of Sciences).

Methods used at the Russian NODC for calculation of climatic characteristics of the variability of hydrophysical parameters and fields, aroused considerable interest among the participants of the course.

To illustrate possible use of databases and results of data processing, the participants of the Course were provided with a lecture on the Decision Support System for considering hydrometeorological conditions of the sea, which was developed at NODC of Russia.

3.2.5 Data Archeology, Data Exchange and Management for the Black Sea Region

Lectures on the problems of data archeology, exchange and management for the Black Sea region included information about:

(i) Methods and techniques used for collecting information on R/V cruises for the development of data catalogues for the Black Sea;

(ii) Development of possible schemes of regional data plans and exchange;

(ii) Content of oceanographic datasets for the Black Sea, available at RIHMI-WDC.

The lecturers presented extensive information on the content, state and characteristics of oceanographic datasets for the Black Sea, which have been created at the NODC of Russia. Since information about the Black Sea data has been prepared in the form of an electronic reference manual on PC, the participants of the Course had a direct opportunity to find answers to various questions.

3.2.6 Practical Training

During the Course 2 types of practical training were organized:

(i) Use of the original software immediately after the lecture or demonstration;
(ii) Execution of special tasks on PCs to master the use of different software.

Practical studies of the first type took place during the whole Course. This helped participants to assimilate theoretical materials and improve their practical skills in using the software, listed in Item 3.2.4.

Special tasks involved the execution of different operations on data management. The tasks were formulated by instructors and included, for example:

(i) Development of the format for hydrological-hydrochemical data exchange, using GF-3 and GETADE formatting systems;

(ii) Implementation of all steps of data management using the OceanPC system - data input, format transformations, R/V cruise data input in ROSCOP form, data control and browsing.

3.3 STUDY VISIT

The participants of the Course visited the Hydrometeorological Data Centre of RIHMI-WDC, the main national archival centre for marine environmental data. The participants were informed about methods and technology of long-term data archiving and conditions of data storage.

3.4 CLOSING

The Training Course was closed on 11 August 1994. At the closing ceremony, Mr. Mikhailov, Director of the Russian NODC, congratulated the participants for completing successfully the Course and thanked the lecturers, instructors and IOC for their co-operation and support. He expressed hope that the participants would utilize knowledge and experience obtained during the Course to increase the efficiency of oceanographic data management at home. He pointed out that another important result of the Course was the formulation and adoption of practical recommendations (Item 4.2) targeted for the extension of co-operation between NODCs and DNAs in the region for the management of the Black Sea data. The implementation of these recommendations will undoubtedly play a significant role in providing support to the Black Sea research and monitoring and to decision-making.

The participants thanked the local organizers and IOC for the opportunity provided and expressed their satisfaction with the Course.

4. COURSE EVALUATION AND RECOMMENDATIONS

4.1 RECOMMENDATIONS ON THE COURSE PROGRAMME

The participants noted the high level of lectures and training carried out during the Course. Practical knowledge and skills acquired by the participants during the Course, as well as the methodological materials and software will help to contribute to the international data exchange and will facilitate the development of oceanographic data acquisition, accumulation and processing systems in the Black Sea region at the national level.

The participants considered that it would be useful in the future:

(i) To invite data management experts from other regions to deliver lectures;
(ii) To include in future programmes of the Training Courses, scientific presentations on hydrometeorological and hydrochemical regimes of the Black Sea, and lectures on the commercial systems of database management and on geographical information systems (GIS).

The participants believed that it would be most desirable to make use of the software for oceanographic data management and processing, developed at Marine Hydrophysical Institute (National Academy of Sciences of the Ukraine), Southern Branch of the Institute of Oceanology (Russian Academy of Sciences) and NODC of Russia, for the implementation of the OceanPC project and other similar projects.

The participants of the Training Course expressed their thanks to IOC and RIHMI-WDC for the organization and financial support to the Training Course. The participants believed that it would be very important to continue the practice of having the IOC Training Course for the Black Sea countries on a regular basis, if possible every two years.

4.2 RECOMMENDATIONS ON THE CO-ORDINATION IN OCEANOGRAPHIC DATA ACQUISITION, ACCUMULATION AND PROCESSING FOR THE BLACK SEA

The participants were of a general opinion that closer co-operation between NODCs/DNAs in the Black Sea region and between other countries in the field of Black Sea oceanographic data management should be established.

The following priorities were set up for the coming years:

(i) Development of the computerized manual on oceanographic databases for the Black Sea region (BS_DATA);

(ii) Development of the integrated catalogue of the cruise oceanographic data for the Black Sea region (BS_CRS);

(iii) Development of the format for cruise oceanographic data exchange and software (BS_EXCH) to support the development of the catalogue referred to under (ii).

To reach these objectives, the participants formulated proposals for co-operation of NODCs/DNAs of the Black Sea countries in oceanographic data management (Annex III).

The participants requested the Secretary IOC to provide assistance for meeting the above-mentioned objectives.

The participants further requested the IOC Secretary to inform Member States of the region and other countries involved in the Black Sea research, as well as the organizations concerned, about the views on future regional co-operation in oceanographic data management expressed by the Course participants in order to seek support of the Member States and organizations in the implementation of the proposals.

5. CONCLUSION

More than 30 lectures were given on a wide scope of issues relevant to oceanographic data collection, management, distribution and preparation of products. Lectures were followed by round table discussions and practical training.

The Training Course gave an opportunity to bring data managers from the Black Sea region together to make them acquainted and to establish close bonds of co-operation which will help to establish stable data flow links between national oceanographic data centres and between them and the WDC system.

ANNEX I

PROGRAMME OF THE TRAINING COURSE

1. GENERAL INFORMATION

The objective of the Course is to develop the capability of Member States co-operating in the implementation of the project *"Investigation of the Black Sea"* to manage observational data for their present and future use in research studies, and to extend the international oceanographic data exchange, using IOC's GF3 formatting system, OceanPC and other modem data processing facilities. The Course is oriented to develop skills in applying the available methods, formats and software in the field of accumulation, exchange and processing of oceanographic data. The Course is conducted within the framework of the IOC COMSBlack project and the IODE programme.

2. DATES

1-11 August 1994.

3. PLACE

All-Russian Research Institute of Hydrometeorological Information
World Data Centre B (RIHMI-WDC-B)
National Oceanographic Data Center of Russia
6, Korolev Str.
Obninsk 249020
Kaluga region
RUSSIA

4. PROGRAMME OF THE COURSE

The programme of the Training Course is designed for 9 working days, starting at 09.00 on 1 August and finishing at 17.00 on 11 August 1994.

01.08 Monday Opening of the Training Course

Lecture 1
IODE System - Tasks, Status and General Principles of Data Exchange and Management.
Speaker
V. Smirnov, Deputy-Director of RIHMI-WDC, Vice-Chairman of the Committee on IODE.

Lecture 2
IODE and GOOS
Speaker
I. Oliounine, Head, Ocean Services Unit of IOC

Lecture 3
National Oceanographic Data Centre of Russia - Tasks, Functions, Databases, Data Management and Processing Technology.
Speaker
N. Mikhailov, NODC of Russia.

Lecture 4
Oceanographic Data Formatting Systems and Formats for Data Collection, Accumulation and Dissemination, including International Exchange (GF3, GTSPP, JGOFS, HDDL, BUFR, ICES Punch Card, ICES-Blue print).
Speaker
N. Mikhailov, NODC of Russia.

Lecture 5
Methods and Technologies for Collection and Preliminary Processing of Observational Oceanographic Data.
Speaker
I. Shakirzyanov, NODC of Russia.

02.08 Tuesday

Lecture 6
IOC Project for Investigation of the Black Sea.
Speaker
I. Oliounine, Head, Ocean Services Unit of IOC.

Lecture 7
Collection, Updating and Usage of Real-time IGOSS Data (BATHY and TESAC).
Speaker
I. Shakirzyanov, NODC of Russia.

Lecture 8
Data Key-entry, Quality Control and Preliminary Processing of the Cruise Oceanographic Data (CIRS “Oceanography”). Software Demonstration.
Speaker
A. Kuznetsov, NODC of Russia.

Lecture 9
GF3 Formatting System.
Speaker
N. Mikhailov, Director NODC of Russia.

Lecture 10
GF3 Definition Record, Composition and Format of GF3 Data Records, Magnetic Tape Structure, GF3 Records and Files.
Speaker
N. Mikhailov, NODC of Russia.

Lecture 11
GF3 Codes and Rules of their Usage.
Speaker
N. Mikhailov, NODC of Russia.

03.08 Wednesday

Lecture 12
Concept of Standard GF3 Subsets and Examples of Using GF3 for Different Types of Oceanographic Observations.
Speaker
N. Mikhailov, NODC of Russia.

Lecture 13
GF3-Proc Programme Package: Concepts, Possibilities and Technical Specifications. Software Demonstration and Practical Studies of the Application of GF3-Proc in the User Programmes.

Speaker
N. Mikhailov, T. Galchenkova, NODC of Russia.

04.08 Thursday

Lecture 14
Development of Oceanographic Data Exchange Methods. GETADE Format and Software.
Speaker
N. Mikhailov, T. Galchenkova, NODC of Russia.

Lecture 15
Quality Control Procedures for Validation of Oceanographic Data (Manual N° 26, IODE-CEC).
Speaker
V. Vorontsov, NODC of Russia.

Lecture 16
OceanPC - Basic Concepts and System Architecture.
Speaker
N. Mikhailov. NODC of Russia.

Lecture 17
OceanPC - Overview of Components (Data Key-entry, Import/Export). OceanPC Software Demonstration.
Speaker
N. Mikhailov, NODC of Russia.

05.08 Friday

Lecture 18
OceanPC - Overview of Components (Quality Control, Data Display). OceanPC Software Demonstration.
Speaker
N. Mikhailov, NODC of Russia.

Lecture 19
OceanPC - Description of Related Software (the "SHOEBOX-IOC 1991"), MICRO WORLD DATA BANK-II, SURFER, ATLAST). Software Demonstration.
Speaker
N. Puzova, NODC of Russia.

06.08 Saturday Day off - Social events.

07.08 Sunday Day off - Social events.

08.08 Monday

Lecture 20
Oceanographic Data on CD-ROMs and Related Software (NODC/WDC-A Temperature/Salinity Profiles, TOGA, Current Data Inventory, JGOFS). Software Demonstration.
Speaker
N. Mikhailov and N. Puzova, NODC of Russia.

Lecture 21
General Concept of Computing Information-Reference System on PCS (CIRS "Oceanography", Russian NODC) for Key-entry, Management, Processing and Display of Oceanographic Data.
Speaker
A. Vorontsov, NODC of Russia.

09.08 Tuesday

Lecture 22
Coastal, Current, Ship Meteo Data Key-entry. Data Management and Database Maintenance under CIRS "Oceanography". Software Demonstration.
Speaker
A. Vorontsov, NODC of Russia.

Lecture 23
Processing and Display of Oceanographic Data (CIRS "Oceanography "). Software Demonstration.
Speaker
A. Vorontsov, NODC of Russia.

Lecture 24
Reference System for Cruise Oceanographic Data on PC (CATOD). Software Demonstration.
Speaker
I. Lychagina, NODC of Russia.

10.08 Wednesday

Lecture 25
Reference Services for Data and Information in the GODAR Project on the National Level and their Development. Software Demonstration.
Speaker
E. Vyazilov, NODC of Russia.

Lecture 26
Some Aspects of Data Archeology, Data Exchange and Management as Applied for the Black Sea Historical Data.
Practical Studies on the Preparation and Usage of the Integrated Reference Dataset for the Black Sea (based on Metadata and Real-Data provided by the Course participants).
Speaker
E. Vyazilov, NODC of Russia.

11.08 Thursday

Lecture 27
Methods and Software for obtaining Climatic Characteristics of Hydrometeorological Processes and Fields Variability. Software Demonstration.
Speakers
Y. Sychev, NODC of Russia; N. Borenko, NODC of Russia.

Lecture 28
Expert Systems and Decision Support Systems (DSS) for Study of Marine Hydrometeorological Conditions. Software Demonstration.
Speaker
E. Vyazilov, NODC of Russia.

Course Evaluation, General Conclusions.
Closing of the Training Course.

To make the programme of the Course as much as possible applicable to the problems of the Black Sea data processing, the Course participants are requested to submit to the NODC of Russia (RIHMI-WDC) before 1 July 1994, the following information (as detailed as possible):

(i) Characteristics of the ComsBlack national marine data collection and data flow (type of observations, amount of data, characteristics of data exchange, specific character of data use);

(ii) National R/V cruise descriptions for the preparation of the integrated reference dataset;

(iii) Status of historical data (observation types, amount of data, data format carriers, amount of data stored in manuscripts. availability and peculiar features of technologies of data transfer onto machine-readable media);

(iv) Basic problems in data management and processing.

LECTURE 1 IODE SYSTEM - TASKS, STATUS AND GENERAL PRINCIPLES OF DATA EXCHANGE AND MANAGEMENT

Speaker *V. Smirnov, RIHMI-WDC, Deputy-Director, Vice- Chairman of the Committee on IODE*

Purpose of the System and its Structure

The IODE system has been established to enhance marine research, exploration and development by facilitating the exchange of oceanographic data and information between participating Member States. IODE is a programme of the Intergovernmental Oceanographic Commission (IOC) of UNESCO.

The IODE system is based on functioning of the World Data Centres for Oceanography (WDCs, Oceanography), Responsible National Oceanographic Data Centres (RNODCs) and National Oceanographic Data Centres (NODCs).

Data which are Exchanged Internationally

The data obtained within the national programmes and those acquired during international cruises and programmes are exchanged internationally.

Types of Oceanographic Data Exchange

Within the IODE system operational and non-operational data are exchanged on routine and non-routine basis. Exchange of data in IODE takes place according to the principles of the IOC/ICSU Manual on IODE, N° 9, 1991.

Procedures for the International Exchange of Oceanographic Data

An essential mechanism of the IODE system is the mechanism of announcing planned research cruises and data provided for the international exchange in a standard form as “National Oceanographic Programmes” (NOPs) and of submitting the Cruise Summary Report to the WDCs (former Roscop format). The data exchange is based on the use of storage media and formats of various types, but preference is given to the computer-compatible media, GF3 Format and its modifications.

General Principles of the IODE System Operations

The fundamental principle of the system is that Member States, international co-operative programmes, and individual scientists contribute data voluntarily to the RNODCs and WDCs for Oceanography for the benefit of all.

Users of the IODE system can approach a WDC for Oceanography, RNODC or NODC for data, data products, or data inventory information. As a guiding principle, users are encouraged to approach the IODE system through the NODC in their country. WDCs for Oceanography will generally provide data to NODCs and RNODCs as items of exchange, free of charge. Charges may be requested to cover costs of providing the service, e.g., cost of copying the data. RNODCs are required to submit data, data products or inventory information to users as specified in the terms of reference under which centres are operating. NODCs are required to provide services to users in their own Member State according to national procedures and participate in international data exchange. NODCs may, if they wish, provide services to others, either free of charge or according to national cost recovery procedures.

LECTURE 2 IODE AND GOOS

Speaker *I. Oliounine, Head, Ocean Services Unit, IOC*

The description is given of a new IOC programme on the establishment of the Global Ocean Observing System (GOOS).

The Global Ocean Observing System will provide for regular observations of major physical, chemical and biological properties of the World Ocean, including the coastal zone and enclosed and semi-enclosed seas. It will

include the collection, analysis and distribution of data and information to contribute to the understanding of ocean processes and the management of ocean and coastal resources.

GOOS will be developed on a solid scientific basis and will be built as far as possible on existing national and international activities, such as IGOSS and IODE.

It is shown in what way IODE can respond to the needs of GOOS in data management by meeting 4 specific goals. They include the supply of data, data management, provision of products and data quality issues.

It is emphasized that efforts should be focussed on strengthening the IODE national and regional infrastructures. A major commitment needs to be made by all countries of the region to effectively respond to the GOOS needs in data collection and management, distribution and products development.

LECTURE 3 NATIONAL OCEANOGRAPHIC DATA CENTRE OF RUSSIA - TASKS, FUNCTIONS, DATABASES. DATA MANAGEMENT AND PROCESSING TECHNOLOGY

Speaker *N. Mikhailov, NODC of Russia*

The Oceanographic Data Centre of RIHMI-WDC, established in 1964, is a national centre of the All-Russian (earlier all-Union) system of marine environment data acquisition, processing, archiving and dissemination. Observation data obtained from research vessels, aircraft, buoys, coastal stations and other platforms of the Federal Service for Hydrometeorology, the Academy of Sciences of Russia, Committee of Fisheries, the Ministry of Defence and other agencies, engaged in the study of the World Ocean and utilization of its resources, are sent to RIHMI-WDC as well as materials of R/V cruises of foreign countries, Members of the IODE system.

Main fields of activity:

(i) Development of software and hardware; data accumulation, creation and management of the national archive of oceanographic and hydrometeorological data for the seas bordering Russia and all areas of the World Ocean;

(ii) Provision of national users with oceanographic data and information products;

(iii) Development of methods and software for ocean data management to implement programmes and projects of the World Ocean studies;

(iv) Execution of functions of the head national institution established for creating the system of ocean data accumulation, storage, processing and distribution.

The NODC of Russia provides accumulation, collection, processing and distribution of the following types of oceanographic observations:

(i) Deep sea hydrological-hydrochemical observations;
(ii) Bathythermographic observations;
(iii) Current observations;
(iv) Coastal hydrometeorological observations;
(v) Chemical pollution observations.

International activities of the Russian NODC include:

(i) Execution of a number of functions of WDC-B;
(ii) Participation in the IOC and IOC-WMO programmes and projects - IGOSS, GTSPP, GODAR, OceanPC.

LECTURE 4 OCEANOGRAPHIC DATA FORMATTING SYSTEMS AND FORMATS FOR DATA COLLECTION, ACCUMULATION AND DISSEMINATION, INCLUDING INTERNATIONAL EXCHANGE (GF-3, GTSPP, JGOFS, HDDL, BUFR, ICES PUNCH CARD, ICES-BLUE PRINT)

Speaker *N. Mikhailov, NODC of Russia*

Widely used formatting systems and oceanographic data formats are considered:

(i) Oceanographic punch card format (ICES);
(ii) Blueprint ’86 format (ICES);
(iii) Hydrometeorological Data Description Language (HDDL) formatting system (RIHMI-WDC-B, Russia);
(iv) GF3 (General Format 3) formatting system (IODE, BODC);
(v) Provisional JGOFS Data Interchange Format (BODC);
(vi) Exchange Format of GTSPP (IOC-WMO Global Temperature-Salinity Pilot Project) (MEDS, Canada);
(vii) BUFR (Binary Universal Format for data Representation) - formatting system (WMO);
(viii) Oceanographic Station Data (SD2) (NODC of USA).

LECTURE 5 METHODS AND TECHNOLOGIES FOR COLLECTION AND PRELIMINARY PROCESSING OF OBSERVATIONAL OCEANOGRAPHIC DATA

Speaker *I. Shakirzyanov, NODC of Russia*

Hydrometeorological and oceanographical data collection system, based on a network of observational sites, performs hydrometeorological, deep water hydrological, hydrochemical, pollution, current and meteo observations. The existing system of data acquisition has a 3-level structure:

(i) observational sites;
(ii) local data collection centres (agencies - ship owners);
(iii) main centre (RIHMI - WDC).

The following procedures of data processing are carried out by the components of the system: preparation of data for entering into storage media, initial checking and information processing, preparation of the report materials in the form of tables, magnetic tapes, diskettes and in the form of operational telegrammed. The main task is to make data available to users. At local centres the report materials are checked for completeness and quality; these centres are also responsible for regional databases updating and forwarding data to RIHMI-WDC. In RIHMI-WDC, the data are registered and cataloged; those received in printed form are entered onto magnetic tape after preprocessing, information check and structural reformatting of data. Data on magnetic tapes are then archived in State holdings.

The lecturer described methods for solving problems at each of these structural levels, presented functional purposes of each level, organizational structure, hard and software needed. The amount of the received information, as well as the formats of its presentation and types of information storage media are considered as information support. The lecture also includes some issues related to the acquisition system development.

LECTURE 6 IOC PROJECT FOR INVESTIGATION OF THE BLACK SEA

Speaker *I. Oliounine, Head, Ocean Services Unit, IOC*

The Black Sea is an unique natural phenomena which is in danger of being lost for mankind due to the heavy impact of human activities and climate change.

The lecture gives analysis of the major environmental issues and recommends possible ways in which Member States bordering the Black Sea can contribute to the safety of the sea through providing the necessary assistance and co-operation in the field of ocean data management.

A detailed description is given of the IOC Black Sea Regional Programme in marine sciences and services with an associated IOC regional co-ordinating mechanism. Through this initiative IOC will become more involved with the Black Sea and will also gain an identity in the region. It is emphasized that data management should form a key component of the Black Sea programme plans and this topic must be addressed at the start of the

planning. The roles of the IODE system and existing NODCs in the region are identified and recommendations on their participation in the programme are presented.

LECTURE 7 COLLECTION, UPDATING AND USAGE OF REAL-TIME IGOSS DATA (BATHY AND TESAC)

Speaker *I. Shakirzyanov, NODC of Russia*

IGOSS data from national sources are operationally collected via the global telecommunication system (GTS) on the basis of software developed at RIHMI-WDC. Computerized subsystem of IGOSS data processing (BATHY and TESAC reports) operates as a part of computerized meteorological system of complex operational data use (CMS CODU). Subsystem IGOSS performs the following main functions:

(i) data reception via telecommunication channels;
(ii) data preprocessing and entering into the database;
(iii) data compilation on intermediate magnetic tape;
(iv) data archiving;
(v) obtaining printed forms of statistical reports and making charts of data distribution over the World Ocean areas.

Preprocessing of data comprises synthetic control of texts, received telegrammed, data decoding, their quality check and compilation of information in the database - CMS CODU. Some issues relating to organizational and software support are considered in the lecture. Tables and cartographic material, produced by the subsystem, are demonstrated. Examples are given of how operational oceanographic information is used at RIHMI-WDC and by national users.

LECTURE 8 DATA KEY-ENTRY, QUALITY CONTROL AND PRELIMINARY PROCESSING OF THE CRUISE OCEANOGRAPHIC DATA (CIRS “OCEANOGRAPHY”)

Speaker *A. Kuznetsov, NODC of Russia*

Despite the progress in the field of automatization of hydrometeorological observations, considerable amount of data is entered into technical media via manual key-entry. A few programming systems are known, where manual key-entry of hydrometeorological data into PC (CLICOM, OceanPC and others) is realized.

Programming system is considered, the main purpose of which is to enter deep-sea oceanographic data and to develop a corresponding database on PC. A relative independence of the programme from the type of input and output data permits its use for processing of different types of observations. The following functions are realized in the programming system:

(i) Data entry into screen forms (panels) of an arbitrary type;
(ii) Synthetic control of input symbols;
(iii) Logical control of numeric data for limiting values, and alphabetic data - for possible values;
(iv) Linear conversion of numeric data and tabular conversion of alphabetic data;
(v) Formation of an output file of data in a given format.

Creation of Data Key-entry Form

Before starting data entry, it is necessary to create a key-entry panel, the form of which would be similar to a table from which data are transferred. For this purpose any textual editor can be used in which ASCII codes, adopted by IBM standards, are observed (in particular, for the end of line, carriage return). Panel is created in a suitable for a user form, without any restrictions on its size. Panel consists of data entry fields and comments on them.

Entry fields are specified by a rarely used symbol. To organize synthetic control, the system of field types is used: entry fields are defined by specific symbols, according to the type of entered data. Panel can be placed in a frame or designed differently, using ASCII symbols. After a data entry panel is ready, it is recorded on a disk as a separate file, which can be further processed.

Data Entry

Once entry panel has been formed and tuning parameters have been specified, the data entry programme starts with the panel loading from the file to PC buffer and its display (or part of it) in the window of a PC screen, designed for the location of the panel. If the size of a panel is larger than a window size, horizontal and vertical scrolling of the panel is provided.

A cursor can be used only within this or that entry field. A cursor moves left and right within entry field after the corresponding cursor control key is pressed. Escape from one entry field to another can be made in horizontal and vertical directions, as well as to the beginning and end of a row or to the beginning and end of the panel. If an entry field, to which a cursor should move, is out of the window, automatic scanning (scrolling) of the entry panel is made, so that the whole field and one symbol from the edge would be within the window.

Control of Entered Data

Synthetic control of symbols is carried out according to the type of an entry field. If symbols do not correspond to the type of an entry field, they are not displayed. When a cursor moves to the next field, the contents of an entry field, left by a cursor, undergo logical control. According to the type of entered data numeric data, run through the check for limits, and symbolic data are controlled by the list of possible values. In case of erroneous values, an error message is displayed on the monitor screen. To realize control functions, the parts, involving limiting values for numeric fields and lists of values for alphabetic fields, should be added to a panel file.

Formation of Data Output Record

The easiest case may be when, an output record is a simple copy of the contents of entry panel fields. In this case, the format of an output record is defined by the format and arrangement of data in an entry panel. However, in a general case, to organize data transfer from an entry panel to a data file, it is necessary to describe output record format. For this purpose, the language of data description is used, which has been developed at RIHMI-WDC. According to the rules of the language, the description of a data file structure is formed, which is supplemented by the description of its relations with entry panel fields and the values of linear transformation coefficients if such are necessary. For example, it may happen in the case when measurement units of some parameters do not correspond to the units, in which they should be represented in an output file. A special programme is used to process an output data description file and perform the transfer of data from entry fields into an output file.

Data Entry Management

The process of data entry consists of two main steps. The first step involves the development of a data entry system (creation of an entry panel, preparation of control limits, creation of an output data description file, etc.). The second includes data entry and formation of an output file. The first step requires a qualified specialist and the second one can be performed by technical personnel.

In a general case, the system allows to realize processing of several panels, designed for the entry of data of different types simultaneously. For example, after oceanographic station observations have been made, it is possible to enter meteorological, hydrological, hydrochemical and other types of data, recording them in one data file. First a specialist, using a programme menu system implements a task of data processing in a dialogue regime, where he determines the types of processed information, specifies conditions of data control, conversion and recording. After that, the choice and change of panels is made automatically as a simple turning of pages. There is a log-to-monitor data entry process, where the performance of individual process steps is automatically registered. The regime of browsing and editing of data, entered into a database earlier, is also provided by the system.

LECTURE 9 GF3 FORMATTING SYSTEM

Speaker *N. Mikhailov, NODC of Russia*

GF3 is a multi-purpose formatting system designed for data exchange within the international oceanographic community. It is based on oceanographic and meteorological data formatting methods used in the GARP (Global Atmospheric Research Programme) Tropical Experiment (GATE). The current version of GF3 (version 3.2)

gives a possibility of formatting digital data and textual information on magnetic tape or another carrier for exchange and dissemination of oceanographic data, The GF3 system can equally be used for recording meteorological and other types of environmental data. The principal characteristics of the GF3 system include: self documenting; a wide range of possibilities for computer processing of GF3 formatted magnetic tapes (in general); the possibility of formatting a broad spectrum of dataset structures; and magnetic tape usage for data exchange. Such key GF3 characteristics as definition and parameter codes provide the flexibility of the format for describing different structures of data. Computer processing of GF3 formatted data is provided by a special programme package - the GF3 Proc.

LECTURE 10 GF3 DEFINITION RECORD, COMPOSITION AND FORMAT OF GF3 DATA RECORDS, MAGNETIC TAPE STRUCTURE, GF3 RECORDS AND FILES

Speaker *N. Mikhailov, NODC of Russia*

A GF3 formatted magnetic tape is an unlabeled one with data recorded mainly in ASCII or EBCDIC. The tape file consists of physical records each of a length of 1,920 bytes (as a rule with one logical record per one physical record). For digital or textual data the letters from A to Z, the decimal digits from O to 9, the blank and the special symbols + - * / < > . , ; : () [] are used. The commonly used recording density is 1,600 bpi, 9 tracks. A GF3 allows to use the following 4 types of files - Test File, Tape Header File, 1 or more Data Files, Tape Terminator File. There are 7 different types of records each with its own distinctive use and format. The record type is indicated by a record identifier in its first 2 bytes: 0 - plain language record, 1 - tape header record, 3 - series header definition record, 4 - data cycle definition record, 5 - file header record, 6 - series header record, 7- data cycle record and 8- end of tape record. The formats of records 5 and 6 are identical.

A GF3 definition record used to define the content and format of data stored on a magnetic tape is the key to the GF3 system. The definition record is used to define the content and format of a user defined area of a series header record or the data cycle record. Combination of the series header/data cycle definition records allows reflecting the structures of highly hierarchical datasets as well as formatting data on a magnetic tape.

Each GF3 record type is characterized by a specific composition and format. At the same time, there are a few rules in the GF3 system for formatting the record type independently. The most important of them are:

(i) Representing the majority of the GF3 records as continuous groups of 80-character line images (a total of 24 line images per record);

(ii) Allocation of a sequential number of the fields of a record type identifier and of a line image;

(iii) Using homogeneous data types and rules for storing them in record fields;

(iv) The mandatory usage of major characteristics of observations.

Each type of a GF3 record has a fixed format area composition. Format depends on the type of a record and may include various information on the data source, technical specifications of data, obtained data files and the space-time characteristics of observations.

LECTURE 11 GF3 CODES AND RULES OF THEIR USAGE

Speaker *N. Mikhailov, NODC of Russia.*

There are 7 code tables used in GF3 which allow to implement the necessary level of computer data reading and writing. They are as follows: IOC country code; a GF3 common character set; platform type code; specific platform code; a modified I, H.B. ocean/sea area code; validation flags and a parameter code. The parameter code is the most important one for it contains information necessary for recognizing an observation type and units, peculiarities of obtaining data, etc. There is a special structure of a parameter code used in GF3 which, on one hand, allows replenishing the code table and, on the other, gives a user the possibility of creating a parameter code (for a given tape or tape series) if it is not included in a list of standard GF3 codes. At present, there are 10 extensive tables of standard GF3 parameter codes for physical oceanography, waves, meteorology, geophysics and ocean chemistry.

LECTURE 12 CONCEPT OF STANDARD GF3 SUBSETS AND EXAMPLES OF USING GF3 FOR DIFFERENT TYPES OF OCEANOGRAPHIC OBSERVATIONS

Speaker *N. Mikhailov, NODC of Russia*

Collection, accumulation and archiving of oceanographic observational data, as well as national and international data exchange, are carried out on discipline basis: STD or CTD data, drifting buoy data, etc. To facilitate the management of discipline-oriented observation data, there are standard GF3 subsets which are actually pre-determined GF3 formats used in the management of standard data. A standard subset is constructed by pre-seleding the GF3 options most suitable for the description of data composition and hierarchy and forming the definition records specifying tape contents and format. Another advantage of standard subsets is that the user obtains the format fully complying with the GF3 requirements which, after some simple operations of including or deleting certain parameters, could be used for recording data whose composition and structure are only slightly different from a standard subset.

LECTURE 13 GF3-PROC PROGRAMME PACKAGE: CONCEPTS, POSSIBILITIES AND TECHNICAL SPECIFICATIONS

Speaker *N. Mikhailov, NODC of Russia*

Software Demonstration and Practical Studies on the Application of GF3-Proc in the User Programmes.

Speakers *N. Mikhailov, T. Galchenkova, NODC of Russia*

The main characteristics of the GF3-Proc Programme Package are considered. The GF3-Proc is the FORTRAN Programme Package, providing simple and complete interface for read/write of data in GF3. The most essential aspect of the Package is its capability to read and automatically analyze definition records and use the results of such analysis for automatic read/write of data within the “user defined areas” of GF3 records and control these processes. GF3-Proc can be used on different computer systems. If it is necessary to transfer GF3 processed data from one computer to another the usage of the package is especially important. The Package consists of 11,000 lines of FORTRAN code, 50% of which is made up of on-line comments. Original texts of programmes are compiled by FORTRAN-77 compilers.

GF3-Proc is used by calling routines of the Package through the use of the FORTRAN statement “CALL” (designed for performing one of the functions of data processing in GF3). Only about 50 routines maybe called directly out of the user programme, providing the GF3-Proc User Interface. The User Interface routines may be classified into the following categories: package control routines; 1/0 unit control routines; file, record, fixed fields, cycle, parameter handling routines and special utility routines. Adaption of the package for fulfilling the function, necessary for a user routine operation is performed through the definition of package control option which includes FORTRAN logical unit number for data read/write, type of GF3-Proc current units for data read/write, etc.

Before the beginning of an operation it is necessary to define the GF3-Proc 1/0 units required for the user routine performance; input or output of data in the user programme, tape specification (ASCII or EBCDIC), specification of disk, printout unit, etc. Package control option and GF3-Proc 1/0 units may be changed during the programme performance.

The programmes for handling file, record, cycle, fixed areas and parameters, GF3-Proc error reports and utility routines are considered. GF3-Proc software enables performing read/write operations of data using “automatic processor”. The “record buffer” is used for read/write of “fixed format areas” in GF3 records. Read/write of “the user defined areas” is performed using “automatic cycle”. GF3-Proc provides control of 180 fault states and output of 9 groups of information on error reports. The package includes a small suit of utility programmes of significant help for writing or reading the GF3 formatted data. Trainees develop small FORTRAN-77 programmes on PC for reading and writing oceanographic data in a subset format.

LECTURE 14 DEVELOPMENT OF OCEANOGRAPHIC DATA EXCHANGE METHODS. GETADE FORMAT AND SOFTWARE

Speakers *N. Mikhailov, T. Galchenkova, NODC of Russia*

Information was given on different issues relevant to the development of formats for exchange of oceanographic data.

Two factors stimulated an *increased* use of data formats: need for new data formats of scientific programmes such as WOCE, TOGA, JGOFS and a wide use of PCs by data collectors. The latter reason put an increasing pressure on data centres and international data exchange mechanisms to be able to adopt quickly the data in the PC formats. In response to these needs and new requirements, a wide range of formatting systems and special software was recommended, such as FREEFORM, HDDL and of electronic networks, such as Internet for distributed database capabilities.

In order to increase the efficiency of a data centre in data management, it was recommended to data collectors to be closely acquainted with the data format guidelines developed by GETADE. These guidelines provide basic rules on how information should be supplied to data centres. It is stressed that submission of metadata and its handling is becoming vital.

In the lecture, a detailed description is given of the formatting scheme developed by GETADE. This scheme has the following characteristics:

(i) The format is built on the strongest features of GF3 (coding scheme and definition records). Formatting scheme is simpler than in GF3;

(ii) Using GF3 parameters and plain language records;

(iii) Using the tabular structure for a data record. The hierarchical nature of oceanographic data collections has been preserved by using the same features as in GF3;

(iv) The data and information are encoded using ASCII characters.

The following formatting rules should be applied when the GETADE formatting scheme is being implemented:

(i) Each variable to be reported in a data record must be described in a corresponding definition record. Every definition record will be found at the start of the data file;

(ii) Variables are presented in a data record in the same order as they appear in definition records. The formatting of data in a record is given by the characteristics of each variable;

(iii) There is no limit for a number of definition records;

(iv) There is an attribute in a definition record to indicate what sort of a delimiter is placed in an output record;

(v) Data records may be of any desired length.

There are some FORTRAN subroutines to define the structure of data and to build the “format” statement for reading data in GETADE formats. List of subroutines includes:

(i) LOAD_LIST - This routine loads all known parameters from definition records;

(ii) CHECKLIST - This routine checks if a parameter is known, and whether non-standard units, etc., are used ;

(iii) GET_DATA - This subroutine takes the information from definition records and extracts the data from data records;

(iv) CHK_DFLT - This subroutine reports if the value is a default;

(v) GET_NULL - This subroutine translates the information regarding null characters to null values.

One of the conclusions made is that if too many rules are set on data providers/users in data formatting, it might discourage them from submitting/getting any data into the national, regional or international data flow. Two ways are proposed to meet this concern: become intimately involved in the data collection and processing programme right from the beginning; make it as easy as possible for data collectors/users to provide/use data over formatting system and software.

LECTURE 15 QUALITY CONTROL PROCEDURES FOR VALIDATION OF OCEANOGRAPHIC DATA (MANUAL N° 26, IODE-CEC)

Speaker *A. Vorontsov, NODC of Russia*

The content of the IOC-CEC Manuals and Guides N° 26 on Quality Control Procedures is presented and discussed.

It is noted that using the means of computer information systems, users are able to perform quality control of hydrometeorological data included in databases. These means are realized in the form of a separate control block. The main procedures of this block are the procedures of data check for local limits of hydrometeorological parameter variability. In addition, deep-sea data are run through the checks of sea water salinity and temperature inversion. Control procedures for currents and coastal data are supplemented by a statistical control (" three sigma" and "give sigma"). Data control block management is carried out via menu with many windows. The process is completely automated and a user does not need to make any alternative decisions. Trainees become acquainted with the user's guide and informed of the procedures of its usage.

LECTURE 16 OCEANPC - BASIC CONCEPTS AND SYSTEM ARCHITECTURE

Speaker *N. Mikhailov, NODC of Russia*

In an introductory talk on OceanPC, information is given of the content and function of the project which is being implemented by IOC in order to organize a system of free or inexpensive software for processing of oceanographic data (principally oceanographic profile data) on IBM-compatible microcomputers. By using OceanPC, you can:

(i) Key-enter various types of oceanographic observations from your own files;

(ii) Merge your own data with historical data from other data sources to create a local or regional oceanographic atlas;

(iii) Analyze, display, print and plot merged data;

(iv) Exchange data with oceanographers and national data centers around the world.

OceanPC has been designed for low cost operations on XT and AT microcomputers with a MS-DOS operating system (Versions 3.x and higher). All but one of the utilities have been written to run on a CGA monitor (or a monochrome monitor running in CGA-emulation mode). Only the GENERAL OCEAN MAPPING utility is written to require an EGA monitor (or better). A desirable optional hardware item is a CD-ROM reader for having access to large datasets.

The system assumes that a user has MS-DOS, but the following software additions are desirable:

(i) QUICKBASIC Version 4.5 -To enable the user to modify existing utilities or create new ones compatible with the OceanPC code. The QBASIC interpreter that is included with DOS 5.1, is also useful;

(ii) SURFER - A commercial gridding and contouring programme; can accent oceanographic data and coastline geographic data files from OceanPC utilities (Golden Software, Inc. 1990);

(iii) ATLAST - The public domain oceanographic data analysis package (Rhines 1991) available from the Jet Propulsion Laboratory in California. This allows a user to produce publication-quality graphics from the GENERAL OCEAN MAPPING utility.

Content of OceanPC and organization of data include:

(i) Cruise oceanographic profile data (temperature, salinity, oxygen content and hydrochemical parameters) in the ICES Punch Card format and information about cruises in the ROSCOP form;

(ii) Observation data and information are presented in independent files and are processed separately.

OceanPC functions include:

(i) Key entry of digital ROSCOPs and oceanographic data;

(ii) Import of data from NODC USA and ICES formats and export in SURFER and ATLAST formats as well as comma-separated format;

(iii) Quality control, editing and cruise sorting of data;

(iv) Generalization of data (cruise by cruise, year by year, station by station);

(v) Data sample on space-time criteria, display of data as X-Y plots;

(vi) Plotting oceanographic stations maps.

LECTURE 17 OCEANPC - AN OVERVIEW OF COMPONENTS (DATA KEY-ENTRY, IMPORT/EXPORT)

OceanPC Software Demonstration.

Speaker *N. Mikhailov, NODC of Russia*

Manual data entry (ENTICE. EXE, ROSIN. EXE) is presented which provides an input of oceanographic profiles data through screen forms in intermediate format and cruise description in ROSCOP form. This includes the following operations:

(i) Entry of oceanographic profiles data (ENTICE.EXE); provision of user screen forms and rather comfortable data input facility; carry out checks for limits of observation depths, enable to estimate doubtful values of parameters; produce data transformation in the CI system;

(ii) Entry of digital ROSCOP's (ROSIN.EXE); provision of user screen forms and rather comfortable input facilities; provision of a comfortable type of means "brows" for entry of some ROSCOP characteristics;

(iii) Import/export of data (DATCONV.EXE, OURINF.EXE, NODC-ICE.EXE, ICE-NODC.EXE, CD-ICE.EXE, BLU-ICE.EXE, ICE-CSV.EXE, ICE-CSV.EXE, CSV-SVR.EXE, CSV-ATL.EXE).

It is stressed that this is the most developed system component, providing input/output conversion of the data. Software provides a possibility:

(i) Convert the NODC USA (CD-ROM, SD1/SD2) and ICES Blueprint '86 formats to ICES Punch Card format (as internal system format) for creating its own (for example, regional) data files;

(ii) Reformat data from internal format into formats' series (NODC USA, Blueprint'86, SURFER, ATLAST, CSV) for subsequent applications, including international exchange.

The lecture was followed by an OceanPC demonstration and training.

LECTURE 18 OCEANPC - OVERVIEW OF COMPONENTS (QUALITY CONTROL, DATA DISPLAY)

OceanPC Software Demonstration.

Speaker *N. Mikhailov, NODC of Russia*

Software (ICESQC.EXE, ICE-EDT.EXE) and protocols for performing quality checks (QC) of a data file (ship speed, decreasing depth of observations, comparison of sounding and the lowest observation depth, instability of a density profile and create file (*.err) as error list and to fulfil editing of false values using file (*.err) or generalization results of data file (*.out)) are demonstrated.

The lecturer presents the utilities (ICESORT.EXE, INDEX.EXE, ICE-EXT.EXE, LIMITS.EXE, STAPLOT.EXE, FISUM.EXE, STASUM.EXE) to perform useful procedures for processing and display of data-sample, data sorting in internal system format, generalization of a dati file, display of data as X-Y plot and making oceanographic stations maps.

The lecture was followed by an OceanPC demonstration and training.

LECTURE 19 OCEANPC - DESCRIPTION OF RELATED SOFTWARE (THE “SHOEBOX-IOC 1991”), MICRO WORLD DATA BANK-II, SURFER, ATLAST). SOFTWARE DEMONSTRATION

Speaker *N. Puzova, NODC of Russia*

A catalogue of standard software packages for oceanographic data management - “SHOEBOX-IOC 1991“ is demonstrated. As an initial step, IOC compiled and distributed an inventory of available PC programmes which included information on tools, time and productivity packages, format conversion and exchange routines, etc., with particular focus on analytical capabilities, quality control and data visualization for marine science. This inventory was built upon the “Inventory of software and Products for the Display and Analysis of Marine Data” of the Working Group on Marine Data Management of ICES. “Shoebox 91“ includes software and data products which can be operated in personal computer environments, such as IBM PC. However, it is not restricted to IBM type computers. This edition includes descriptions of both software and products (software/data packages). Commercially available software application of which is important for the ocean community is listed in a separate section of the catalogue. OceanPC inventory provides guidance on how to acquire this software.

LECTURE 20 OCEANOGRAPHIC DATA ON CD-ROMS and RELATED SOFTWARE (NODC/WDC-A TEMPERATURE/SALINITY PROFILES, TOGA, CURRENT DATA INVENTORY, JGOFS)

Software Demonstration.

Speaker *N. Mikhailov and N. Puzova, NODC of Russia*

NODC USA/WDC-A CD-ROMs

NODC USA/WDC-A has released a set of 2 CD-ROMs containing global ocean temperature and salinity profiles:

(i) Volume 1 (CD-ROM NODC-02) contains 1.62 million profiles from the Atlantic, Indian and Polar Oceans;

(ii) Volume 2 (CD-ROM NODC-03) contains 1.57 million profiles from the Pacific Ocean.

The data included on CD-ROMs were selected from NODC’s 6 major temperature and salinity data files:

(i) Oceanographic station (Nansen cast) data;
(ii) Low-resolution Conductivity/salinity-temperature-depth (C/STD) data;
(iii) Mechanical bathythermograph (MBT) data;
(iv) Expendable bathythermograph (XBT) data;

(v) Selected bathythermograph (SBT) data;
(vi) IGOSS radio message bathythermograph (IBT) data.

Software demonstration was arranged of

(i) Module CDINV which displays a number of profiles for a “10 degree square” or a “ 1 degree square”;

(ii) Module ROMSEL which allows a user to scan the profiles on CD-ROMs, and plot them on a EGA monitor.

TOGA CD-ROM

Data sets on the CD-ROM include:

(i) United Kingdom Meteorological Office, Ship (Surface) Data;
(ii) Marine Environmental Data Service of Canada, Drifting Buoy Data;
(iii) University of Hawaii, Sea-Level Data;
(iv) Pacific Marine Environmental Laboratory (PMEL), Moored Current Meter Data;
(v) PMEL, Moored Temperature Data;
(vi) PMEL, Island Data;
(vii) Institute Française de Recherche pour l’Exploitation de la Mer, Ship (Subsurface) Data;
(viii) European Center for Medium-Range Weather Forecasts (ECMWF), Surface Meteorological Fields;
(ix) Climate Analysis Center, Sea Surface Temperature Field;
(x) Florida State University, Surface Pseudo-Stress Field;
(xi) Institute Française de Recherche Scientifique pour le Developpement en Cooperation, Surface Pseudo-Stress Field.

Software used with this CD-ROM provides the following services:

(i) “Select Data Set(s) and File(s)” option - to select data files;

(ii) “Load/Constrain Selected Files” software - a list of previously selected files (“Select Data Set(s) and File(s)” option) and search it based on specific temporal, geographic and parameter constraints;

(iii) “Display/Graph Data” option - to provide graphs for a selected list of files.

Moored Current Meter Data Inventory

This is an inventory of moored current meter data and retrieval software, which has been prepared by the British Oceanographic Data Centre. The disk (or disks) contains an inventory of moored current meter data, collected by ICES Member States (Belgium, Canada, Germany, Finland, France, Greece, the Netherlands, Norway, Portugal, Sweden, the UK and the USA), and a software package to run selective retrievals from the inventory.

BOFS North Atlantic Dataset

Datasets on the CD-ROM include:

(i) CTD Profile Plots;
(ii) Satellite Images;
(iii) Kasten Core X-Ray Images;
(iv) Surface Data Set;
(v) “Kit-form” Database;

Software permits to present underway data display, to make underway data selection and format conversion, to implement database merge and image display programmes.

LECTURE 21 GENERAL CONCEPTION OF COMPUTING INFORMATION - REFERENCE SYSTEM ON PC (CIRS "OCEANOGRAPHY", RUSSIAN NODC) FOR KEY-ENTRY, MANAGEMENT, PROCESSING AND DISPLAY OF OCEANOGRAPHIC DATA

Speaker *A. Vorontsov, NODC of Russia*

Computer Integrated Specialized System "Oceanography" is presented which was designed for key-entry, storage, processing of original and calculated hydrometeorological data and providing system users with data and results of data processing on magnetic media and hard copies in textual and graphical forms. The system is developed in MS DOS environment, using ASSEMBLER, FORTRAN, C algorithmic languages. The unity of the system is reached via the common internal agreements on storage, transfer and conversion of data and control parameters. Software is developed on the following principles:

(i) Compatibility of programming languages;

(ii) Programme uniformity for different types of data;

(iii) Development of sub-shells, independent of data forms, in the shell for the operation by a separate data form (common EXE-file, integrating private EXE-files);

(iv) Development of private EXE-file through integration of EXE-modules and execution of individual functions via a sequential call of performed EXE-files.

LECTURE 22 COASTAL, CURRENT, SHIP METEO DATA KEY-ENTRY. DATA MANAGEMENT AND DATABASE MAINTENANCE UNDER CIRS "OCEANOGRAPHY"

Software Demonstration

Speaker *A. Vorontsov, NODC of Russia*

Subsystems of data key-entry and database maintenance are considered. Subsystems of data key-entry have been developed in the form of independent programming blocks, for each data type separately (coastal hydrometeorological, currents, deep-sea and ship meteo data). When developing the subsystems, CLICOM utilities are used. A standard hydrometeorological table (THM-1, THM-3, THM-7, etc.) is formed to enter data into a monitor screen. Positional spaces are allocated in these tables for entering "symbolic information. Coincident with data entry, the check of parameters for limits is carried out. Limiting values of parameters can be changed, using a special function. It is convenient when using local limits for improving the quality of entered information. Finally, subsystems of data entry form, data files in a given intermediate format. After this it is possible to carry out scanning and editing (correction) of entered data or recording them into a database. Data entry subsystems are provided with help functions, which are called with function keys. A name of the keys is given in the bottom line of the screen. When working with data entry subsystems no special knowledge is required. The subsystem of database updating and management has been "developed as a special purpose service block and it is designed for the automatization of a number of database transformation processes. Main problems which can be solved by a subsystem include: database maintenance (adjustment of meta files to data files) and monitoring of database updating. Subsystem management is performed with the help of a multi-level menu with many windows, built in a general programming shell of the main system. The subsystem of data management and updating is provided with a large complex of helps, called, as a rule, with function keys. The system is oriented to a trained user or data base administrator.

LECTURE 23 PROCESSING AND DISPLAY OF OCEANOGRAPHIC DATA (CIRS "OCEANOGRAPHY")

Software Demonstration.

Speaker *A. Vorontsov, NODC of Russia*

The trainees are acquainted with the means of computer information system (CIRS Oceanography) with the help of which users are able to process, visualize and graphically represent hydrometerological data. These means are realized in the form of separate blocks:

(i) Database control block;

(ii) Block of generalizations and statistical calculations to produce regime (climatic) characteristics of natural environment;

(iii) Block of visualization of full scale and calculated data for thermohaline, hydrochernical and ice conditions, dynamics of currents, waves, tides and others.

The system permits:

(i) to study the variability of any parameter at any point of the investigated area by data scanning in textual and graphical forms, obtaining various dependencies and statistical characteristics for necessary periods (month, season, year, a number of years), compare current hydrometeorological conditions with climatic data;

(ii) to obtain calculated characteristics for given hydrometeorological parameters on screen, magnetic or paper media. Statistical estimation of probable characteristics of hydrometeorological processes is performed either in the form of time series of sampling sets of a random value by integrating observation ‘results noneducable in time-space scale, or in the form of sampling realizations of a random function, if there are educible series of observation data.

Statistical data processing is reduced, practically, to producing a number of statistical characteristics:

(i) Mean and extreme values of data for many years;
(ii) Quartile estimates and their combinations;
(iii) Variance estimates, coefficients of asymmetry and variation;
(iii) Recurrence and distribution function of parameters for given gradations. For each type of data, the system realizes its own processing scheme and a concrete set of statistics.

As a rule, data are processed in two steps:

(i) Preprocessing;
(ii) Statistical analysis.

Preprocessing permits to perform a number of specific transformations before statistical analysis started. Calculated data may be represented in different ways, according to the choice based on the menu. Results of the calculations are displayed on the screen or printer.

LECTURE 24 REFERENCE SYSTEM FOR CRUISE OCEANOGRAPHIC DATA ON PC (CATOD)

Software Demonstration.

Speaker *I. Lychagina, NODC of Russia*

Automated catalogue of oceanographic data - CATOD, developed at the All-Russian Research Institute of Hydrometeorological Information is introduced which provides the users with convenient facilities for the storage of oceanographic data descriptions, their updating, retrieval, scanning, modification, for the release of bulletins for the exchange of the stored information. With the help of CATOD, user may perform:

(i) registration of information about different subjects of activity in data bases;
(ii) systematization, storage and updating of this information on technical carriers;
(iii) retrieval and representation of information on the screen or in hard forms in various modes.

Information includes cruise plans, notification about performed observations, data, generalized in space and time, users’ requests for data. This information can be presented in the system by the documents of different types. The contributors and participants are referred in the system as producers, suppliers, users, holders of data holdings. The following different categories are presented in the system: platforms (name, type), instruments (code), methods of measurement (code), data earners (form specification, code). The process of data production, is based on a list of observation levels, number of measurements at each level, type of observation, etc. A similar model is use-d for the description of information based on a common system of standardized dictionaries.

Standardized dictionaries give an opportunity to describe such categories as a project, a country, an organization, a platform, a type of platform, a type of marine" zone, geographical zones of the World Ocean (IHB codes), types of work, fragments of environment, phenomena and parameters, instruments and methods, measurement units, types of carriers, etc. Registration of user's requests for various datasets is an important activity, related to the management of databases. The structure of a request description does not practically differ from the structure of the description of the request content. Development of a library of requests may create the basis for the production of reports on data centres functions, related to the provision of services to users.

LECTURE 25 REFERENCE SERVICES FOR DATA AND INFORMATION IN THE GODAR PROJECT ON THE NATIONAL LEVEL AND THEIR DEVELOPMENT

Software Demonstration.

Speaker *E. Vyazilov, NODC of Russia*

A brief history is given about the development of reference databases at the NODC in Russia and in other countries.

The databases on the state of the environment in the CIS countries and abroad are considered, including data on hydrometeorology (meteorology, hydrology, satellite observations); pollution of the environment (time series of the global environmental pollution data, data in the GRID system, data on the sources of pollution of the atmosphere, data on ocean pollution, data on river pollution); oceanography (deep-water observations, currents, ship hydrometeorological observations, marine geophysical data, marine biological data); international programmes and projects (GARP-GATE, FGGE, MONSOON, ALPEX, TYPHOON, IGOSS, SECTIONS, WOCE and others).

Information is provided about reference data bases (information about data; information on data sources; cartographic data bases; information on international organizations, involved in the investigation of natural environment; information about software; scientific and technical information about ocean investigations).

LECTURE 26 SOME ASPECTS OF DATA ARCHEOLOGY, DATA EXCHANGE AND MANAGEMENT AS APPLIED TO THE BLACK SEA HISTORICAL DATA

Speaker *E. Vyazilov, NODC of Russia*

The description of reference information collection methods is given. Special attention is paid to the methods of input of the reference R/V cruise data within the project "Archaeology". The "Instruction for R/V cruise database creation" is studied in detail.

Information is presented of the results of data acquisition from the Black Sea for the years 1964-1993 including the description of databases for the Black Sea area, information on the organizations-ships' owners, working in this area, information on R/V cruises, available in different institutions and organizations. Information is made available of quantitative characteristics of data, based on the names of the countries, organizations, R/V cruises and years of the data acquired. Data are organized on a year-to-year basis in the form of maps and tables.

LECTURE 27 METHODS AND SOFTWARE FOR OBTAINING CLIMATIC CHARACTERISTICS OF HYDROMETEOROLOGICAL PROCESSES AND FIELDS VARIABILITY

Speakers *Y. Sychev, NODC of Russia; N. Borenko, NODC of Russia*

The trainees are acquainted with the methods of processing observation data for climatic studies and making estimates of climatic characteristics at regular grid points with a high time and space resolution.

Methods, developed at the NODC of Russia/RIHMI-WDC, are designed, specially, for processing time-series which are relatively small samplings, supposedly contaminated by erroneous values. Estimation, using such methods, is based on a two-step procedure. During the first step, the values of normals and root mean square deviations at the one degree trapezia are calculated, using robust procedures. This approach helps to create the largest possible resistance to likely error contaminations of the sampling. During the second step, interpolation of the derived values to the regular grid points is performed with a further smoothing of the field by a numerical filter to eliminate the grid computational waves.

LECTURE 28 EXPERT SYSTEMS AND DECISION SUPPORT SYSTEMS (DSS) FOR THE STUDY OF MARINE HYDROMETEOROLOGICAL CONDITIONS

Speaker *Y. Vyazilov, NODC of Russia*

The following issues are discussed:

(i) Problems related to the usage of hydrometeorological information - (HMI)

(ii) Need for DSS development to study hydrometeorological conditions of the sea (being aware of the environmental conditions one can develop beforehand a list of possible environmental impacts on industry and population in the coastal area; being aware of impacts, it is possible to formulate recommendations to decrease or prevent those impacts).

(iii) Development of the model for knowledge presentation (using mathematical methods).

(iv) Criteria for taking decision on DSS development (the comparison between knowledge presentation, presentation of reports and recommendations).

(v) Merits of the proposed DSS shell (consideration of the same environment with varying emergency cases; user friendly interface; possible links with other systems - data banks, geo-information systems, etc., development of products to be used by common people and decision-makers; using the knowledge base for training; simple methods for making changes in the knowledge base, bases of reports and recommendations; possibility y to include mathematical models and computer charts and plans in a DSS content; adjustment of DSS subsystems according to management levels and information types; interface with bases of current and climatic data).

(vi) Steps to be taken for the development of DSS and knowledge detection:

- selection of the shell;
- detection of knowledge;
- development of knowledge bases;
- estimation of self-descriptiveness and completeness of the knowledge base.

(vii) State of the DSS development.

Demonstration of a prototype DSS was arranged on the computer.

ANNEX II

LIST OF PARTICIPANTS AND LECTURERS

I. PARTICIPANTS

BULGARIA

Valentin D. Trifonov
Research Scientist
Responsible for NODC
National Institute of Meteorology & Hydrology
66 Tsarigradskoshaussee
1784 Sofia
Tel: <359> (2) 72 22 71 Ext. 359
Fax: <359> (2) 88 03 80

Ekaterina Trifonova
Oceanographer, Institute of Oceanology
P.O. Box 152
9000 Varna
Tel: <359> (52) 77 57 10/77 71 07
Fax: <359> (52) 77 42 56
Tlx: 77237 BAN IO

Delcho Solakov
Oceanographer, Research Scientist
Institute of Oceanology
P.O. Box 152
9000 Varna
Tel: <359> (52) 77 45 49
Fax: <359> (52) 77 42 56
Tlx: 77237 BAN IO

ROMANIA

Teodor M. Cristescu
Physicist, Project Manager
Romanian Marine Research Institute
3, Bvd. Mamaia 300
RO -8700 Constanta
Tel: < 40 > (41) 65 08 70
Fax: < 40 > (41) 83 1274
Tlx: 14418

GEORGIA

Zurab Tskvitinidze
Director, Computing Centre
Main Administration of Hydrometeorology and Environmental Monitoring
150 Agmashenebeli Av.
380012 Tbilisi
Tel: < 7 > (8832) 95 01 20
Fax: < 7 > (8832) 95 50 06
Tlx: 212968 METEO SU

UKRAINE

Alexander M. Suvorov
Chief, Marine Information Systems and Technologies Dept.
Marine Hydrophysical Institute
2 Kapitanskaya St.
Sevastopol 335000
Tel: < 7 > (0690) 52 52 76
Fax: < 7 > (0692) 44 42 53
Tlx: 187115 SWSWO
E-mail: lkgal@mhi.sebastopol.ua

Aleksei V. Mishonov
Senior Researcher
Marine Hydrophysical Institute
2 Kapitanskaya St.
Sevastopol 335000
Tel: <7> (0690) 52 52 76
Fax: <7> (0692) 44 42 53
Tlx: 187115 SWSWO
E-mail: vlvlad@mhi.sebastopol.ua

Vladimir L. Vladimirov
Head, Database Laboratory
Marine Hydrophysical Institute
2 Kapitanskaya St.
Sevastopol 335000
Tel: <7> (0690) 52 52 76
Fax: <7> (0692) 44 42 53
Tlx: 187115 SWSWO
E-mail: vlvlad@mhi.sebastopol.ua

RUSSIAN FEDERATION

Konstantin E. Shulgovski
Researcher, Atlantic Research Institute of Fishery & Oceanography
5 Dm. Donskoi
236000 Kaliningrad
Tel: <7> (80112) 22 55 25
Fax: <7> (80112) 21 99 97
E-mail: root@atlant.keonig.su

Natalia N. Pikholenko
Researcher, State Research Institute for Navigation & Hydrography
St. Petersburg
Tel: <7> (812) 72778476

Valeri G. Yakubenko
Senior Researcher
Institute of Oceanology, South Branch
353470 Gelendzhik-7
Krasnodar Region
Tel: <7> (86141) 23261
Fax: <7> (86141) 31631
Tlx: 279124

Elena V. Svirilina
Chief, Dept. of National Data & Federal Projects
National Marine Geological Data Centre, WDC-B
38 Krasnogvardeiskaya St.
353470 Gelendzhik
Tel: <7> (86141) 24582
Fax: <7> (86141) 24606
Tlx: 279124 GEO

Valeri S. Shcherbakov
Director, National Marine Geological Data Centre, WDC-B
38 Krasnogvardeiskaya St.
353470 Gelendzhik
Tel: <7> (86141) 24582
Fax: <7> (86141) 24606
Tlx: 279124 GEO

Vladimir B. Britkov
Laboratory Chief
Institute of System Analysis
9, 60-letia Oktyabrya
117312 MOSCOW
Tel: <7> (095) 135 55 41
Fax: <7> (095) 938 22 09
E-mail: britkov@wlab.msk.su

II. LECTURERS

Iouri V. Oliounine
Senior Assistant Secretary
IOC (UNESCO)
1, rue Miollis
75732 Paris Cedex 15
FRANCE
Tel: <33> (1) 45 68 39 63
Fax: <33> (1) 40 56 93 16
E-mail: i.oliounine@unesco.org
Tlx: 204461 paris

Vyacheslav 1. Smirnov
Deputy-Director, Vice-Chairman IOC/IODE
All-Russia Research Institute of Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Tel: <7> (08439) 25625
Fax: <7> (095) 2552225
Tlx: 412633 INFOR SU
E-mail: wdcblm@sovamsu.sovusa.com

Nikolai N. Mikhailov
Head, NODC
All-Russia Research Institute of Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Tel: <7> (08439) 25907
Fax: <7> (095) 255 22 25
Tlx: 412633 INFOR SU
E-mail: nodc@storm.iasnet.com

Eugeni D, Vyazilov
Chief of Laboratory, NODC
All-Russia Research Institute of Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Tel: <7> (08439) 25676
Fax: <7> (095) 255 22 25
Tlx: 412633 INFOR SU
E-mail: vjaz.@storm.iasnet.com

Alexander A. Vorontsov
Chief of Laboratory, NODC
All-Russia Research Institute of Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Tel: <7> (08439) 25678
Fax: <7> (095) 255 22 25
Tlx: 412633 INFOR SU
E-mail: vorv@storm.iasnet.com

Idris Z. Shakirzyanov
Chief of Laboratory, NODC
All-Russia Research Russia Institute of Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Tel: <7> (08439) 25614
Fax: <7> (095) 255 22 25
Tlx: 412633 INFOR SU
E-mail: idr@storm.iasnet.com

Yuri F. Sychev
Chief of Group, NODC
All-Russia Research Institute of Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Tel: <7> (08439) 25125
Fax: <7> (095) 255 22 25
Tlx: 412633 INFOR SU

Alexander A. Kuznetsov
Senior Researcher, NODC
All-Russia Research Russia Institute of
Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Fax: <7> (095) 255 22 25
Tlx: 412633 INFOR SU

Natalia N. Borenko
Leading Programmer, NODC
All-Russia Research Institute of
Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Fax: <7> (095) 255 22 25
Tlx: 412633 INFOR SU

Natalia V. Puzova
Junior Researcher, NODC
All-Russia Research Russia Institute of
Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Fax: <7> (095) 255 22 25
Tlx: 412633 INFOR SU

Irina N. Lychagina
Oceanographer, NODC
All-Russia Research Institute of
Hydrometeorological Information, WDC-B
6, Korolev St.
249020 Obninsk, Kaluga Region
RUSSIAN FEDERATION
Fax: <7> (095) 255 22 25
Tlx: 412633 INFOR SU

ANNEX III

PROPOSALS FOR CO-OPERATION OF NODCs/DNAs OF THE BLACK SEA COUNTRIES IN OCEANOGRAPHIC DATA MANAGEMENT

1. OBJECTIVES

(i) Development of a computerized Manual on Oceanographic Databases for the Black Sea region (BS_DATA);

(ii) Development of an integrated Catalogue of Cruise Oceanographic Data for the Black Sea region (BS_CRS);

(iii) Development of a Format for Cruise Oceanographic Data Exchange and Software for its support (BS_EXCH).

2. IMPLEMENTATION TIME

1994-1995

3. IMPLEMENTATION OF PROPOSALS

The Proposals will be realized through the co-operation of NODCs/DNAs of the Black Sea countries and other countries, which are interested in meeting the above objectives. The Russian NODC will co-ordinate the implementation of the proposals.

4. PROPOSED ACTIONS AND IMPLEMENTATION STEPS

4.1 DEVELOPMENT OF A COMPUTERIZED MANUAL ON OCEANOGRAPHIC DATABASES FOR THE BLACK SEA REGION (BS_DATA)

BS_DATA is a Manual on computer media, containing information on oceanographic databases and other information about acquisition, accumulation and processing oceanographic data for the Black Sea region.

The computerized Manual, prepared by the NODC of Russia, is used as a pilot version of BS_DATA. (Software, database of this Manual version and instruction for developing databases description have been passed to the participants of the Training Course).

The proposed items of the BS_DATA:

(i) information on organizations carrying out observations, acquisition, accumulation and processing of oceanographic data;

(ii) information about experts from the region working on these and related issues;

(iii) information on databases;

(iv) list of RV cruises implemented in the Black Sea. Contents and structure of a RV's list should be given in accordance with a pilot version of the Manual;

(v) maps with a network of oceanographic (hydro-biological and hydro-optical, etc.) stations as PCX files with brief explanations;

(vi) information on international (multilateral and bilateral) and national programmes (projects) implemented or planned for the Black Sea region (e.g., COMSBLACK);

(vii) information on the software support for oceanographic observation data acquisition, accumulation and processing according to the "Shoebox" (OceanPC) form;

(viii) description of formats and other methodological materials used for international data exchange;

(ix bibliographic sources, containing information on technologies, processing systems and information products (atlases, manuals, guides, etc.).

The software for visualization of the above information is being developed based on the programmes of a pilot version of the Manual, developed in the NODC of Russia.

PCX files with maps of the distribution of observations are being prepared on the basis of the programme INVENT and corresponding auxiliary tiles. The programme and files have been given to the participants of the Course.

BS_DATA will be developed in two languages, English and Russian.

To prepare the first version of BS_DATA the following steps are proposed and deadlines identified:

(i) the participants analyze the content and structure of the Manual pilot version and submit their remarks and proposals to the NODC of Russia. Deadline: 1 November 1994;

(ii) the NODC of Russia compiles the proposals and sends a final description of the Manual contents and structure to NODCs/DNAs of the relevant countries. Deadline: 1 January 1995;

(iii) NODCs/DNAs submit to the NODC of Russia all required information according to contents and structure of the Manual for all marine agencies of the countries involved in the preparation of BS_DATA. Deadline: 1 June 1995;

(iv) the NODC of Russia completes the development of BS_DATA software. The NODC also prepares the datasets on the basis of received materials and the computerized Manual and makes them available to the NODCs/DNAs of the countries and IOC. Deadline: 1 September 1995.

4.2 DEVELOPMENT OF AN INTEGRATED CATALOGUE OF CRUISE OCEANOGRAPHIC DATA FOR THE BLACK SEA REGION (BS_CRS)

BS_CRS is a Computerized Catalogue of Cruise Data, Available on Various Types of Media in Marine Agencies of the Countries Concerned.

The basis of the Catalogue are laid on the instructions developed for making a brief description of RV cruises and on a catalogue with the Black sea cruise data description stored at RIHMI-WDC (the Catalogue of the NODC of Russia). This Catalogue and Instruction have been passed to the participants of the Course. Preparing BS_CRS (both in English and Russian) is considered as the beginning of the GODAR project implementation for the Black Sea region.

To prepare the first version of BS_CRS the following steps are proposed and deadlines identified:

(i) the participants analyze the Instruction for preparing brief description of RV cruises and submit their remarks to the NODC of Russia. Deadline: 1 November 1994;

(ii) the NODC of Russia prepares a final version of the instruction on brief description of RV cruises and disseminates it among NODCs/DNAs of the countries concerned. Deadline: 1 January 1995;

(iii) NODCs/DNAs perform an analysis of the Russian NODC Catalogue, prepare the description of missing cruises according to the instruction and send the modifications to the Russian NODC. All available information about RV cruises is used. Deadline: 1 June 1995;

(iv) the NODC of Russia prepares the Catalogue based on the merged dataset of RV cruise descriptions, develops the software for its supporting and distributes the Catalogue among NODCs/DNAs of the countries concerned and IOC. Deadline: 1 October 1995.

4.3 DEVELOPMENT OF A FORMAT FOR CRUISE OCEANOGRAPHIC DATA EXCHANGE FOR THE BLACK SEA COUNTRIES AND SOFTWARE FOR ITS SUPPORT (BS_EXCH)

BS_EXCH is a format for recording cruise oceanographic data, which is designed to facilitate data exchange between the countries concerned. The format is being developed in accordance with the proposals on oceanographic data formatting, made by the Group of Experts on Technical Aspects of Data Exchange (IOC/IODE). The draft format was prepared at the NODC of Russia and was given to the participants of the Course.

To prepare the first version of the BS_EXCH, the following steps are proposed and deadlines identified:

(i) The NODC of Russia formulates proposals for the software structure to support the format and distributes these proposals to the participants of the Training Course. Deadline: 1 January 1995;

(ii) The participants analyze the format together with the supporting software and submit their comments to the NODC of Russia. Deadline: 1 March 1995;

(iii) The NODC of Russia analyses comments and sends a format description to the NODCs/DNAs of the countries concerned for agreement on the first version of the format. Deadline: 1 April 1995;

(iv) The NODC of Russia develops the software to support the format and makes the materials available to the NODCs/DNAs. Deadline: 1 June 1995;

(v) NODCs/DNAs develop the software for supporting the format BS_EXCH. Deadline: December 1995.

ANNEX IV

LIST OF THEORETICAL MATERIALS AND SOFTWARE DONATED TO THE TRAINEES

Name & Source of Materials (Programmes)	Content, Volume & Carrier
Documentation of GF-3 formatting system, IODE/IOC (in Russian, in English)	Technical specifications of formatting systems in 3 volumes
Software for GF3 formatting system, (GF3 Proc for PC), IODE/IOC	FORTRAN source codes, & examples on 2 diskettes
Documentation on BUFR formatting system, WMO, in English	Technical specifications of formatting system, 1 booklet
Documentation on data formatting system in the international projects, JGOFS & GTSPP, BODC, MEDS, IODE, in English	Technical specifications of data formatting systems, 2 booklets
Documentation on data formatting system for international data exchange (GETADE format), GETADE IODE/IOC, in English	Technical specifications of data formatting, 1 booklet
Analysis of the current oceanographic data formats & formatting systems, working materials of GETADE IODE/IOC, in English	Technical specifications of formats, used for international data exchange, 1 booklet
Technical aspects of oceanographic data formats & formatting systems, working materials of GETADE IODE/IOC, in English	Results of formats comparison used for data recording, 1 booklet
Manual on oceanographic data formatting for international data exchange, working materials of GETADE IODE/IOC, in English	Rules of data recording into technical media before data exchange, 1 booklet
Documentation on oceanographic data processing system (OceanPC), IOC-WMO, in English	Technical specifications of OceanPC, 1 book
Software for OceanPC system, IOC-WMO	Basic source codes, & EXE-files, 2 diskettes
Data on the Black Sea temperature & salinity & software for data reading. Data are selected from dataset of NODC, USA/WDC-B, submitted for international data exchange on CD-ROMs. Programmes were received with CD-ROMs	Data for 2,5 thousand soundings, 4 programmes & additional files on 1 diskette
Hydro-biological data, selected from datasets, submitted for international data exchange within JGOFS project on a CD-ROM, prepared at BODC, Great Britain	Data for 4 cruises of R/V “Challenger” (Great Britain) on 1 diskette
Data on the Black Sea coastal line, selected from World Data Bank-II (USA), submitted for international data exchange on a CD-ROM. Data reading programme prepared at NODC Russia	Data on the coastal line & reading programme (original text in FORTRAN) on 1 diskette
Bathymetric data on the Black Sea, selected from TOPO set (USA), submitted for international data exchange on a CD-ROM. Data reading programme prepared at NODC Russia	Bathymetric data & reading programme (original text in FORTRAN) on 1 diskette

Name & Source of Materials (Programmes	Content. Volume & Carrier
Manual on the description of reports on RIV cruises. Prepared in NODC Russia, in Russian	Rules for the description of reports of R/V cruises, 1 booklet
Methodical materials on CATOD reference system. Materials of R/V cruise reports, in Russian	Examples of the reference database elements, 1 booklet
Catalogue of R/V cruises, carried out observations for the Black Sea & stored at RIHMI-WDC. Instructions to prepare such a catalogue, in Russian. Software for catalogue reading prepared at NODC Russia	Data on R/V cruises from Russia, Ukraine, Georgia, Roumania, Bulgaria & software for data reading in the form of EXE-files. Description of the peculiarities of catalogue compilation. Maps of oceanographic stations distribution in the form of PCX-files. All materials on 1 diskette
Catalogue of current meter observations for the Atlantic Ocean, software for catalogue reading are prepared at BODC, Great Britain, in English	Data on current observations in Great Britain, USA, France, Denmark, USSR & other countries, software for catalogue reading. All materials are recorded on 1 diskette
Documentation on FREEFORM formatting system. NODC, USA, in English	Technical specifications of data formatting system & the C programme on 1 diskette

ANNEX V

LIST OF ACRONYMS

ALPEX	Alpine Experiment
ATLAS	Autonomous Temperature Line Acquisition System
BATHY	Bathythermograph Report
BODC	British Oceanographic Data Centre
BOFS	Bio-geochemical Ocean Flux Study (UK)
BUFR	Binary Universal Form for Representation of Meteorological Data
CEC	Commission of European Communities
CGA	Colour Graphics Adaptor
CIRS	Computer Information-Reference System
CIS	Commonwealth of Independent States
CLICOM	Climate Computing
CMS	Computerized Meteorological System
CODU	Complex Operational Data Use
COMSBLACK	Co-operative Marine Science Programme for the Black Sea
CRS	Coastal Radio Station
CTD	Conductivity, Temperature, Depth Probe
DNA	Designated National Agency
DSS	Decision Support System
EC	Executive Council (IOC)
ECMWF	European Centre for Medium-Range Weather Forecasting
EGA	Enhanced Graphics Adaptor
FGGE	First GARP Global Experiment
GARP	Global Atmospheric Research Programme
GETADE	Group of Experts on Technical Aspects of Data Exchange
GF3	General Format N° 3
GIS	Geographic Information System
GODAR	Global Oceanographic Data Archeology & Rescue Project
GOOS	Global Ocean Observing System
GTS	Global Telecommunication System
GTSPP	Global Temperature-Salinity Project
HDDL	Hydrometeorological Data Description Language
HMI	Hydrometeorological Information
IBT	IGOSS Bathythermograph
ICES	International Council for the Exploration of the Sea
ICSU	International Council of Scientific Unions
IGOSS	Integrated Global Ocean Services System

IHB	International Hydrographic Bureau
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data & Information Exchange
JGOFS	Joint Global Ocean Flux Study
MBT	Mechanical Bathythermograph
MEDS	Marine Environmental Data Service (Canada)
NODC	National Oceanographic Data Centre
NOP	National Oceanographic Programme
OCEANPC	Ocean Personal Computer Project
PC	Personal Computer
PMEL	Pacific Marine Environmental Laboratory
QC	Quality Control
RIHMI	All-Russian Research Institute of Hydrometeorological Information
RNODC	Responsible National Oceanographic Data Centre
ROSCOP	Report of Observations/Samples Collected by Oceanographic Programmes
SBT	Selected Bathythermograph
STD	Salinity, Temperature, Depth Probe
TESAC	Temperature, Salinity & Currents Report from a Sea Station
UNESCO	United Nations Educational, Scientific & Cultural Organization
WDC	World Data Centre
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
XBT	Expendable Bathythermograph