Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow

Ottawa, Canada, 18-22 January 1988

Unesco

Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow

Ottawa, Canada, 18-22 January 1988

Unesco

IOC-WMO/IGOSS-IODE-DF-II/3
Paris, 29 April 1988
English only

In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
3. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of «El Niño» *(Also printed in Spanish)*
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP (SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping *(Also printed in French and Spanish)*
12. Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica *(Spanish only)*
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources *(Also printed in French and Spanish)*
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans *(Also printed in French)*
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities *(Also printed in Spanish)*
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meetings on RNODCs and Climate Data Services

TABLE OF CONTENTS

ORGANIZATION OF THE MEETING

1.1 OPENING OF THE MEETING

The Second Meeting of the Joint IOC-WMO Experts on IGOSS-IODE Data Flow was opened at 10:00 a.m. on Monday 18 January, 1988 at the Marine Environmental Data Service (MEDS) of the Department of Fisheries and Oceans in Ottawa, Canada, by Dr. R. Wilson, Director of MEDS.

Mr. G. Holland, the Director General of the Oceanographic Sciences Directorate of the Department of Fisheries and Oceans Canada welcomed the participants on behalf of the Department and the Federal Government and indicated that through hosting this Meeting Canada shares concerns for the proper management of oceanographic data. He stressed that it is important to capture every data point we can and to preserve it for future use. It is also important to ensure the quality of the observed data points. Since the IGOSS-IODE Data Flow Meeting addresses all three of these vital concerns, collection of data, assurance of data quality and assembly of the data into data bases that we can share and use to learn more about the ocean and the atmosphere, there can be no question as to the importance of this Meeting. In closing Mr. G. Holland assured the participants that their efforts will provide a long term beneficial contribution to the sciences of oceanography and meteorology.

On behalf of IOC and WMO Dr. I. Oliounine, the IOC Technical Secretary, expressed thanks to the Department of Fisheries and Oceans and to MEDS, in particular, for hosting the Meeting and for providing all necessary facilities. He wished the participants a successful meeting.

The List of Participants is given in Annex III.

1.2 ADOPTION OF THE AGENDA

The Agenda as adopted by the Meeting is given in Annex I. Dr. R. Wilson was designated the Chairman for the Meeting.

1.3 WORKING ARRANGEMENTS

The IOC Technical Secretary introduced the proposed time schedule, identified changes in the list of documents and informed the Meeting on administrative arrangements.

Through it was expected to work in plenary, the Meeting agreed to establish, if necessary, ad hoc drafting groups to deal with specific Agenda items. The Representative of MEDS informed the Meeting of the local arrangements.

2. REVIEW AND MONITORING OF IGOSS-IODE DATA FLOW

The Meeting recalled the mechanisms of data flow monitoring now in operation in the framework of IGOSS and IODE systems (doc. IOC/WMO-IGOSS/IODE-II/Doc.6).

The Meeting realized that there were some drawbacks in existing monitoring procedures and that there was a need for the NODCs to accelerate the compilation of delayed mode data collected by IGOSS platforms, to assist RNODCs in identifying duplicates, increasing the quality of their regional data sets, and finally, to use monitoring procedures as a tool for advertising IGOSS and IODE activities.

The Meeting recommended NOCs and NMCs to submit the information outlined in Annex IV to the NODCs/DNAs each month. It is expected that this information will help NODCs/DNAs to accelerate the compilation of delayed mode data from IGOSS platforms and will help to increase the quality of a final data set.

To assist NODCs, RNODCs-IGOSS and WDCs in identification and elimination of duplicate data from their files the Meeting further recommended that the IOC Secretariat request from NODCs and SOCs, a list containing the following information on ships providing data through IGOSS or IODE channels:

- name of ship
- call sign
- ship identification codes used by National Centers.

This information will be circulated to National Centres and will make it possible to identify the GTS transmitted data and delayed-mode data of the same origin.

The Meeting recommended that the IOC Secretariat arrange a meeting of the directors of RNODCs-IGOSS during the Wormley, UK, consultative meeting on RNODCs and Climate Data Services in order to seek agreement on ways to implement this pilot study. The Meeting recommended that the Chairman of the Technical Committee on IODE then request the RNODCs-IGOSS to fill in annually on a pilot study basis, two types of tables which will contain information on the amount of data from IGOSS observing platforms received through IGOSS from SOCs and through the IODE system and to report to the next session of the RNODCs-IGOSS. A draft of such table forms are given in Annex V. The tables are subdivided into platforms and months for both data received through GTS from SOCs and through IODE channels from NODCs. These tables will be produced by RNODCs-IGOSS every January for each of the 5 previous years. These tables are to be submitted to the IOC and WMO Secretariats for their use in monitoring the effectiveness of data flowing in the IGOSS-IODE system. The usage of these tables will give the desired effect only if there are no regional overlapping and if the figures given in the table prepared by the RNODCs (IGOSS) correspond to each distinct region.

The Meeting exchanged information on the experience of SOC's and NODC's in BATHY/TESAC data management (see Annex VI).

The Meeting noted a few problems in this regard including duplication, deficiencies in quality control, and delay in data transfer from SOCs to RNODCs.

The Meeting agreed that one of the reasons for duplicated messages is

the overlap in the areas of responsibilities assigned to each responsible data center. The Meeting felt that one of the approaches to overcome this problem was to request NOCs or NMCs in parallel with the insertion of data into the GTS to pass this data on magnetic tapes every six months, to the assigned RNODCs-IGOSS. The tape will be unique, the quality of data better and the number of duplicated messages within this data set would be low. After merging the data sets submitted by different NOCs the final regional data sets could be sent after one month to the WDCs, Oceanography for the development of the global data set, which is most desirable. This data set could be made available to users with the maximum delay of 8 months after data collection. A general agreement must be sought for the allocation of distinct areas of responsibility which must totally cover the entire World Ocean. However the Meeting agreed that this type of arrangement needs careful consideration and thought that it might be premature to make a recommendation along these lines before the study of all pros and cons is made.

Meanwhile the Meeting recommended that the Secretariats bring this matter to the attention of the coming session of the Joint IOC/WMO Working Committee for IGOSS for further discussion.

Noting that some SOCs and RNODCS do not strictly follow the guidelines for data submission the Meeting instructed the IOC and WMO Secretariats to urge Directors of SOCs and RNODCs to keep strictly to agreed upon procedures, as they are presented in Annex VII to this Summary Report

3. REVIEW OF IMPLEMENTATION OF RECOMMENDATIONS RELATING TO THE WORK OF THE MEETING

The Technical Secretary presented a brief summary of the accomplishments made within IGOSS and IODE for the implementation of Recommendations adopted by the First Meeting of Experts on IGOSS-IODE Data Flow (Tokyo, Japan, 12-16 November 1984). Revised terms of reference of SOCs for BATHY/TESAC data and RNODCs - IGOSS have been submitted to the IOC and WMO governing bodies for consideration and approval. After the approval, texts have been included in the relevant IOC and WMO publications and will also be published in the Guide on Specialized Oceanographic Centres and the IOC Manual on International Oceanographic Data Exchange.

Appreciating the efforts of the IOC and WMO Secretariats in this regard the Meeting was, however, in general agreement that IOC and WMO should address Heads of SOC's and RNODCs - IGOSS directly with the request to comply fully with their terms of reference. In addition the Meeting took the following actions:

- After considering the guidelines for data distribution and arrangements between SOCs and RNODCs - IGOSS, the Meeting modified slightly the existing ones and agreed upon the guidelines as presented in Annex VII.

- The Meeting expressed satisfaction with the publication of GF3

subsets for BATHY/TESAC and drifting buoy data and reiterated the importance of the usage of this format in the data exchange between SOCs and RNODCs, between RNODCs and WDCs-Oceanography.

- The Meeting stressed the importance of RNODCs-IGOSS providing IOC and WMO Secretariats with inventories of their data acquisition semi annually in the form of catalogues and charts for further distribution to NODCs, NOCs and to other groups of users, on request.

The IGOSS Operations Co-ordinator informed the Meeting on the deliberation of the First Session of the IGOSS Group of Experts on Operations and Technical Applications (OTA) (Geneva, 30 November - 4 December 1987) and of the Second Session of the Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of Opportunity Programmes (Sidney, Canada, 5-8 August 1987) relevant to the objectives of the meeting either directly or indirectly. The Meeting paid special attention to the discussions from the OTA Meeting on IGOSS data monitoring and those from the Ship-of-Opportunity Meeting on the use of new technology for data collection, exchange and storage, quality control procedures and on the ways to decrease the loss of data collected by IGOSS XBT Ships-of-Opportunity. The Meeting supported the decisions of these meetings and took them into account when relevant agenda items were under consideration during the Session.

4. PROCEDURES USED BY DIFFERENT SOC'S AND RNODCS-IGOSS FOR DATA HANDLING AND EXCHANGE

The Technical Secretary introduced this Agenda Item. Heads of data centers at the Meeting made presentations on the procedures used by their centers for data holding and exchange. Abstracts of these presentations are contained in Annex VIII.

Two important items emerged: the efforts of data centers in actively pursuing data were generally rewarded by increased data flow and there is a need to accelerate the exchange of data between SOCs and RNODCs-IGOSS. The latter could be accomplished by adhering to guidelines established for data exchange under Agenda item 3.

5. IDENTIFICATION OF WAYS TO OVERCOME PROBLEMS OF NON-REAL-TIME SUBMISSION OF BATHY AND TESAC MESSAGES THROUGH IODE CHANNELS

This Agenda Item was introduced by Mr. Greg Withee of the U.S. National Oceanographic Data Center. He pointed out that the U.S. RNODC-IGOSS has taken the initiative to obtain non-real-time data and merge it with the real time IGOSS data for the TOGA Pacific region. This was an effort by the US NODC to provide the best possible data set to the international TOGA effort.

Mr. Withee noted that the international scientific efforts, TOGA

and WOCE, were pushing for more rapid data submission. Initial time frame estimates by WOCE indicated that the only data that would be available at the US NODC in the appropriate time frame was the real time low resolution IGOSS data set which did not meet the quality standards set forth by WOCE. In order to meet the timeliness and quality requirements of TOGA and WOCE it is going to be necessary for RNODC's to actively pursue data. The IGOSS data set is an excellent monitoring tool and has enabled the US NODC to track down data over and above that collected in real time. Another effort by the US NODC is the Joint Environmental Data Analysis (JEDA) program with the Scripps Institute of Oceanography. The U.S. NODC through this effort was able to open the way for better exchange of data between the US NODC and the US scientific community.

Mr. Chris Noe informed the Meeting of the status of the TOGA data management effort at the U.S. NODC. The U.S. NODC maintains a data base for the TOGA Pacific Region from 1985-present and he also noted that IGOSS is excellent for tracking data. The U.S. NODC's effort in this regard is described in document IOC-WMO/IGOSS-IODE-II/Doc. 7.

The Meeting noted with interest experience gained by the U.S. NODC and felt that there is a need for a substantive IGOSS-IODE project supporting a data set of interest to the scientific community such as WOCE. The Meeting agreed upon the draft of the project proposal as presented in Annex IX and recommended that the Chairmen and Vice Chairmen of the Technical Committee on IODE and the Joint IOC/WMO Working Committee for IGOSS jointly with the IOC and WMO Secretariats take steps for the preparation of a final version of the project proposal to be presented to the next sessions of the relevant committees.

The Heads of Data Centers were asked to comment on their efforts in expediting the flow of data. Some of the salient points that emerged were as follows:

- Data centers have to actively pursue data.
- There is a need for unique timely global data bases for a variety of oceanographic parameters
- Data centers must make an effort to improve relations with scientific institutions in their countries/regions
- WDC's need assistance from RNODC's in the quality control of regional data sets

6. IMPROVEMENT OF QUALITY CONTROL PROCEDURES

Prof. D. Kohnke introduced this Agenda Item. He pointed out that, within IGOSS, quality control takes place at three levels:

- at the source,

- before insertion onto the GTS,
- after transmission on the GTS.

At the source quality control could be improved through the use of automated systems. SEAS was making important contributions in this area. The following additional items would also improve the quality of measurements

- better handling of the surface transient,
- truncation of the cast at the rated depth of the XBT,
- increased number of points to describe the structure.

Before insertion onto the GTS, NOC's and NMC's should be reminded to perform minimum quality control standards listed in The Guide to Operational Prodedures for the Collection and Exchange of Oceanographic Data (BATHY & TESAC), no. 3, 1984. Additional standards for this stage which should be considered are position checking, monotonically increasing depth checking and spike elimination Automatic message construction will facilitate the implementation of these standards.

Archiving centers should conduct additional consistency and climatology checks. These centers should also investigate obtaining high quality data sets from data centers supporting the WCRP.

The Quality Improvement Profile System (QUIPS) was discussed with regard to quality control both before and after insertion of data onto the GTS. QUIPS does represent an automated system capable of very high speed data processing however its use of binary files may cause transportability problems.

The Meeting then commented on the quality control procedures in effect at their respective centers.

The Meeting considered the need for global quality control standards and the use of a globally acceptable climatology. It was pointed out that QUIPS II might be used to establish a global quality control standard. The chief concern was that QUIPS II could physically alter the data thus requiring standardization of procedures. Since QUIPS II uses the binary format BUFR and since WMO communications will use BUFR in the future, the Meeting adopted Recommendation IGOSS-IODE-DF.1 in this regard.

The Meeting then considered the multitude of quality control procedures presently used in addition to the minimum quality control standards. In many cases, data is arriving at RNODC's IGOSS with no clear record of the quality control applied to it. RNODC's IGOSS are then reapplying quality control to the data. The Meeting noted that the numerous quality control procedures applied might have an adverse effect on the actual data. The Meeting felt that it would be necessary to establish a set of universal quality control procedures that would be applied to the data at each center. This would apply only to data that was to be transmitted through the IGOSS-IODE data systems. Each center would be free to do additional quality control as necessary to support

their own data standards and product requirements. The Meeting adopted Recommendation IGOSS-IODE-DF.2 on this subject.

The Meeting noted that quality control is a process which must be applied to the complete life cycle of the data - from ocean instrumentation to final analysis and distribution. An important part of this data quality process is concerned with the measurement system itself. In view of the emerging number of automated systems, the Meeting recommended that IOC and WMO consider carrying out in situ comparisons of the data from the different measurement systems. The Meeting noted that a good candidate for such experiments would be a comparison of temperature measurement systems which are automated such as SEAS, analog systems such as the Sippican XBT recording system, and perhaps the older MBT systems. The Meeting further noted that such a difficult exercise would be in direct support of the climate scientists' requirements for consistent, validated data sets over a long period of time (covering the use of many measurement systems).

The Meeting recommended that the coming Consultative Meeting of Experts on RNODCs and Climate Data Services pay special attention to this matter and formulate an appropriate recommendation.

7. APPLICATION OF IGOSS DATA IN THE IODE SYSTEM TO MEET USERS NEEDS

This Agenda Item was introduced by Dr. Ron Wilson. He stressed the fact that the application of IGOSS data to user needs was very important. In addition there was a need to advertise the IGOSS-IODE Data Sets. Each Head of data center then gave a brief presentation on the IGOSS product produced by his data center. Abstracts of these presentations are contained in Annex X.

The Meeting noted with concern the decline in drifting buoy data being transmitted on the GTS. It was estimated that only 25-30% of all drifting buoy data reached the GTS. The Meeting instructed the Director of the RNODC for Drifting Buoys to bring the decline in data flow to the attention of the Chairman of the Joint Working Committee on IGOSS, the Chairman of the Technical Committee on IODE, and to other relevant bodies such as the Drifting Buoy Cooperation Panel and the CCCO.

The Meeting then addressed the subject of data management and data advertising products. Pollution studies were considered first. Prof D. Kohnke described a marine environmental data base system currently in use in the Federal Republic of Germany. He pointed out that there are still some drawbacks in exchanging marine pollution data, internationally. They result particularly from the lack of standardized sampling and analysis methods as well as from the lack of internationally agreed upon data exchange formats.

The Meeting recalled the contribution made to the MAPMOPP program by IGOSS and noted the increasing and intense interest in marine pollution data. In view of the interest and particularly in view of GIPME requests to IODE to promote the exchange of pollution data the Meeting requested the IOC

Secretariat to continue discussions with relevant organizations such as ICES, GIPME and UNEP for the purpose of further clarifying the role of IODE and IGOSS in the management and exchange of marine pollution data.

The Meeting noted the value of posters which depict the actual data bases held in NODCs and WDCs. In this connection the meeting requested the Secretariats to bring this idea to the attention of Member States and relevant IODE centres.

8. PUBLICATIONS

The Meeting reviewed the status of IGOSS and IODE publications and agreed that existing Guides and Manuals relevant to the IGOSS-IODE data flow should be kept under permanent review and regularly updated , if necessary.

The Meeting welcomed the offers from Dr. R. Wilson to review the Manual on IGOSS data Archiving and Exchange and from Prof. D. Kohnke to review the Guide for Responsible National Oceanographic Data Centers (RNODCs) and prepare amendments to these publications if there is a need.

The Meeting stressed the need for urgent publication of the Guide to IGOSS Specialized Oceanographic Centers (SOCs) and requested the IOC and WMO Secretariats to make necessary efforts for the publication of this document before the coming session of the WMO Executive Council.

The Meeting invited Dr. R. Wilson to check the IGOSS Guide to Drifting Buoys from the point of view of the drifting buoys data management; include in the guide, if necessary, information on the RNODC-Drifting Buoys Data activities and the data flow; and seno these comments to Dr. G. Hamilton who is responsible for the preparation of the final draft.

The Meeting recommended the IODE Editorial Group while finalizing the IOC Manual No. 9 on International Oceanographic Data Exchange to pay special attention to the IGOSS-IODE interface and reflect existing procedures to the Manual.

The Meeting felt the need to review IGOSS Plan and Implementation and make changes to the guidelines for SOC's to reflect the decisions of this meeting. Ms. Muriel Cole volunteered to make the required changes to this document.

The Meeting considered the need for some sort of semi-annual publication which could contain descriptions of data management projects information on data centers activities, development in the technology of data handling, etc. In this respect a newsletter published by NASA was noted with a special interest. The Meeting then agreed that there is a need for a publication which will describe existing IGOSS-IODE quality control procedures. The Meeting requested its Chairman to bring this view to the attention of the Chairman of the Technical Committee on IODE in order to have it discussed at the next Session of the Committee.

9. ADOPTION OF THE SUMMARY REPORT AND RECOMMENDATIONS

The Meeting adopted the Summary Report and Recommendations as they are presented in Annex II. The Meeting requested the IOC and WMO Secretariats to prepare the final version of the report and distribute it to the participants, IODE National Co-ordinators and IGOSS National Representatives.

10. CLOSURE OF THE MEETING

The Meeting was closed on 22 January 1988 at 15.00.

ANNEX I

AGENDA

1. ORGANIZATION OF THE SESSION

    1.1 OPENING OF THE SESSION

    1.2 ADOPTION OF THE AGENDA

    1.3 WORKING ARRANGEMENTS

2. REVIEW AND MONITORING OF IGOSS/IODE DATA FLOW

3. REVIEW OF IMPLEMENTATION OF RECOMMENDATIONS RELATING TO THE WORK OF THE MEETING

4. PRODEDURES USED BY DIFFERENT SOC'S AND RNODC'S-IGOSS FOR DATA HOLDING AND EXCHANGE

5. IDENTIFICATION OF WAYS TO OVERCOME PROBLEMS OF NON-REAL-TIME SUBMISSION OF BATHY AND TESAC MESSAGES THROUGH IODE CHANNELS

6. IMPROVEMENT OF QUALITY CONTROL PROCEDURES

7. APPLICATION OF IGOSS DATA IN THE IODE SYSTEM TO MEET USERS NEEDS

8. PUBLICATIONS

9. ADOPTION OF THE SUMMARY REPORT AND RECOMMENDATIONS

10. CLOSURE OF THE MEETING

ANNEX II

RECOMMENDATIONS ADOPTED BY THE SESSION

Recommendation IGOSS-IODE-DF.1

Recognizing that there will be an increasing requirement for the rapid exchange of both observational and numerical model data to support climate research and ocean forecasting,

Noting the expansion in regional relecommunications capabilities, such as SPAN and electronic mail, and globally, such as the GTS, and the use of protocols such as X.25 to ensure the error free transmission of data, and that compact transmission formats, such as BUFR, are being developed for use on such networks,

Further noting that the IGOSS Group of Experts on Operations and Technical Applications has an interest in and is working on the use or implementation of some of these capabilities and techniques,

Recommends that IODE Group of Experts for Technical Activities investigate regional relecommunications capabilities such as SPAN, electronic mail and global capabilities such as the GTS for the exchange of observational data. In addition, that it investigate the use of various communications techniques such as X.25 and BUFR in the exchange of these data,

Further Recommends that they cooperate closely with the IGOSS Group of Experts on Operations and Technical Applications in these matters.

Recommendation IGOSS-IODE-DF.2

Recognizing that many data centres are using the minimum set of quality control standards specified in Manuals and Guides #3, and supplementing their processing with other procedures,

Further recognizing that the procedures used at the different centres are not widely known and may differ in the means of treating the same problem,

Noting that the IGOSS Group of Experts on Operations and Technical Applications is also concerned with the quality control procedures for IGOSS data handling,

Recommends that the present minimum set of quality control standards be reviewed by the IODE Group of Experts on Technical Applications in consultation with IGOSS OTA to produce a comprehensive list of quality control procedures to be followed. Such a list should specify the minimum procedures to be carried out at each data reception centre, and a list of further optional and desirable procedures to be applied to data. The list should also specify the procedures that each centre should not apply. For each procedure, there must be sufficient detail such that the exact algorithms for processing are specified, as well as the specific climatologies or reference data sets used by the procedure.

Further recommends that each member state reports on an annual basis to the secretariat the procedures from the above list that are followed and makes recommendations of additions to the list of procedures to be considered by the IODE Group of Experts on Technical Applications.

ANNEX III

LIST OF PARTICIPANTS

I - INVITED EXPERTS

Mr. C. Billard
Prevision Meteorologique Marine
Meteorologie Nationale
SCEM
2, Av. Rapp
75340 Paris Cedex 07
FRANCE
Tel: (1)65567210 (direct)
Telex: 200276 F

Mr. P.A. Bolduc
Chief, Data Management and User
Services Division
Dept. Fisheries and Oceans
200 Kent Street (Stn. 1202)
Ottawa, Ontario K1A 0E6
Canada
Tel: (613)990-0231
Telemail: A.BOLDUC

Mrs. M. Cole
Department of Commerce
NOS International Affairs
14th & Constitution Avenue, NW
ROOM 4029
Washington, D.C. 20230
U.S.A.
Tel: 202-377-8047
Telemail: M. Cole

Mr. A. Duncan
Manager
Information Services Division
Institute of Marine Affairs
Hilltop Lane, Chaguaranias
P.O. Box 3160 Carenage
Trinidad and Tobago
Tel: (809) 634-4292/4
Cable: "MARINAF"
Telemail: IMA.LIBRARY
(OMNET)

Mr. J. Gagnon
Head, Data Quality and Products Section
Dept. Fisheries and Oceans
200 Kent Street (Stn. 1202)
Ottawa, Ontario K1A 0E6
Canada
Tel: (613)990-0240

Mr. R. Keeley
Chief, Ocean Information and
Systems Division
Dept. of Fisheries and Oceans
200 Kent Street (Stn. 1202)
Ottawa, Ontario K1A 0E6
Canada
Tel: (613)990-0246
Telemail: R.KEELEY

Professor D. Kohnke
Deutsches Hydrographisches Institut
Bernhard-Nocht-Str.78
D-2000 Hamburg 4
Germany, Federal Republic of

Telex: 211138 BMVHH D
Tel: (0)40-3190 5231

Telemail: DHI HAMBURG

Mr. T. Mori
Director
Japan Oceanographic Data Center
Hydrographic Department
Maritime Safety Agency
No. 3-1 Tsukiji 5-Chome
Chuo-Ku, Tokyo
104 Japan

Telex: 252-2452 HDJODC J

OMNET: T. MORI
Tel: (0)3-541-3811
Fax: (0)3-545-2885

Mr. C. Noe
Chief, Data Processing Branch
NODC/OC12-Room 422
1825 Connecticut Ave., NW
Washington, D.C. 20235
U.S.A.

Tel: 202-673-5636

Mr. B.J. Searle
Officer in charge
Australian Oceanographic Data Centre
Hydrographic Office, R.A.N.
P.O. Box 1332
OPPTH SYDNEY N.S.W. 2059
Australia

Tel: (02) 925-4870

Telemail: BSEARLE/NESDIS

Mr. R.B.L. Stoddart
Ocean Science Affairs Division
Dept. of Fisheries and Oceans
200 Kent Street
Ottawa, Ontario K1A 0E6
Canada

Tel: (613)990-0320

Mr. S. Tani
Japan Oceanographic Data Center
Presently in
Marine Geological & Geophysical Division
NGDC/E-GC3
325 Broadway, Boulder CO 80303
U.S.A.

Tel: 303-497-6376
OMNET: T.MORI

Dr. J.R. Wilson (Chairman)
Director
Marine Environmental Data Services
Dept. of Fisheries and Oceans
200 Kent Street (Stn. 1202)
Ottawa, Ontario K1A 0E6
Canada

Tel: (613)990-0264
Telemail: R.WILSON

Mr. G. Withee
Director,
National Oceanographic Data Centre
1825 Connecticut Ave., NW
Washington, D.C. 20235
U.S.A.

Tel: 202-673-5594
Telemail: GWITHEE/NESDIS
OMNET: NODC.WDCA

II - SECRETARIAT

Dr. I. Oliounine
IOC Technical Secretary
Head, Ocean Services Unit
Intergovernmental Oceanographic
Commission (IOC)
UNESCO
7, Place de Fontenoy
757000 Paris
France

Tel: (33)(1)45683978/7
Telex: 204461 Paris
Telemail: IOC.SECRETARIAT

Mr. J. Withrow
IGOSS Operations Co-ordinator
Ocean Services Unit
Intergovernmental Oceanographic
Commission (IOC)
UNESCO
7, Place de Fontenoy
75700 Paris
France

Tel: (33)(1)45683975
Telex: 204461 Paris
Telemail: J.WITHROW

ANNEX IV

LIST OF INFORMATION REQUESTED FROM NOCS AND NMCS

Information listing to be submitted by NOC or NMC to the respective NODC (or DNA) about BATHY and TESAC messages put onto the GTS, after each calendar month.

Call Sign	Time Period	BATHY's	TESAC's	Total

Grand Total:

ANNEX V

TABLE FORMS WITH INFORMATION ON THE AMOUNT OF DATA

Draft of annual report of RNODC's on their holdings of GTS and IODE data.

List I Holdings of GTS transmitted data (year_____)

Ship/month	1	2	3	4	5	6	7	8	9	10	11	12	Total
BNPK	25	42	10	33	.....								
BNRB	.												
BNSC	.												
CGBV	.												
CGCL	.												
.	.												
.	.												
.													
.													

List II Holdings of data from platforms received through IODE (year_____)

Ship/month	1	2	3	4	5	6	7	8	9	10	11	12	Total
BNPK	25	42	10	33	.....								
BNRB	.												
BNSC	.												
CGBV	.												
CGCL	.												
.	.												
.	.			(Same as Above)									
.													
.													

ANNEX VI

DATA FLOW DIAGRAMS

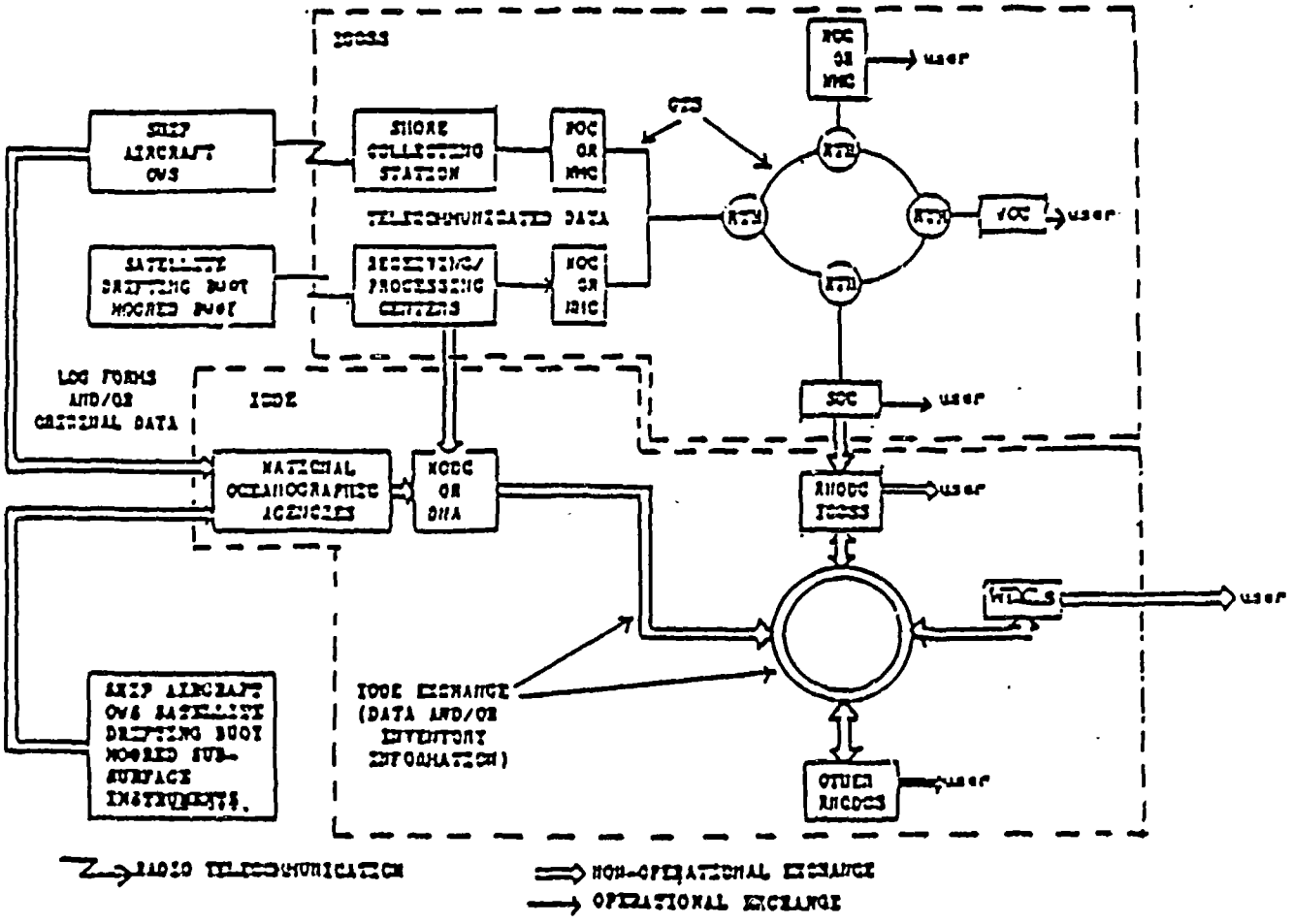

Figure A The IGOSS/IODE Data Flow Diagram

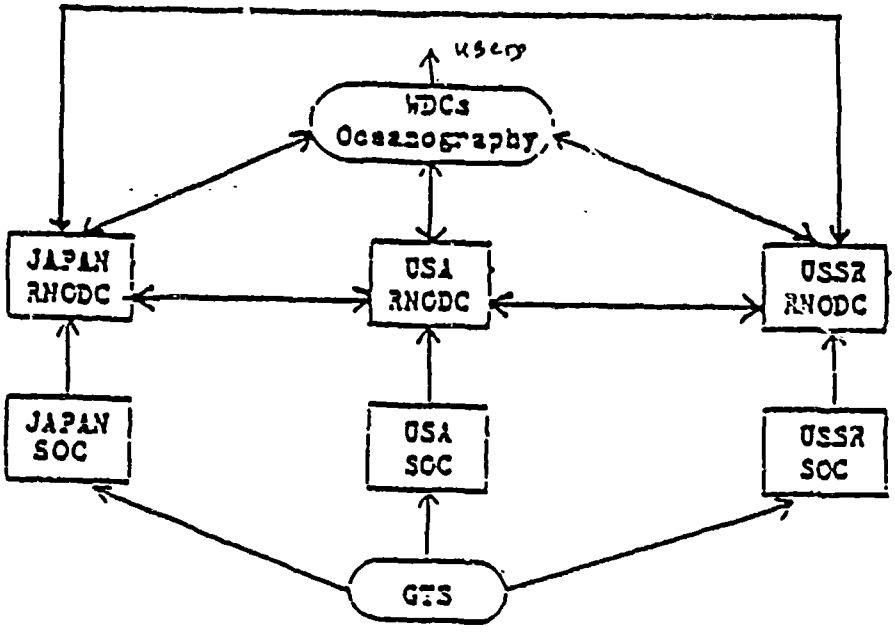

Figure B Data Flow between existing SOCs for BATHY/TESAC data and RNODCs-IGOSS

ANNEX VII

GUIDELINES FOR SOC'S AND RNODC'S - IGOSS

1. All SOC's will provide, data sets of operational data to RONDC's - IGOSS within two months of receipt of the observation.

2. In preparing the operational data sets for transfer to the RNODC'S-IGOSS, the SOC's should process the data to quality control standards as outlined in the last edition of the IOC Manuals and Guides No. 3, 1984.

3. To ensure maximum data flows from IGOSS to IODE, monitoring procedures developed in the IGOSS and IODE systems (given in Annexes IV and V) should be carried out by SOC's and RNODC's.

4.[1] RNODC's - IGOSS provide data sets and inventories for the area of their resposibility to WDC's, Oceanography, every six months, not later than one month after receipt of the last data from the SOC's. RNODC's-IGOSS will provide inventories of their data acquisition semi-yearly to the IOC Secretariat. The IOC Secretariat will distribute this inventory to all NODC's.

5. RNODC's and SOC's should have the capability to provide data sets in GF-3 format. However, upon agreement betweer centers or other users, any exchange format could be used.

6. RNODC's - IGOSS should receive data from only one SOC and should periodically compare their IGOSS files for duplication and remove the duplicate data records with the lowest quality.

7. WDC's, Oceanography will provide the global IGOSS data set to users on request within 4 months after the last data collection in GF-3 or other mutually agreed upon format.

---

[1]The meeting felt it necessary to modify existing Terms of Reference for RNODC'S - IGOSS to meet needs of users' groups more effectively.

ANNEX VIII

NATIONAL PROCEDURES FOR DATA HANDLING AND EXCHANGE

AUSTRALIA

Australian Oceanographic Data Center (AODC)

Data Acquisition and Exchange

In Australia there are approximately 25 ships equiped to deploy XBT's. This consists of two major research vessels, 14 ships of Opportunity and nine (9) naval ships. The majority of data collected by these ships is made available to IGOSS via GTS. BATHY observations from naval ships and five ships of Opportunity are forwarded via radio signal to coastal radio stations which sends on BATHY telex to the Australian Bureau of Meteorology. The data is intered into an automatic switching system where it is formated into a GTS bulletin and sent. Nine ships of Opportunity have SEAS units and data is entered into GTS via GOES.

At the present time no data produced by these ships entered on GTS is quality controlled. The AODC has a QUIPS system on loan from NOAA. However, due to difficulties on software compatibility this system is not yet being used. A cooperative project between the AODC and Bureau of Meteorology should allow the introduction of quality control checks on Australian sourced BATHY data before it is entered on GTS.

Since 1987 data received via GTS at the Bureau of Meteorology is being stored on a file on the CSIRONET computer system. This system is a nationwide network that allows public access. No quality control is undertaken on this data file.

CANADA

A telecommunications line from Toronto routes requested bulletins on the GTS to MEDS. At MEDS, a PDP11 computer logs BATHY, TESAC and DRIBU messages on disk for later processing. Only those BATHY and TESAC messages from the north-west quadrant of the world are retained but all DRIBU messages are stored. Once each day, these data are transferred up to another computer and the BATHY and TESAC massages are split away into a separate file from the DRIBU messages. The BATHYs and TESACs are downloaded to a micro computer for quality control checking each morning. The resulting file, with quality flags added is sent back up to MEDS' host computer, and then over to our main computer centre for updating the archive database.

The DRIBU messages are accumulated for an entire calendar month, at which time they are passed to an interactive quality control program which allows the monthly time series of sea surface temperature, sea level pressure and buoy track to be viewed. Suspect messages and data are flagged. The flagged messages are recombined with the input data and loaded into the archive database. At the same time, the BATHY and TESAC data are undergoing further quality control checks of implied speed between stations. Corrections or

flags are applied as appropriate. All of the IGOSS data are then used in the production of MEDS monthly IGOSS product.

FEDERAL REPUBLIC OF GERMANY

The NOC of the Federal Repubdic of Germany (Deutsches Hydrographisches Institut - DHI) puts all operational oceanograhic data which were collected by German institutions onto the GTS. The data are quality controlled according to the minimum quality control procedures described in IOC Manuals and guides No. 3. The DHI enters onto the GTS BATHY and TESAC messages and has also recently started to exchange TRACKOB data. The data are put onto GTS the same day that they are received by the NOC.

Those data which were collected in programmes of the DHI on strip charts are digitized and cassette data are processed by the NOC immediately after the completion of a cruise. This high-quality data set is then passed on to the German Oceanographic Data Centre (DOD) for final archiveing and exchange with the RNODCs (IGOSS) and WDCs (Oceanography). All DHI XBT data which have entered the GTS are also sent in delayed mode to the IODE system. This is not always true for data from other sources in Germany. Therefore, the NOC is planning to inform the DOD about those cruises where XBT data have been taken and exchanged in an operational mode, so that the DOD can take care for this data to get into the IODE system.

Delayed mode XBT data sets which were exchanged on the GTS are labelled as such by the DOD assisting the RNODCs (IGOSS) in identifying duplicate XBT data in their files.

FRANCE

The French Meteorological Service hosts an IGOSS/NOC for BATHY-TESAC measurements and a SOC for drifting buoy data.

All BATHY, TESAC and DRIBU reports arriving at RTH Paris, coming from the GTS or to be inserted onto this network, are permanently archived. In addition, BATHY and TESAC are quality-controlled, prior to insertion onto the GTS for those introduced in Paris.

Monthly data monitoring products are issued: dot maps indicating places of observations, charts with number of observations in each Marsden square, IGOSS statistical evaluation sheet as defined in the IOC/WMO Guide to operational procedures for the collection and exchange of oceanographic data (BATHY and TESAC) , statistical information for each ship about the delays in availability of the observations with associated ranking of the ships.

Thermal upper-ocean structure data are used for various purposes: SST analysis for numerical weather prediction, activities such as fisheries or naval warfare, 3-dimensional ocean temperature analysas (not yet operational), ocean modelling, climate studies....

There is no real exchange of data but one can notice an increasing need from the scientific community. At the same time, BATHY-TESAC quality controlled data for the tropical area between 30'N and 30'S are sent to TOGA sub-surface thermal data Center located in Best on a monthly basis.

As far as drifting buoy data are concerned, quality control flags will soon be archived: gross error checks, and for those data entering the operational data assimilation scheme, departure from the first guess field, spatial consistency checks. Some data compression is done for each square of 1/2' latitude-longitude and for each 10mn duration period, only the first observation received is kept in the archive. Filtering procedures are applied in order to remove the data from platforms other than drifting buoys (moored buoys, yachts,...) According to its commitments, the SOC for drifting buoy data is sending its monthly maps to all National Representatives for IGOSS, both Secretariats of WMO and IOC, other SOC's and Chairman IGOSS.

JAPAN

Since 1972, Japanese oceanographic research vessels have been making radio messages to report subsurface temperature on a real-time basis in the framework of the IGOSS BATHY/TESAC Programme, some of them through GMS. (Geostationary Meteorological Satellite). The greater number of reports contained not only subsurface temperature data but also those of sea surface current with GEK (Geomagnetic Electro Kinetograph) or acoustic Doppler current profiler. A total of 4,143 reports (including delayed mode ones) were put onto the GTS from the Tokyo Hub in 1986.

In addition to the BATHY messages, mentioned above the JMA (Japan Meteorological Agency), one of the SOC's for IGOSS, began to handle the delayed-mode data since August 1982. Delayed-mode subsurface temperature data are obtained through telefacsimile and mail from other national organizations.

In the SOC, systematic quality control for the collected BATHY/TESAC reports are made. The SOC compiles the IGOSS monthly summaries including maps showing the geographical distribution of BATHY/TESAC messages and numbers of messages of individual ships and sends them to both the secretariats of the IOC and the WMO. The JMA initiated to collect reports of TRACKOB form. The SOC has requested shipping companies to participate in the TRACKOB Programme. The SOC is now developing the method of operational use of them for analysis and forecast.

IGOSS data submitted by JMA are stored in three formats in JODC (Japan Oceanographic Data Center). The first one is original data file on half-year basis. The file contains the collected and processed data from the GTS and other operational sources within the framework of the area of responsibility. The second is the data and data inventory file recorded in a form of SYNDARC Format, and is available to users in the forms of computer-generated data summaries, statistical process, graphical plots, etc. or in a medium which allows the users to further process by a personal

computer. During conversion process, minimum quality control procedure is applied to the original data based on the IOC Manuals and Guides No. 3. and approximately 10% of the data are omitted. The third is the JODC format version of the data inventory file. From this file, data products such as data summaries and location plots are provided to users as well as the IOC and WMO.

SOVIET UNION

The RNODC - IGOSS and WOC for IGOSS data was established in 1984 under the auspices of the All-Union Scientific Research Center for Hydrometeorological Information (VNIIGMI-WDC) and Hydrometeorological Scientific Research Center of the USSR (Hydrometcentre USSR).

The responsibilities of the RNODC - IGOSS include the collection of BATHY/TESAC messages and logs, quality control of the data, preparation of data sets on magnetic tapes, development of products concerning the availability and time-space data distribution. The RNODC - IGOSS is providing national and international users with copies of data, results of analyses and with other products for the RNODC - IGOSS area of responsibility.

The responsibilities of the WOC include preparation, publication and distribution of different types of operational oceanographic products on a regular basis including those distributed via FAX machines that are readily available to different groups of users.

The activities of the RNODC - IGOSS and WOC are carried out in accordance with the procedures spelled out in the Guide to Operational Procedures for the Collection and Exchange of Oceanographic data (BATHY and TESAC), 1985; the Guide to the IGOSS Data Processing and Services System, 1983 and other relevant international manuals and guides which are now in use.

The average annual number of BATHY messages received by the Soviet Union primarily via the GTS of the WMO WWW from national and international sources is about 30,000. These come mainly from the USA, USSR, Japan, Australia, FRG, United Kingdom and France. TESAC messages are primarily received from national sources and the volume is about 7000 - 8000 messages per year.

The RNODC - IGOSS is pursuing activities aimed at shortening the time required for data handling in order the make the data available to users in the appropriate format in a more timely manner. On request, the RNODC-IGOSS will provide data in different formats for special user groups.

The experience gained by the RNODC - IGOSS in quality control of BATHY/TESAC messages received from the GTS showed that a large number of errors (up to 20%) occurred in the headers of the messages. Because of this problem it was difficult to identify the type or originator of the message.

In accordance with our estimates, the number of errors in the data itself is much lower and in the range of 5% - 15%. The quality control procedures used by the RNODC - IGOSS are based on the methods recommended by international guides and on national experience.

In the framework of GLOSS and PSMSL the Soviet Union distributes annually to PSMSL in Bidston, monthly averages of mean sea level for five national tidal stations located at Barenzburg, Russian Harbour, Murmansk, Kaliningrad, Tuapse, Nagaevo, Petropavlovsk - Kamchatskiy, Uzno - Kurilsk.

Since October 1987, the Soviet Union has participated in the ISLPP and monthly averages of mean sea level are submitted each month to the SOC - Sea Level in Honolulu, USA from two locations: Petropavlovsk - Kamchatskiy and Uzno - Kuzilsk.

UNITED STATES

Activities in the United States are concentrated in the U.S. Specilized Oceanographic Centre, and the U.S. RNDOC for IGOSS. The U.S. Specialized Oceanographic Centre (the Ocean Products Center of NOAA) receives oceanographic data and performs automated quality control checks prior to insertion of the data on to the GTS. The data is also regularly transmitted to the RNODC for IGOSS (the U.S. National Oceanographic Data Center).

U.S RESPONSIBLE NATIONAL OCEANOGRAPHIC DATA CENTRE

The U.S. RNODC for IGOSS receives near real-time data weekly from the Ocean Products Center at Suitland, Maryland and the Ocean Applications group in Monterey, California. These data are extracted from the Global Telecommunications System (GTS) on a daily basis for screening and editing.

At the RNODC the IGOSS data are sorted, duplicates are eliminated and basic quality control is performed. The archive is updated on a monthly basis in geographic order. An on-line inventory is also maintained.

The RNODC also receives higher quality delayed mode data. Document 7 describes an effort between the RNODC and the U.S. Scripps Institute of Oceanography. This effort combines the IGOSS and delayed mode data for the tropical Pacific. This experiment, in support of the Tropical Ocean Global Atmosphere (TOGA) program has resulted in the formation of the Joint Environmental Data (Thermal) Center combining the talents of both institutes to produce a high quality research data set.

Results to date indicate that present data levels resulting from JEDA exceed those of previous years by a factor of two.

ANNEX IX

DRAFT PROJECT PROPOSAL

Introduction

The session considered the development of a project under IODE to develop a very high quality, scientifically acceptable Global Ocean Thermal Data Set.

The purpose of this project is three fold

(a) to increase awareness of IODE, its services and benefits

(b) improve the flow of data into IODE with particular reference to the timeliness of data submission

(c) to provide a quality data set to the world user community to assist with climatic and other global research projects

Background

A data exchange system to improve the flow of oceanographic data under the framework of International Oceanographic Data Exchange (IODE) has been in existence for many years. This programme has resulted in the development of a number of very large global data sets. With the introduction of various global atmosphere and ocean/atmosphere research projects there has developed a need for higher quality and more up-to-date global ocean data sets. These data sets must be of a sufficiently high standard so as to be acceptable to the scientific community both oceanographic and meteorological areas.

Procedures

A Global Ocean Thermal Data Set could be viewed as a pilot project under IODE. The project could have two parts. The first would be concerned with the improvement of quality, and the second part would be concerned with a continuously updated timely data bases.

Part I: Data Quality

It is suggested that IODE data centers assist the World Data Centers (Oceanography) with the quality control of existing thermal data sets maintained by WDC's.

WDC's would provide sub-sets of their global data sets to volunteering NODC's who would undertake quality control checks, to a uniform standard, on data for agreed upon areas that would produce the world ocean coverage. Due to the quantities of data involved it is likely that this process would take some time (two years is a suggestion). The quality control efforts would be undertaken on all data available before the beginning of the project e.g. pre-1987.

During the Q/C period, other centers (perhaps in consultation with research agencies) could be devising appropriate standard products that would utilize the "clean" global data set. On completion of the Q/C checks the WDC's will merge all "regional" data sets to form the Global, high quality, Thermal Data Set.

Also, during this period the IODE Project should be widely promoted to the international scientific community via National IODE coordinators. One method of promotion would be the issue of a "one-page" brochure on the Project, its aims, benefits and proposed outputs.

Output/Results

On completion of the main phase of the project a single, high quality data set would exist for all archived data of pre 1987 origin. The second phase would consist of the regional centres quality controlling WDC's post-1987 annual acquisitions. On completion, the data would be copied to WDC's to continue the continuity of a "clean" global data set. This procedure would continue on an annual basis.

The main phase of the IODE project should result in a tangible output, that could consist of a CD-ROM containing a copy of the high quality data set. A sub-project would be the preparation of a climatology along the lines of the Levitus atlas, which could also be placed on the disk. These CD's could be distributed to the scientific community who assisted in providing data.

Part II: Continuously updated thermal data base

As a parallel effort to the quality control, an activity to improve the timeliness and completeness of the global data set would be undertaken. Under the leadership of a data center(s) or World Data Center or designated RNODC, continuously updated data bases would be developed with the following properties:

- The data bases would be updated with quality controlled global IGOSS data on a weekly basis . The data would be flagged as IGOSS.

- As a function of receipt of higher quality delayed mode data, these data would replace and augment IGOSS data if appropriate flagged and merged onto the data set on a monthly basis.

- All NODCs would be encouraged to expedite their data submissions to the agreed upon centers with a great effort being made to get the data within 6 months after observation through improved co-operation with data collectors.

- The WCRP or WOCE could consider funding a scientific effort to use this data set in a multi year project that would produce applied products and good science. This effort could result in a further improvement in data quality.

- The data set would be available on line with an inventory and accessible through a readily available network like SPAN or OMNET. Graphics could also be considered for delivery over the network.

- The data would be archived annually or bi-annually on a CDROM and become a companion to the complete historical data set, available from the first part of the project.

Benefits from this part of the project could be a two fold increase in data available to Scientists within 2 years instead of the four to eight years it takes now. Such turnover has been demonstrated by the TOGA/JEDA project.

Conclusion

This project should achieve a number of benefits for IODE including advertising its existence, its products and the project itself. The project provides feedback to the scientific community via the CD-ROM and on line products. It would also improve the quality of the Global Data Set and stimulates data flow.

ANNEX X

PRODUCTS BEING PREPARED BY RNODCS - IGOSS

AUSTRALIA

In the meteorological sense, that is SST, wave forecasting and surface wind forcasting and analyses the development, production and distribution of data products has a relatively long history. These products have developed over the years from the changing demands from the maritime community and as a result of the introduction of new technology in data collection, analysis, product development and information dissemenation.

In Australia the Bureau of Meteorology operates the Bureau of Meteorology Research Centre (BMRC) which is continually undertaking research into new products and enhancing existing ones. Numerical models are playing an increasingly important role in this area and as a result of more powerful computing facilities, modelling is being used more extensively. The maritime communtiy in Australia is well catered for by the Bureau of Meteorology who are very responsive to the changing needs of the user. The Bureau provides a number of excellent products concerning both sea surface and air/sea interface phenomenon.

Unfortunately, the provision of sub-surface information products for the Australian area is somewhat lacking. A primary reason for this relates to the low density of real-time (and non-real time) sub-surface observations. The waters surrounding Australia cover many thousands of square miles/kilometers, much of which is away from the main shipping lanes.

Data collected in the more remote areas is generally the result of one-off oceanographic research cruises which results in only the short-term availability of real-time data which is insufficient to develop regular, useable data products. Also, non-real time data is frequently biased to certain times of the year which can cause difficulties during analysis.

The main sub-surface data procucts presently produced in Australia consist of SST, mixed layer depth and T250 metre analysis charts for the Western Tasman Sea. These charts are derived from satellite imagery, merchant ship SST meteorological observations, XBT's, drifting buoys and any other available real-time information. Products for the Western Tasman region are being produced as a result of the relatively high densities of XBT observations.

Over a twelve month period, XBT's are deployed at sufficient frequency to produce an analysis of the area on a 7 day basis. This product has evolved since 1982 when it first became available and it is now considered to be quite accurate. A limited amount of feedback is obtained from commercial fishermen and in particular yachtsmen involved in offshore races. The product is now generally accepted as being reliable by the user community. However, certain user groups, particularly fishermen are dissatisfied with the time taken to produce and distribute the charts. In many cases, fishermen are relying on 'closer to real-time' SST satellite imagery. This product, supplied by CSIRO covers the south western corner of Australia and

is available in a timely and therfore more usable manner. A number of steps are being taken to improve the timeliness of issuing the Naval Weather Centre Western Tasman analysis charts. A major improvement will be the introduction of facsimile machines that will allow the transmission of the charts within a few hours of production. This approach is dependant on the recipient also having access to a facsimile machine. An investigation is presently underway into the possibility of charging for these charts. If this eventuates, then the service will have to be improved in order to justify the charges.

CANADA

Once each month, for data collection in the previous month, the Marine Environmental Data Service (MEDS) issues a product showing location maps of BATHY and TESAC data collected, the depth of penetration of the data collection, lists of vessels and dates of data collections of the messages, maps of drifting buoy tracks with a list of sensors reporting and location maps of real-time reporting wave and water level stations. These products are presented for three regions around Canada. Once each month, Dr. M. Miyake at Canada's Institute of Ocean Sciences, issues maps for the north-east Pacific, showing mixed layer temperatures, temperatures at 100m and 300m, mixed layer temperature changes from the previous month, a meridional section down to 300m of water temperature. These all accompany MEDS monthly product described above. Once each month, MEDS as the RNODC for drifting buoy data, issues four maps showing global drifting bugy tracks for the buoys reporting over the GTS. On a yearly schedule, MEDS and Dr. Miyake, issue an annual summary of the monthly reports. This shows location maps of the BATHY and TESAC data, a list of the ships that reported and the numbers and types of data reported and maps of drifting buoy tracks reported over the previous year All of these are for data collected in the previous year and from the same three regions around Canada as in the monthly product. Also included are water level and significant wave height time series for the real-time reporting stations surrounding Canada. Accompanying this report is a summary be Dr. Miyake reproducing maps of the monthly mixed layer temperature in the north-east Pacific with the explanatory text, maps of means and standard deviations of mixed layer, 100m and 300m temperatures for the previous year and meridional sections of mean, standard deviation and ranges of temperatures down to 300m with explanatory text. Once each month, for the previous month, a group of scientists at the Bedford Institute of Oceanography prepares a summary of oceanic conditions for the north-west Atlantic. Most of this is textual, but there are maps sxowing both surface features and temperatures. Once every two weeks, MEDS prepares a data file of BATHY and TESAC messages from the north-east Pacific and places them in a computer mailbox for Dr. Miyake. These data are used in the production of his monthly maps. Once each month, MEDS prepares a similar file for the north-west Atlantic for the Bedford Institute. These data are incorporated into their monthly product described above. Each month, Canada supplies data to the ISLPP product for the north Pacific and MEDS distributes the resulting product within Canada. As required, data collected on cruises from the Bedford Institute are transmitted to MEDS for insertion onto the GTS.

Products and Services under study

There are three new products currently under study. The first is a joint effort by Dr. Miyake, Dr. White of Scripps Institute in the U.S. and Japan. Dr. Miyake will use IGOSS data collected by Japan, Canada and the U.S. to prepare maps of subsurface temperatures in the entire north Pacific basin on a monthly basis. These are a contribution to Dr. White's global maps of subsurface temperatures. The second is an initiative at MEDS to evaluate the feasibility of an ISLPP type product for the Atlantic. This evaluation will take place over the next few months. The third project is the evaluation of a product of surface and subsurface temperature anomaly maps prepared using the technique of optimum interpolation and the Levitus atlas as climatology. This is being done in cooperation between MEDS and scientists at the Bedford Institute with the goal of making use of such maps in their monthly report for the Atlantic.

FRANCE

The direct applications of IGOSS data are rather few:

- SST analysis either coarse mesh (1.5' lat X 2' long) with global coverage, or fine mesh (35 km) over a limited area (300 X 3000 km) centered over France, for numerical weather prediction purposed; only in-situ data (Bathy TESAC, Ship and DRIBU) are presently used and the method is optimum interplation with Alexander and Mobley's climatology s first guess field; fishermen as well as the Navy are interested in receiving such products possibly in real-time but they also need high resolution information (fronts, eddies,..) which can be obtained only through remote sensing techniques;

- global ocean temperature analysis (3. dimensional) not yet opertional; an optimum interpolation scheme is again used from Levitus's climatology. One can find here a similar need as for SST, coming from fishermen and Navy; in addition, the use of this kind of product will increase amongst the scientific community;

- direct as similation of some drifting buoy data, such as wind, in numerical atmospheric models, the results of which are then incorporated in wave models,

- activities of TOGA subsurface thermal data center located at IFREMER in Brest, that is in charge of producing dedicated products covering the tropical area.

Two important activities which are more or less closely related to IGOSS data, have to be emphasized,

- development of satellite active sensors, for calibration and assessment purposes;

- climate studies, especially implying ocean mesoscale modelling, air

sea flux computations;

The establishment of new data bank, more thermatic and including remote sensing data is expected in the forthcoming years in France.

JAPAN

JODC does not produce any special products from IGOSS data at this moment, although it is planning to begin this analytical statistical job in future. It has a couple of requests a year for IGOSS data. Meanwhile, IODE thermal data are positively used in Japan in various fields such as energy and resources exploitation, search and rescue calculations, thermal flud calculations, etc. Number of requests and inquiries for thermal data and informations to JODC was almost 2000 a year in 1987.

SOVIET UNION

The following FAX products are presently being prepared and distributed by the Hydrometcenter of the Soviet Union:

- Charts of sea surface temperature analysis (3 day) for the tropical zone of the World Ocean;
- Charts of SST analysis (3 day) for the northern parts of the Atlantic and Pacific;
- Charts of SST analysis (5 day) for the tropical zone of the World Ocean;
- Ten day forcasts of the sea surface temperature, sea surface temperature anomalies and monthly averages for the northern part of the Atlantic Ocean
- Ten day forcasts of SST for the northern part of the Pacific Ocean;
- Sea Wave analysis and 24 and 48 hour sea wave analysis for the norther part of the Atlantic Ocean.

In addition to the products mentioned above the Center provides operational and advisory services for ship routing, fisheries, and other marine activities.

Soviet Antarctic stations issue regular FAX bulletins on ice conditions in the antarctic waters of the world ocean.

UNITED STATES

In recent years use of IGOSS/IODE data has increased. The U.S. now prepares a number of experimental and operational products on a regular basis.

The U.S. IGOSS Specialized Oceanographic Center is NOAA's Ocean Products

Center. This center produces a number of operational products including some which depend on IGOSS data some samples are:

1) a global sea-surface temperature chart weekly and monthly using conventional data only,

2) a blended global sea-surface temperature chart depicting in situ and satellite data, and

3) an experimental sub-surface (100m.) chart of the North Pacific. NOAA's Climate Analysis Center operates an upper ocean model which uses XBT data as validation for the model.

The Scripps Institute for Oceanography prepares monthly a sub-surface termperature product for the tropical Pacific using IGOSS data for analysis purposes. This product studies and has been useful in depicting an eastern tropical Pacific behavior called "El Nino"

NOAA's National Ocean Service encourages the use of real-time data for analysis predictive purposes. A recent example of new applications is an experimental product indicating sea level using GEOSAT altimetry data.

The U.S. National Oceanographic Data Center has collected products being used operationally by various research and operational centers. A prototye Ocean Climate Environmental Analysis News, containing these products will be issued on a bi-monthly basis as a national product. Resources permittng, the National Oceanogrphic Data Center will prepare annual summaries of data sets used in these products and perhaps distribute these data on CD-ROM