24 APR 1989

Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

IODE Group of Experts on Technical Aspects of Data Exchange

Fourth Session

Ottawa, Canada, 11-15 July 1988

Unesco

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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
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange

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1. OPENING OF, AND ARRANGEMENTS FOR THE SESSION

1 The Chairman of the IODE Group of Experts on Technical Aspects of Data Exchange, Dr. M.T. Jones, opened the Session at 10.15 a.m. on 11 July 1988 at the Marine Environmental Data Service, Ottawa, Canada.

2 The Director General, Physical Sciences Directorate of the Department of Fisheries and Oceans, Canada, Mr. G. Holland, welcomed the participants to Ottawa. He noted the importance of the work of the Group of Experts in view of the growing needs of the scientific community and the global experiments underway and planned in the near future. In particular, he mentioned the current emphasis attached to global change and climate issues and the ocean components of these problems that were being tackled through international programmes such as the World Ocean Circulation Experiment and the Joint Global Ocean Flux Study. It was very clear that IODE and IGOSS have a major role to play by organizing and making available, data inventory, data and data products where and when they are needed.

3 The Director General stated that new technologies and new methodologies must be brought to bear to address modern requirements and that this Group of Experts will be forming recommendations to commence this process. Resource constraints at intergovernmental levels have led to longer intersessional periods between full scale sessions of Working Committees such as IODE and IGOSS putting more responsibility on Groups of Experts to make the necessary progress. The attendance of experts from so many different countries demonstrated the significance of the work to be undertaken this week. The Director General concluded his welcoming remarks with wishes that the deliberations of the Group would be fruitful and that the results would lead to a significant step forward in data management within IODE.

4 On behalf of the Secretary IOC, the IOC Assistant Secretary and Technical Secretary for the Session, Mr. T. Sankey, welcomed participants. He pointed out that new computer and communication technologies have a double impact on the IODE system. Firstly, these technologies must be applied directly to the work of IODE data centres. But the same technological changes have equally changed the way oceanographic observations are made and data is managed by the scientists themselves. The new patterns of scientific work are most obvious in the global science programmes such as TOGA, WOCE and JGOFS, but the now widespread use of personal computers is also a significant change. It is vital for the IODE system to strengthen and adapt its existing standards and methods and where necessary to develop new ones. The work of the present session will contribute to this, helping to make sure that the IODE system continues to provide an effective service to ocean science and to those who apply oceanographic data to practical problems.

5 The Group appointed Mr. D. Hamilton and Mr. J.R. Keeley as Rapporteurs for the Session.

6 The Group adopted the Agenda as given in Annex I.

7 The Technical Secretary introduced the list of documents for the Session as given in Annex III and Dr. J.R. Wilson, Director, MEDS, announced details of local arrangements. The List of Participants is given in Annex II.

2. REPORT ON INTERSESSIONAL ACTIVITIES

8 The Chairman reported on a number of activities to improve the distribution of information about GF3 and to continue its development (Document IOC/GETADE-IV/6).

(i) A newsletter 'GF3 Update' was prepared by MIAS and copies were tabled at recent data management meetings.

(ii) The publication IOC Manuals and Guides No. 17 titled 'GF3 - A General Formatting System for Geo-Referenced Data' is a new series. Volume 2 'Technical Description of the GF3 Format and Code Tables' was published in April 1987, and is currently available in English, Spanish and Russian.

(iii) The GF3 Parameter Code Table has grown to almost 300 parameters and is available in Volume 2 of IOC Manuals and Guides No. 17, on floppy disk, or through Telemail (from IOS.BIDSTON).

(iv) GF3 standard subsets were approved for BT data, directional wave spectra, IGOSS DRIBU, and IGOSS TRACKOB data. The latter was developed in response to the IGOSS Working Group on Operations and Technical Applications.

(v) Other subsets for hydrocast data, sea level data, multi-beam echo sounder, underway geophysics, petroleum pollution, and synoptic meteorology reports are in various stages of development.

(vi) GF3-Proc software is now available in FORTRAN 77 form. Programs written in the new version of GF3-Proc are twice as efficient in computer time and storage as programs written in the FORTRAN 66 version of GF3-Proc.

(vii) GF3-Proc software was successfully implemented on IBM compatible PC computers as a feasibility test.

(viii) Pre-publication documentation on GF3-Proc is available from MIAS in three forms:

(a) User's Guide to the GF3-Proc Software
(b) Reference Manual for the GF3-Proc Software
(c) Installation Guide for GF3-Proc

(ix) Forty copies of GF3-Proc software were distributed to 31 laboratories in 19 countries around the globe.

(x) A one-week course of instruction in GF3 and the use of GF3-Proc software was provided by MIAS to participants from Portugal, Yugoslavia and China in May 1988.

(xi) Contacts with the IGOSS Group of Experts on Operations and Technical Applications have opened communications on possible interfaces between GF3 and BUFR, a WMO approved binary format.

(xii) The First Consultative Meeting on RNODCs and Climate Data Services recommended that the GETADE:

(a) examine the use of binary data as part of GF3;
(b) explore the possibility of transmitting GF3 data sets over networks,
(c) explore the implications of GF3 and increased use of PCs for data processing.

9 Reports on progress in the use of GF3 in Argentina, Canada, China, FRG, USSR, UK and USA were presented to the Session and these are attached as Annex IV. In reporting their experiences with GF3, several participants emphasized that it would be helpful to have a few sample programs illustrating the use of GF3-Proc (see Agenda Item 3.4). Detailed issues raised in these reports are covered under the relevant Agenda Item.

10 While recognizing the considerable progress achieved at a number of data centres, the Group stressed the importance of ensuring that all NODCs including WDCs, give high priority to developing their capability for handling GF3 and for increasing the volume of GF3-based data exchange.

3. DEVELOPMENT AND PROMOTION OF THE GF3 SYSTEM

3.1 REVIEW OF GF3 DEVELOPMENT AND APPROVAL OF NEW SUBSETS

11 The Chairman pointed out that although GF3 was originally developed for data exchange on magnetic tape, there are now new requirements. Some data sets are better exchanged on floppy disks, which has raised the need to study the use of GF3 on PCs. Also, some high volume data sets point to the need to consider introducing binary data storage within GF3.

12 The Group considered Documents IOC/GETADE-IV/15 and IOC/GETADE-IV/18, which propose adding a binary data type to GF3, with restrictions outlined in the documents. The Group was of the view that there are data sets such as multi-beam echo sounder or acoustic doppler current profile data which are best recorded in binary. The Group agreed to review the two documents and to send detailed comments to the Chairman by September 15, 1988. The Group accepted in principle the concepts presented in the two documents and recommended that tests be carried out before final

approval of the binary extension to GF3. Versions of the GF3-Proc software, incorporating routines to handle binary data, will be produced for VAX computers, to be tested by MEDS, for IBM type computers, to be tested by MIAS, and for CDC computers, to be tested by DOD.

13 The Group discussed the use of the WMO BUFR format and possible ties to GF3, recognizing that GF3 and BUFR have distinct functions. GF3 works well for managing and archiving diverse data types and is an excellent carrier of data documentation along with the data. BUFR, on the other hand, works well for telecommunication of high volume, operational data sets. The Group was of the view that the oceanographic community should take advantage of either GF3 or BUFR as appropriate to meet the particular need of the moment.

14 In this context, the Group noted that the extension of GF3 to handle binary data would meet the needs of high volume data sets. The PC version of GF3 (see Agenda Item 3.3) may prove to be a suitable form for exchanging lower volume data sets over computer networks, although this is not its main purpose.

15 Mr. Keeley reported on his work on developing the IGOSS Flexible Code scheme. As part of this, a table of correspondence between BUFR and GF3 parameter codes has been started. The Group encouraged the continuation of this work and requested that Mr. Keeley keep them informed of progress made. The Group believed that BUFR and GF3 should be linked through the use of common parameter tables and that the best way to accomplish this would be the adoption of the GF3 parameter code table as a special BUFR table.

16 A subset of GF3 for hydrocast data was presented by Dr. M.T. Jones (Document IOC/GETADE-IV/13). Because of the nature of hydrocast data, this subset is to be viewed as a flexible model within which parameters may be changed as needed. Dr. N.N. Michailov proposed a subset for petroleum pollution data (Document IOC/GETADE-IV/17), based on MARPOLMON data. The Group agreed to review the subsets and provide comments to the Chairman by September 16, 1988.

17 The Group agreed that further work was required to develop the subsets for sea level data, multi-beam echo sounder data, underway geophysics, and synoptic meteorological reports.

18 Mr. H. Hecht pointed to the need for pollution monitoring parameters in the GF3 code table. The Group requested the Secretary IOC to invite the Hydrographer ICES to provide the Group with information on pollutant parameters that require GF3 codes.

19 Mr. Hecht, recalling the discussions of the Third Session of the Group of Experts, requested that work begin in developing subsets for biology data. The Group recommended that the Chairman of the Technical Committee on IODE request the Chairman of the Task Team on Marine Biological Data to provide the Group with specific requirements for the formatting of biological data.

3.2 GF3-PROC SOFTWARE DEVELOPMENT AND DISSEMINATION

20 The Chairman reviewed Document IOC/GETADE-IV/14 which was a concise summary of the present status of GF3 software developments. The document also serves as a draft GF3 publication (See Agenda Item 3.4). The next immediate concern was to disseminate Level 4 of GF3-Proc software. He emphasized that this version was significantly more efficient, and used less storage than the previous version. Among the participants, all existing users of Level 3 wished to receive Level 4, and the Chairman agreed to arrange this. The Chairman expressed the hope that the writing of an Installation Guide and the improvements made in Level 4, would relieve some pressure on MIAS to assist new centres installing the software.

21 A question was raised about whether software written under the old version of GF3-Proc would run under the new version. The Chairman agreed to prepare a document to be issued with Level 4 which would make specific reference to how changes would affect application software using Level 3.

22 The Chairman described experiments being performed with the GF3-Proc software installed on an IBM PC. He noted that the performance of the software was perfectly acceptable and indicated that tests would start soon on other PC hardware.

23 The Group discussed the possible sharing of GF3 application software. Mr. Keeley suggested that a more rapid and widespread adoption of GF3 would be promoted if application software development could be distributed among IODE centres. The Group expressed the view that exchangeable software was desirable although some customization would always be required. The Chairman noted that an exchange scheme had been tried within ICES, but that in practice only algorithms were used by others.

24 The Chairman also noted that readily available software would serve to meet the requests for sample GF3-Proc application programmes that had been requested by many countries (See Agenda Item 2). The Technical Secretary drew the Group's attention to the importance of the originator retaining copyright even when software is distributed free of charge, in order to guard against any third party establishing copyright and restricting the originator's rights. The Chairman agreed to ensure that GF3-Proc is suitably protected.

25 The Group identified a need to write guidelines for the writing of GF3 applications code to allow for easy use by others. The Group decided that the Guidelines should be based on the principle that users of application software cannot expect the originators to install the software on other machines. Rather, application software would be made available but those wishing to use it must install and customize it themselves. The Group also specified that the software must use GF3-Proc. The Group accepted the offer of Mr. Keeley to prepare a draft version of the guidelines, which would be distributed to Members of the Group by the end of 1988.

26 The Group expressed its thanks to the Chairman and MIAS for their hard work over the years in the development and support of GF3.

3.3 USE OF GF3 ON MICROCOMPUTERS

27 The Chairman introduced Document IOC/GETADE-IV/20 as a preliminary sketch of how GF3 might be adapted for use on a PC. The impetus for a PC version of GF3 stems from three sources. First there has been a rapid growth in the number of PCs available to scientists worldwide. Second, there is a need to develop links between the large data centres using GF3 and these small machines on which data collections are being logged and processed. Third, GF3 may, in certain circumstances, be wasteful in space for some of the smaller data sets that may be held on PCs. The Chairman recalled that the concepts of the GF3 format had been established originally independently of the storage medium, but that the published specification of GF3 had been geared primarily towards the storage of data on magnetic tape. There was no reason, therefore, why a PC based version of GF3 (GF3-PC) should not be built on the same concepts in such a manner as to provide full compatibility with the standard magnetic tape format. It was envisaged that GF3-PC would lead to more efficient exchange of data on floppy disks or over computer networks - it would also be simpler for the PC user to handle.

28 A broad based discussion followed. The Group expressed their conviction that the proposal is directed along the correct development path.

29 Several requirements for the GF3-PC system were suggested by participants.

(i) Memory demands and portability of software may be a more important issue than efficiency as the software is transferred to a PC environment.

(ii) Suitable interface software, for example a GF3-Proc for PCs, is essential to ensure a correct data structure in creating GF3 compatible data sets on a PC. This will have the advantage of ensuring that data sets are well documented since GF3 imposes this discipline on those who use it.

(iii) An extension is needed to GF3-Proc as it now stands, to permit the reading and writing of GF3-PC files. This extended GF3-Proc must be able to run on PCs.

(iv) The GF3-PC software must be able to both read and write data in the formats of the more common spreadsheet and data base management packages that presently run on PCs.

30 The Group agreed that the goals of a PC version were to provide well documented data to the IODE system, and to provide an easy mechanism to PC users whereby they could both receive data

from and send data to the IODE system, and also archive their own data. The Chairman was prepared to continue to develop his ideas for a PC version of GF3. Following a request from the Chairman, the Group agreed to send their views on this topic to him by 16 September 1988.

3.4 GF3 PUBLICATIONS

31 The Group expressed its appreciation of the cover design and colouring applied to the GF3 brochure and to IOC Manuals and Guides No. 17, Vol. 2, and requested the IOC Secretariat to use this design for all future GF3 publications, in order to give the GF3 formatting system a distinctive image.

32 The Group then discussed the publication of IOC Manuals and Guides No. 17, GF3 - A General Formatting System for Geo-Referenced Data.

33 Noting that to permit easy updating, users preferred to hold GF3 manuals in loose leaf form, the Group requested the IOC Secretariat to use a binding for future volumes that allowed this.

34 The Chairman noted the urgent need for GF3 publications, in English, Spanish, Russian and French, to be used during training and as reference material in the Centres. The Group stressed the importance of speedy production of these volumes when they are submitted for publication, including production of the translated versions in French, Spanish and Russian, and called on the Secretary IOC to ensure this.

Volume 1: "Introductory Guide to the GF3 Formatting System"

35 The Group identified a widespread need for a simple guide which introduced both GF3 and GF3-Proc using plenty of diagrams and a single worked example of a straightforward GF3 application. Mr. Keeley suggested that any introductory document to GF3-Proc should emphasize that only a small number of the many available functions were commonly used, and hence that the software was much easier and more straightforward to use than first appeared.

36 The Group decided to review the earlier Introductory Guide, IOC Manuals and Guides No. 9, Annex I Part 3 and to pass their comments on the form and content of Volume 1 to the Chairman with a copy to Dr. J.R. Wilson, MEDS by 30 September 1988. Dr. Wilson undertook to prepare a first draft for Volume 1 by 9 December 1988 which would then be circulated to the Group for review. The Chairman of the Group took responsibility for co-ordinating the results of this review with a view to publication of Volume 1 during 1989.

Volume 2: "Technical Description of the GF3 Format and Code Tables"

37 This volume is now available in English, Russian and Spanish. The Group requested the IOC Secretariat to follow-up the translation and production of the French version, and to send a stock of the Russian and Spanish versions to RNODC-Formats.

Volume 3: "Standard Subsets of the GF3 Format"

38 The Group reiterated that GF3 Standard Subsets are helpful as anyone using GF3 for a data type covered by a subset does not have to prepare a definition record, can use the example as a checklist for documenting the data, and can use it as a starting point for developing his own subsets. The Group recommended that definition records for the standard subsets be made available in machine-readable form.

39 The Group agreed that while the subsets should be bound together as a volume, for ease of use the content of each subset should stand alone, even though this implies some redundancy between the different subset definitions.

40 The Group agreed that Volume 3 should be submitted for publication in June 1989, incorporating standard subsets ready at that time.

Volume 4: *"User's Guide to the GF3-Proc Software"*
and
Volume 5: *"Reference Manual for the GF3-Proc Software"*

41 **The Group decided** that as copies of the pre-publication drafts would shortly be sent to those data centres needing to upgrade from Level 3 to Level 4 of GF3-Proc, these centres should be invited to comment on the documentation in time for the Chairman to submit a final version for publication by 11 November 1988, without waiting for pending software updates.

GF3 Reference Sheets

42 **The Group was of the view** that a set of reference sheets, covering both GF3 and GF3-Proc, was an essential tool for GF3 users and should be issued as Volume 6 of IOC Manuals and Guides No. 17. The Chairman undertook to submit these sheets to the IOC for publication by 11 November 1988.

GF3 Newsletter

43 The Chairman introduced "GF3 Update", document IOC/GETADE-IV/14, a draft of a GF3 newsletter. The Group regarded this as an excellent presentation of current developments in the GF3 system. **The Group recommended** that the Chairman consult with the IOC Secretariat to arrange for copying and distribution of the newsletter during September 1988 to all IODE National Coordinators, to the RNODC-Formats list of GF3 enquirers, and to other known GF3-Proc users.

44 Among topics suggested for subsequent issues of the newsletter were a brief summary of the main decisions of the present session, extracts from national reports, and technical accounts of the application of GF3 and GF3-Proc to particular applications.

45 The Technical Secretary pointed out that the International Marine Science (IMS) newsletter could be used to promote the GF3 system, particularly by highlighting the availability of new GF3 publications.

4. REVIEW OF THE ROSCOP SYSTEM

46 The Chairman introduced document IOC/GETADE-IV/12, "Revision of the ROSCOP form" and summarized the recommendations on the ROSCOP system made by the Ad Hoc Consultation of Experts on Data Monitoring in the IODE System which had preceded the Session (Document IOC/Ad hoc IODE Mon./3). He explained to the Group the issues related to this revision, particularly the design of the data type code. Among points raised in the subsequent discussion were the question of retention of IHB sea area codes, the possible use of other numbering schemes for ten degree squares including the WMO scheme, and the possible use of GF3 parameter codes as a basis for the data type code.

47 The Chairman pointed out that producing a further draft would inevitably involve compromises between the differing views expressed. In preparing this draft, as agreed by the Consultation, he and Mr. Dooley would take account of all the views put forward.

48 **The Group** reiterated the importance of including track charts with ROSCOP forms and stressed that, as the new and existing versions would be compatible, the existing ROSCOP forms could still be used where Member States found this appropriate. In addition **the Group emphasized** that, with the new version, particular scientific programmes or Member States were free to request supplemental information from Chief Scientists of the cruises concerned.

49 **The Group concurred** with the recommendation of the Consultation that a revised draft be prepared by Dr. M.T. Jones and Dr. H.D. Dooley by November 1988, and that it be circulated to IODE National Coordinators for comment with a view to final approval in May/June 1989.

50 At the suggestion of the Chairman, **the Group decided** to defer consideration of standards for computerized storage of ROSCOP information until the design of the reporting form had been finalized.

5. IMPLICATIONS FOR IODE OF RECENT TECHNICAL APPROACHES TO DATA EXCHANGE

5.1 APPLICATION OF CURRENTLY AVAILABLE COMPUTER TECHNOLOGY

51 Mr. H.A.C. Jones, MEDS, Canada, and Dr. J.R. Wilson gave a two part presentation which analyzed trends in future demands likely to be placed on oceanographic data management, and outlined the solutions that are being considered in Canada. Mr. Jones began with the thesis that while ocean science is rich in data, it is poor in extracting information from the data. He stated that present data collection technology, computers and communications technology limits our ability to produce decision support and strategic information. However, these limits will disappear in the future with rapid technology advancement. Then our poor understanding of ocean information needs will become the new limitation. He introduced the concept of "user model", defining it as a description in complete functional detail of the requirements for an ocean information system. He proposed that as much effort should be spent in the future to define these user models as is now spent on data collecting and technology advancement. With excellent user models to build future information networks on, the role of the data manager and the functionality of information networks will be assured.

52 Dr. Wilson then outlined the ways the user modeling problem is being tackled within Canada, noting that a national user study has just been completed. He discussed the concept of an Ocean Information System (OIS) which is linked by a computer network. The Department of Fisheries and Oceans is in the process of establishing the backbone network linking the various departmental oceanographic institutions in Canada. After discussing the various data suppliers to the system, Dr. Wilson went on to discuss the users of the OIS and noted that there is provision for participation by both governmental and private sector groups. A number of the concepts of the OIS are in place but the linkages are still missing. He emphasized that without this networking, users will not have the access they need to ocean information in the future.

53 Mr. Keeley presented document IOC/GETADE-IV/8. He emphasized that many of the ideas expressed in the document were being realized at many places in the oceanographic community and that there was some urgency for IODE to meet the issue directly. He noted that while individual aspects of new technology are of importance, the effects and impacts of combinations are much more far reaching, and more than a simple addition of separate capabilities. He emphasized that the gains made by individual centres by adopting new technology, would show gains for the entire IODE system in improved system performance to the oceanographic community. He concluded by suggesting that a mechanism be established to examine the areas in which new technology could be used, and to set priorities on which areas should be pursued first.

54 Several suggestions were made in the subsequent discussion.

(i) IODE data centres should be canvassed to determine what technology is presently at their disposal, and their views on where progress might be made. The Group welcomed this suggestion.

(ii) A mechanism should be set up for the IODE system to identify appropriate applications of new technology, both those already used by IODE data centres and others. The mechanism should include monitoring of current and emerging standards in the relevant technologies, and be designed to ensure clear and definite recommendations for the TC-IODE on the directions to take in applying new technology. The provision of information on capabilities existing at other data centres would enable data centres acquiring new capabilities to make choices ensuring a high level of compatibility between IODE centres.

(iii) CD-ROM technology is attractive for data distribution because of low cost and high storage capacity. The Group expressed the view that this is one area that deserves immediate attention.

55 The Group agreed that it is imperative that a workshop be organized at which these issues can be discussed in detail (See Agenda Item 6).

5.2 TECHNICAL ASPECTS OF IODE INTERACTION WITH GLOBAL OCEAN SCIENCE PROGRAMMES

56 The Chairman noted that large scale science programmes such as WOCE, TOGA and JGOFS were largely autonomous in their approach to data management although there was a general willingness to use internationally agreed standards and procedures where appropriate. The IODE system therefore needed to take account of the data management methods and requirements of these programmes in developing IODE standards.

WOCE

57 The Chairman noted that the data management section of the draft WOCE implementation plan included use of GF3 for data exchange.

JGOFS

58 The Chairman welcomed Dr. G. Flierl, MIT, Cambridge, USA to the Session and invited him to present the data management scheme being proposed for the US component of the JGOFS study.

59 Dr. Flierl noted that this study, which will start in 1989 and last through the mid 90's, includes chemistry, biology and some physical oceanography. Many US GOFS scientists are not used to large scale data management, work with PCs and do not send data to national archives. To provide timely access to up-to-date data a distributed archive is seen as essential and MIT had submitted a proposal to develop a system to NSF. If approved the effort would involve 3 scientists and 2 programmers over a two year period, one year to create some basic working examples, the second to extend it to the full specification.

60 The software system would be custom-built applying the computer science principle of "object oriented databases".

61 Transparent transfer of data from PC to PC through the SPAN and INTERNET communications networks would be supported and 10-15 network nodes are anticipated initially. The aim is to provide a scientist with the means so that whichever data format or software package he is using (e.g. Lotus, dBase III, GF3-Proc), any other scientist can access his data through a standard interface. To the remote scientist a particular data set and the interface programme ("method" in object oriented language) appear as an "object" which returns defined "messages" in response to defined incoming messages (implemented as remote procedure calls). Equally a scientist using, for example, the Lotus software package needs a "method" so that all data on the network accessed through the standard interface, look to him as though they are part of his Lotus files. A simple readable ASCII message format is planned for the network data exchanges and "methods" inputting this format will be provided, for example, to merge data sets and for processing functions such as graphic display.

62 In response to questions Dr. Flierl stated that the system would provide inventory facilities to determine what data were available through the network, and the ability to include adequate data documentation including plain language comments, essential for the very diverse data types of JGOFS. He was looking at existing data formats, notably GF3, to get ideas for this. He also intended to give scientists the facility to control use of their data by restricting or recording external data accesses. The system will not provide graphics data transfer.

63 Dr. V. Keondjan outlined Argos, a data presentation system written in Fortran 77 being developed in the USSR, which includes the ability to process data through mathematical models, and has some similarities with the JGOFS system.

TABLE 1 - TOGA DATA SETS

Data Sets			Data Centres			
Contents	Period	Format	Name-Location	Input	Products	Status
.Level Global III-A fields -Basic (00,12) -Advanced (00,06 12, 18) -Supplementary (00,12)	85-95	GRIB	Atmospheric Level III-A Data Centre (ECMWF)	GTS	-	Operational
.Global Level III Precip. fields - monthly 2.5° x 2.5° lat/long	87-95	GRIB	Global Precitation Climatology Centre (FRG)	-SYNOP (GTS) -CLIMAT (GTS) -Satellites Radiances (GEOSAT & POLAR)	Maps	SYNOP,CLIMAT Operational
.Level II-B marine surface met. data	85-95	IMMT	TOGA Marine Climatology Data Centre (UK)	-VOS	-	Operational
.Level III-B SST 2° x 2° grid monthly Level II-A SST observations	85-95	GRIB FGGE	Global Sea Surface Temperature Data Centre (CAC, USA)	-GTS, SHIP DRIBU TRACKOB -Satellite retrievals	Maps	Operational
.Level II-B -Sea Level Values -Pressure Gauges -Monthly averages	85-95	TBD GF3 upon request	Tropical Sea Level Data Centre (Hawaii, USA)	-Sea Level Data (hourly) daily) -Monthly Sea Values -Pressure Gauge Data	Monthly synoptic maps Monthly indices	Operational -Pacific -Indian (no maps yet)
.Level II-B Sub-Surface temperature and salinity	85-95	GF3	Tropical Ocean Sub-Surface Data Centre (Brest, France)	-IGOSS: BATHY TESAC -XBTs, CTD, XCTDS -JEDA Level II-B data set	Monthly maps	Operational

TOGA

64 Dr. Joel Martellet described data management plans for the Tropical Ocean Global Atmosphere experiment, part of the WCRP aimed at improving climate forecasting on sub-annual and inter-annual scales. He noted that improvements in data availability through IODE will benefit this programme. TOGA started on 1st January 1985 and will continue through 1994/1995. He presented the TOGA data sets being assembled, as summarized in Table 1. He noted that GF3 will be used to exchange and archive oceanographic data sets, including XBTs and sea level copies will go to WDCs A and B, Oceanography. A meeting later this year with both data managers and scientific users, is planned to assess if the TOGA data flow meets scientific needs, and to define any additional data sets required.

65 There are seven years left in the field phase of TOGA and therefore new means of data distribution can be employed to meet user requirements. In addition to magnetic tape, TOGA is exploring data distribution through use of CD-ROMs and communication networks. From 1991 satellite altimetry and scatterometer data will be available. TOGA and WOCE planned to collaborate for datasets of common interest.

66 Dr. N.N. Michailov reported that although marine climatological data was to be archived in the IMMT format, use of a GF3 subset with the proposed binary option would give a 50% saving.

67 The Group noted that there is a need to specify a GF3 subset for sea level data which would be used by TOGA.

68 The Group noted that at the Meeting on IGOSS/IODE Data flow, Ottawa, Canada, January 1988, (Document IGOSS-IODE-DF.2) the requirement to collate a full set of guidelines for quality control of oceanographic data had been referred to GETADE. The Group regarded it as more appropriate for this action to be considered by the IODE Task Team on Oceanographic Quality Control and requested the IOC Secretariat to inform the Task Team Chairman of the requirement.

6. PLANS FOR WORKSHOP ON APPLICATION OF NEW COMPUTER TECHNOLOGY AND TELECOMMUNICATIONS TO OCEANOGRAPHIC DATA MANAGEMENT

69 The Technical Secretary introduced document IOC/GETADE-IV/9 outlining the proposal for such a Workshop made by the Twelfth Session of TC-IODE.

70 In response to its revised Terms of Reference, the Group believed a small Workshop to explore data management possibilities made available through new technology to be vital. In order to prepare for the Workshop, the Group recommended that:

(i) MEDS be invited to write a paper to be distributed to the Group by September 1988 with suggestions as to how best to proceed on this issue;

(ii) the IOC Secretariat coordinate a technical survey in collaboration with IODE National Coordinators to gather information about existing technologies used for ocean data management both within IODE centres and by scientists and other users in each country;

(iii) MEDS be invited to circulate to the Group as early as possible the results of the User Requirements study that they recently completed;

(iv) MEDS be invited to supply a copy of the work statement for the User Requirements study to the IOC Secretariat to help in the preparation of the IODE survey;

(v) those centres offering training courses in the next year ask for statements of user requirements from participants, and that these be forwarded to the Technical Secretary at the IOC Secretariat;

(vi) the IODE Task Team on Data Centre Services be contacted for their views on a user and technology survey;

(vii) the Workshop on Ocean Climate Data Management be approached to describe their requirements for using the IODE system;

(viii) the Technical Secretary ask ACCIS, the UN committee which is working on assembling information on telecommunications networks in the world, to provide the results of their work to the IOC;

(ix) the IOC Secretariat request IODE System Data Centres to supply any information that they have on user requirements for ocean data;

(x) the IOC Secretariat seek information on any user requirements for oceanographic data identified by donor agencies such as IDRC and ICOD;

(xi) the IOC Secretariat collate all of this information for use in the planning of a detailed agenda for the Workshop.

71 The Workshop would review the status of available technology and focus on specific areas of technology that are thought to be particularly helpful in data exchange and data management. The participants from MEDS agreed that their organization would assist in preparing for the Workshop.

72 **The Group recommended** that a small group of IODE experts and ocean data users, chosen by the Secretary IOC in collaboration with the Chairman, constitute the Workshop participants, that the Workshop last for 5 days and that it be held near the end of 1989.

73 Mr. Hamilton reiterated the offer of the U.S. NODC to host this meeting. **The Group welcomed** this offer, **and noted** that the wide availability of, and experience with, recent computer and communications technology among oceanographers in the USA and Canada meant that there would be substantial gains from a North American location for this activity.

74 **The Group believed** that it is essential for each Data Centre in the IODE System to have a clear description of its users' requirements for oceanographic data. The Group urged all data centres that do not have this information to take action to obtain it.

7. TRAINING AND MUTUAL ASSISTANCE ACTIVITIES

75 The Technical Secretary reviewed for the Group training activities either planned or possible, as outlined in document IOC/GETADE-IV/10. Courses focusing specifically on GF3 have been proposed or are seen as needed in the U.S.S.R. and in Argentina. Other IOC training courses in ocean data management will devote some time to the use of GF3 and GF3-Proc. Presently, such courses are planned in Japan, Canada and Thailand. In addition, there are other TEMA activities and consultant visits which should include some component of distributing information about GF3.

76 Dr. M.T. Jones reported on results of a one week GF3 training course held in May 1988 at MIAS with participants from China, Portugal, and Yugoslavia. It was their experience that a small number of class lectures, with ample time for practical exercises, was a productive division of time.

77 All of these planned activities put heavy pressure on the available resources. Therefore, the Group proceeded to identify some priorities.

78 South American countries are already contributing to data exchange, but increased competence in use of GF3 is expected to greatly facilitate the flow of data. **The Group regarded** a GF3 training program in South America as essential in order to increase the flow of data from the climatically important oceans surrounding the continent **and recommended** that the Secretary IOC give high priority to funding and organization of such a course.

79 Mr. Yang Dequan emphasized the need in data centres such as his own for training in the use of GF3 and the GF3-Proc software. In particular, Mr. Yang suggested that training be provided to WESTPAC countries through the Japan NODC, which is RNODC for WESTPAC.

80 **The Group noted with appreciation** the ocean data management training provided by Japan as a contribution to WESTPAC, **and recommended** that the Secretary IOC explore with Japan the possibility of giving special emphasis to GF3 and GF3-Proc training in the 1989 JODC Ocean Data Management Course, with participation of a GF3 expert from outside Japan to be funded by IOC.

81 Dr. N.N. Michailov presented information on the Training Course to be arranged in the USSR for specialists from developing countries (Document IOC/GETADE-IV/19). The Group suggested that, to achieve maximum benefit from this course, candidates should be selected from medium sized to large data centres.

82 Dr. V. Keondjan, Chairman, Task Team on IODE Data Centre Services, described the recommendation that a CLICOM-like system be developed to help small centres and developing nations in ocean data management, and requested guidance from the Group. The Group agreed that the first step is to define the purpose and functions of this system. Dr. Keondjan was invited to seek the detailed views of the Group by correspondence.

83 In this context, the Group recognized that there is a need to gather definitions of the user requirements for an ocean data management system from a sample of Member States and data centres, and noted that training courses such as the one planned in Canada provide an opportunity to do this.

8. DRAFT ACTION PLAN FOR THE NEXT INTERSESSIONAL PERIOD

84 The Group requested the IOC Assistant Secretary, in consultation with the Chairman, to prepare an Action Plan for 1988-1991 summarizing the work required to fulfill the recommendations of the Session. This is presented as Annex V.

9. MEMBERSHIP OF THE GROUP

85 Mr. H. Hecht announced that as he had taken up a new post within the Deutsches Hydrographisches Institut and was no longer Director of the DOD, he would be resigning from Membership of the Group, following the present Session. In his view, Mr. C. Brockmann, the present Director of the DOD was well qualified to contribute to the work of the Group and he hoped that his candidature would be favourably received. The Group endorsed this view and thanked Mr. Hecht for the efforts he had made for the work of the Group.

10. DATE AND PLACE OF NEXT MEETING

86 The Group recommended that its Fifth Session take place in 1991 and requested the Secretary IOC, in consultation with the Chairman of the Group, to select a suitable location in the light of any invitations that may be received from Member States.

11. ADOPTION OF THE SUMMARY REPORT

87 The Group adopted the Summary Report and requested the IOC Secretariat to consult with the Chairman to produce the final version with editorial changes considered necessary.

12. CLOSURE

88 The Chairman, in his closing remarks, thanked the participants for their lively and constructive contributions to the Session and expressed his appreciation of the clearly focused manner in which they had addressed a wide range of issues. On behalf of the Group he thanked the two Rapporteurs for their excellent reporting and Ms. Dolores Swift for processing the text in such an accurate and efficient manner. Finally a special vote of thanks was extended to MEDS for their kind hospitality and support in hosting the meeting.

89 The Chairman closed the Session at 11.45 a.m. on Friday 15 July 1988.

ANNEX I

AGENDA

1. OPENING OF, AND ARRANGEMENTS FOR THE SESSION

2. REPORT ON INTERSESSIONAL ACTIVITIES

3. DEVELOPMENT AND PROMOTION OF THE GF3 SYSTEM

   3.1 Review of GF3 development and approval of new subsets
   3.2 GF3-Proc software development and dissemination
   3.3 Use of GF3 on microcomputers
   3.4 GF3 publications

4. REVIEW OF THE ROSCOP SYSTEM

5. IMPLICATIONS FOR IODE OF RECENT TECHNICAL APPROACHES TO DATA EXCHANGE

   5.1 Application of currently available computer technology
   5.2 Technical aspects of IODE interaction with global ocean science programmes

6. PLANS FOR WORKSHOP ON APPLICATION OF NEW COMPUTER TECHNOLOGY AND TELECOMMUNICATIONS TO OCEANOGRAPHIC DATA MANAGEMENT

7. TRAINING AND MUTUAL ASSISTANCE ACTIVITIES

8. DRAFT ACTION PLAN FOR THE NEXT INTERSESSIONAL PERIOD

9. MEMBERSHIP OF THE GROUP

10. DATE AND PLACE OF NEXT SESSION

11. ADOPTION OF THE SUMMARY REPORT

12. CLOSURE

ANNEX II

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ANNEX III

LIST OF DOCUMENTS*

Document code	*Title of document*
IOC/GETADE-IV/1	Agenda
IOC/GETADE-IV/2	Annotated Provisional Agenda
IOC/GETADE-IV/3	Summary Report
IOC/GETADE-IV/4	List of Documents
IOC/GETADE-IV/5	List of Participants
IOC/GETADE-IV/6	Chairman's Report on Intersessional Activities
IOC/GETADE-IV/8	Impacts of New Technology on IODE
IOC/GETADE-IV/9	Proposal for Workshop on Application of New Computer Technology and Telecommunications to Oceanographic Data Management
IOC/GETADE-IV/10	Future Training and Mutual Assistance Activities
IOC/GETADE-IV/12	Revision of the ROSCOP form
IOC/GETADE-IV/13	Standard GF3 Subset for Classical Hydrocast Data (final draft for approval)
IOC/GETADE-IV/14	GF3 Update
IOC/GETADE-IV/15	A proposed extension of GF3/GF3-Proc to incorporate binary data
IOC/GETADE-IV/16	The utilization of the GF3 formatting system and the software package GF3-Proc in Marine Institutions of the USSR
IOC/GETADE-IV/17	Standard subsets GF3 for observation data on marine pollution (petroleum and petroleum products)
IOC/GETADE-IV/18	Proposals on the GF3 system development
IOC/GETADE-IV/19	Information on the GF3 training course to be arranged in the USSR for specialists from developing countries
IOC/GETADE-IV/20	A derivative subset of GF3 suited to use on personal computers

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* This list is for reference only. No stocks of these documents are maintained.

ANNEX IV

NATIONAL REPORTS ON PROGRESS IN THE USE OF GF3

ARGENTINA

Comments on Installation of GF3-Proc

During the installation of the first version:

1 - no compilation errors encountered in GF3-Proc, with our FORTRAN/77 version

2 - the GFSOWT and GFSIRD subroutines were modified (we needed to put FORMAT definitions in the READ and WRITE statements because without these the output tape was generated with records in variable spanned format)

3 - the numbers of the INPUT-OUTPUT units were out of range for our installation (this problem was resolved by changing the logical unit numbers)

4 - the subroutine PLNTXT contained statements incompatible with our FORTRAN/77

5 - the test program for the pilot phase was written for ASCII GF3-Proc installations, but our installation needed EBCDIC GF3-Proc, so the GF3-Proc test output tape was generated in EBCDIC code and converted to ASCII by a standard utility

Comments on use of GF3-Proc

Since the first version of GF3-Proc was installed and tested (mid 1987):

- CEADO has not received any tapes in GF3 format
- CEADO has not sent any tapes in GF3 format (or in national format) to the RNODC's (data exchange between national institutes was made in national format)

Comments on the use of GF3 by CEADO

December 1985: CEADO was invited to participate in the Pilot Phase of GF3-Proc distribution and installation.

April 1986: CEADO sent the details of the computer
(IBM 370/3032 OPERATING SYSTEM OSVS2-MVS)
(COMPILER FORTRAN: VS RELEASE 3.0)
(MAGNETIC TAPE DENSITY: 6250/1600/800 BPI)
(INSTALLATION CODE: EBCDIC)

September 1986: CEADO sent a magnetic tape to WDC 'A' with oceanographic station data for ISLAS ORCADAS, in GF3 format. (This tape was produced using a program written by CEADO's programmers.)

December 1986: CEADO received the tape of GF3-Proc software.

February 1987: CEADO sent to MIAS (UK) a tape containing the output of the test program sent by MIAS to fulfill the pilot phase for the installation of GF3-Proc.

June 1987: CEADO sent to MIAS a second tape containing the output of test programs. (The first tape arrived at MIAS in mid-July).

September 1987: CEADO learnt that "Level 4 of GF3-Proc should be ready for installation in 1988".

CANADA

Canada began using GF3 as early as 1982 in receiving hydrocast and CTD observations. These were developed before standard subsets existed and before the use of GF3-Proc. Since about 1986 all applications have been written using GF3-Proc. At present, there is the capability to read and write mean sea level data, and to write BATHY, TESAC and drifting buoy data in GF3. Within Canada,

private companies collecting current meter, wave and tidal data must report these in GF3 and so these can also be read these. GF3SUMM and GF3LIST software provided by MIAS are also used extensively by Canada. All reading and writing activities are carried out on CDC hardware with the exception of BATHY and TESAC subsets which can be written on CDC and DEC hardware.

Canada did not use GF3-Proc for reading or writing GF3 data as soon as the facility was available. This was because the documents describing it gave the impression that it was very complicated to use. Upon the recommendation of others, it was used and noted that only a relatively small number of the subroutines are needed frequently. So, what appeared to be a very complex system to learn reduced to a simpler one in practice. This suggests that an introductory document to GF3-Proc should explain this clearly such that new users would not feel overwhelmed by the apparent complexity.

Recently a newly established oceanographic institute in Canada has started to explore the utility of GF3 as an archiving format. To assist them, MEDS will be forwarding documents and providing assistance in evaluating this as an archive option.

GF3 is not used by most of the oceanographic institutes in Canada because they already have established formats and in the past did not have to deal with data in differing formats from a variety of sources. Because of the evolution of data management here, they are now faced with a diversity of formats, and so are starting to appreciate the advantages of both GF3 and GF3-Proc.

Early in 1989, the newest WMO code for wave data (WAVEOB) will come into use on the GTS. It is necessary that the present GF3 wave subset be compared to the WAVEOB code form to ensure that they are compatible in parameters and that there is a ready correspondence between them. Depending on the results of this comparison, it may be necessary to modify the present subset or develop a new one for this code form.

Through members on IGOSS committees, Canada has become aware of the BUFR code recently approved by WMO for the transmission of data over the GTS. This code form has similarities to GF3 and appears to some people to be in competition with GF3 in the functions it presently can, and in future could perform. Mr. Keeley has been involved in the development of a flexible coding scheme for oceanographic data sent over the GTS. In the course of this work, he has begun the task of comparing GF3 parameter tables and BUFR code tables. It appears to be necessary to define the relationship of GF3 to BUFR so that advantage can be taken of the work done by both communities in the area of data exchange mechanisms.

It has become apparent that the widespread implementation of GF3 has been slowed by the scarcity of resources available for the development of software. If different centres could make use of software developed by others, this would be of great help in the expansion of the use of GF3. For this to be viable, it would be necessary that all centres use GF3-Proc in any application development. Secondly, it would be helpful if there were a set of recommendations of how the software be structured so that it could be most readily used by others. It is recognized that each centre would have to write their own software to read and write the data into or from the particular application software.

On a quite separate issue, two members of the IGOSS OTA group are rewriting recommendations for standards relating to the quality control of data both before insertion to the GTS and after the data are received from the GTS. The Chairman of the OTA group has expressed his desire that these suggestions might receive wider adoption within the IODE community so that there would be a standardization in the procedures followed. If this were so, secondary data users would be assured of a consistency of data handling within the entire IGOSS/IODE system.

CHINA

Part 1 and Part 2 of the GF3 technical specification were translated into Chinese in 1982. But only a few people were interested in it then, because at that time there was no computer with magnetic tape in CNODC. Since 1984, new computer equipment has been installed, such as IBM 4343, Micro VAX II and IBM PC-XT and AT. So the situation has now changed a lot. More and more people are realizing that GF3 is very useful for data exchange.

It is suggested that the IOC should urge Member States using the GF3 format for data exchange to build standard software based on GF3.

There are several levels, WDCs, RNODCs and NODCs, at which people need to use the GF3 format. Training Courses should be held firstly in RNODCs and then in NODC's. In the WESTPAC Region a training course should be held at JODC.

FEDERAL REPUBLIC OF GERMANY

1. Activities since GETADE III (1985)

At Deutsches Hydrographisches Institut (DHI), the German Oceanographic Data Centre (DOD) utilizing a CDC Cyber mainframe participated in the pilot phase of GF3-Proc. In November 1985, the first Cyber version of GF3-Proc was installed which proved to be a very easy procedure. It turned out that, for the Cyber machine (NOS2), GF3-Proc also ran without difficulties in a pure Fortran 77 environment even taking advantage of character strings in calling GF3-Proc subroutines.

Subsequently, application software has been developed for:

- summary of contents of GF3 formatted files
- current meter subset
- sea level data subset
- CTD subset

Application software for hydrocast and BT data still remains to be written.

When DOD became engaged in the monitoring programmes for the North Sea and Baltic Sea, a new approach for data banking covering a broad variety of parameters including biological and chemical contaminants was needed. The GF3 parameter code system was adopted for that purpose as quickly as possible.

The following institutions have installed the GF3-Proc package:

- Alfred Wegener Institut (AWI), Bremerhaven:
  Mainly for digital bathymetry, work has not yet been completed, however.

- Institut fur Meereskunde, Kiel (IFMK):
  Software has been developed for transferring the internal general format of IFMK, MK4 to GF3. This software was tested successfully in July 1987, and it was agreed to prefer GF3 for future data exchange between IFMK and DOD. As IFMK does not have central data management, this agreement has not become operative so far, but progress may be expected in the near future.

- Bundesanstalt fur Geowissenschaften und Rohstoffe, Hanover (BGR):
  Following a request by the Ministry of Research and Technology, DOD has developed a system for documenting geoscientific research cruises based on GF3. A subset has been worked out comprising all information on the cruise, stations and profiles including instrumentation used, a second part of the subset covers positions and depths of the cruise in 10 min. intervals. GF3-Proc is installed on the VAX computer of RV "Sonne"; all cruise documentation data will be recorded on magnetic tape in GF3 format at the end of each cruise, and will be sent to DOD. The system is now at the final testing stage and is expected to become operational soon. The system is planned to be extended so as to cover also research cruises of other institutes.

2. Problems Identified

- It was found that, in addition to the existing GF3-Proc documentation, a set of worked out and documented sample programs were very helpful indeed. GF3 utilities such as a summary program for GF3 files or other programs of common interest could be useful for that purpose.

- There is clearly a need for a PC version of GF3 allowing data entry and exchange of low-volume data under GF3.

- For biological data a mechanism is needed to provide a reference table for taxonomic codes at the tape header or file header level for reference at the series level without losing any flexibility as to cycle definition records at any level.

- At least guidelines are needed now to define parameter codes for the huge variety of chemical substances collected in pollution monitoring programmes. Presently there is a tendency to define contaminant parameter codes in a way that is incompatible with the parameter coding rules of GF3.

- There exists a need for a subset for multibeam echo sounding data.

UNION OF SOVIET SOCIALIST REPUBLICS

Installation and utilization of the GF3 system and the software package is underway in a few marine institutions of various agencies in the USSR. At present, the Technical Description of the GF3 Format (Manuals and Guides No. 17), the software package, documentation and instructions on installing and testing the software package have been installed in the following three centres:

- The Centre for Physical Oceanography (Oceanographic Data Centre of the All-Union Research Institute of Hydrometeorological Information - World data Centre, Goskomgidromet i.e., the USSR NODC);

- the Centre for Marine Geology and Geophysics (Marine Geological Data Centre of the Ministry of Geology);

- the RNODC MARPOLMON (the Odessa Branch of the State Oceanographic Institute).

In mid-1987, a Workshop was held at the USSR NODC, on the utilization of the GF3 potentialities for oceanographic data accumulation, archival and exchange after which the GF3 system software documentation as well as the software package were forwarded to 4 other institutes (the USSR Academy of Sciences and the Ministry of Fisheries) dealing with the above-mentioned problems. In spite of the fact that the GF3 documentation has been rather widely distributed among marine institutes, it is only in the centres on physical oceanography, marine geology and geophysics, and on MARPOLMON that they deal purposefully with the installation and utilization of the GF3 system facilities.

1. Utilization of the GF3 System

A GF3 subset for deep-sea observations has been developed at the NODC, and programmes for reformatting data from the national format into the GF3 format have been designed. Data are submitted to WDC-A (USA) in this format on magnetic tape. Besides, a draft GF3 subset for this data type has been prepared which is more like the national format in its structure.

A GF3 subset for marine oil pollution observations was developed at the RNODC for MARPOLMON which was forwarded to the Chairman of the GE TADE of the TC/IODE.

The GF3 system is used for describing archival data sets on magnetic tapes at the Centre for Geology and Geophysics.

2. Utilization of the GF3 software package

During 1987-1988 the software package GF3-Proc was installed and tested in the centres for physical oceanography, geology and geophysics, and RNODC for MARPOLMON. The test magnetic tape compiled at the NODC was checked and found to be correct by the package designers (UK). A programme for obtaining special information on the composition of a GF3 formatted magnetic tape was developed on the basis of the GF3-Proc fixed field handling routine. Development of a programme for

converting WDC-B CTD data and XBT observations from GF3 to the data archival format is under way. During GF3-Proc installation, the choice of data type as required by the software package for providing the interface between the user's programme and GF3 was very difficult. In view of this, it is suggested that the data type description used in GF3-Proc should be made more specific in Volumes 4 and 5 of the GF3 documentation whose publication is being prepared. Also, samples of the users' programme texts containing calls to most frequently used (according to the designers) subroutines of the package should be included in these volumes.

Since the GF3 installation phase has been completed at the Centre for Physical Oceanography, the level of future utilization and development of GF3 (including the software package) at the centre will depend on the flow of GF3 formatted data on magnetic tape to WDC-B. Unfortunately, it must be admitted that the portion of the GF3 formatted data on magnetic tape is a rather small part of the total volume of incoming data (in 1986-1988 the data submitted in GF3 amounted only to 10% of the total data flow). Due to this, there are still difficulties in solving the problem of wider use of the GF3 system in the Centre for Physical Oceanography as well as in other centres.

UNITED KINGDOM

GF3 and GF3-Proc have been in regular use at MIAS for a number of years. Experience has shown that, with relatively short and simple programs, it is possible to transfer data between GF3 and other formats with little difficulty - the bulk of the code is normally required to handle the non-GF3 format.

On behalf of the PSMSL, MIAS has used GF3 on a routine basis as the output format for servicing requests for mean sea level data on magnetic tape. It is also used for the dispatch of CTD data to the Hydrographic Department, Taunton, where GF3 has been installed to facilitate the reformatting of these data into the Department's own internal format. Copies of these tapes are also sent to ICES, and WDCs A and B (Oceanography).

MIAS plans to use GF3 as its in-house format for archiving directional wave spectra and one dimensional wave spectra. It has already used GF3 for the MEDALPEX sea level data and for a wide range of meteorological and oceanographic data collected during the JASIN 78 experiment.

The bathymetric contours of the GEBCO (6th Edition) are currently being digitized by the Bureau Gravimetrique International, Toulouse. As each Sheet is completed, the digitized contours are forwarded to MIAS for final checking and for formatting into GF3, which has been adopted as the standard format for distributing the digitized data. MIAS has also been involved in checking out a digitized version of the International Bathymetric Chart of the Mediterranean in readiness for making it available to the IBCM community in GF3.

GF3 is used routinely by the Marine Physics Group of the Institute of Oceanographic Sciences, Wormley, as their internal data archiving format. The GF3-Proc software is used to bring data back off the magnetic tape archives as and when required for further analysis. The utility of this GF3 format/GF3-Proc data interface approach to data archiving was amply demonstrated during a recent computer changeover - both the data and its interface software were ported over to the new system with minimal effort.

The Research Vessels Service of the Natural Environment Research Council, which provides shipboard computing support to the University and Research Council oceanographic community in the UK, has recently adopted GF3 as its standard format for the post cruise transfer of data from ship to shore and for onward delivery to the research oceanographer. The GF3-Proc software is used onboard for downloading the data onto magnetic tape. During the UK North Sea Project, most of the data will be passed on to MIAS in GF3.

UNITED STATES OF AMERICA

The U.S. NODC, as RNODC-FOY completed the FOY data set in the GF3 format. The FOY data set includes oceanographic hydrocast, Bathythermograph, CTD/STD, and current meter data. These files were converted before the GF3-Proc software package was available. GF3-Proc software was installed on NODC's VAX 11/750 in 1986. Since that time the package was used to create GF3 XBT tapes, using the standard subset of GF3 for XBT data. These GF3 XBT data sets are produced routinely at NODC and sent to the TOGA Ocean Thermal Center in Brest, France, in support of the TOGA project.

The World Data Center - A, collocated with NODC, reports it has received GF3 tapes from Argentina, Brazil, France, the United Kingdom and the U.S.S.R.

ANNEX V

ACTION PLAN ON TADE FOR 1988-1991

Agenda item	Action	Responsibility	Status	Comments
GF3 AND GF3-PROC DEVELOPMENT				
3.1	Develop test versions GF3-Proc for proposed binary extension	MIAS	Planned 12/88	
3.1	Test binary extension to GF3-Proc on VAX, IBM type and CDC mainframes	MEDS, MIAS, DOD	Planned 03/89	
3.1	Send comments on proposed binary extension to GF3 to Chairman GETADE	GETADE	Planned 09/88	
3.1	Submit binary extension GF3 for approval by TC-IODE and IOC governing bodies	Chairman GETADE, IOC	Planned 06/89	
3.1	Continue development of table of correspondence of BUFR codes and GF3 parameter codes and keep Group informed	MEDS	Continuing	
3.1	Review GF3 Subsets for Hydrocast and Petroleum pollution (MARPOLMON) data, send comments to Chairman GETADE	GETADE	Planned 09/88	
3.1	Develop GF3 Subsets for sea-level data, multi-beam echo sounder data, underway geophysics, and synoptic meterological reports	Chairman GETADE	Continuing	
3.1	Invite Hydrographer ICES to provide information to Group on polluant parameters requiring GF3 codes	IOC	Planned 01/89	
3.1	Request Chairman TT Marine Biological Data to provide specific requirements for formatting biological data	Chairman TC-IODE, IOC	Planned 01/89	
3.2	Dispatch GF3-Proc Level 4 to Level 3 users participating at GETADE-IV	MIAS	Planned 12/88	
3.2	Prepare document on effect on application software of change from Level 3 to Level 4 of GF3-Proc	MIAS	Planned 12/88	
3.2	Test GF3-Proc on PC compatibles	MIAS	Planned 12/88	
3.2	Ensure copyright protection of GF3	MIAS	Continuing	
3.2	Prepare draft guidelines for exchangeable applications software using GF3-Proc and distribute to Group	MEDS	Planned 12/88	
3.3	Send comments on proposed PC version of GF3 to Chairman GETADE	GETADE	Planned 09/88	
3.3	Develop more detailed proposal for a PC version of GF3	Chairman GETADE	Planned 06/89	

Agenda item	Action	Responsibility	Status	Comments
GF3 PUBLICATIONS				
3.4	Ensure speedy production of GF3 publications, including translations, with loose leaf binding and "GF3" cover design and colouring	IOC	Continuing	
3.4	Send comments on form and content of proposed IOC M+G No.17 Vol.1, Introductory Guide to the GF3 Formatting System to Chairman GETADE and to MEDS	GETADE	Planned 09/88	
3.4	Prepare first draft IOC M+G No.17 Vol.1 Introductory Guide to the GF3 Formatting System and circulate to Group for review	MEDS	Planned 12/88	
3.4	Coordinate review and arrange publication in E,F,S,R of IOC M+G No.17 Vol.1 Introductory Guide to the GF3 Formatting System	Chairman GETADE	Planned 12/89	
3.4	Follow up production of French version IOC M+G 17 Vol. 2.	IOC	Commenced, completion 01/89	
3.4	Send stock Russian and Spanish versions IOC M+G 17 Vol. 2 to RNODC Formats		Done 09/88	
3.4	Make definition records for GF3 standard subsets available in machine-readable form	MIAS	Planned 06/89	
3.4	Submit IOC M+G 17 Vol. 3, "Standard subsets of the GF3 Format" for publication in E,F,S,R	MIAS, IOC	Planned 06/89	
3.4	Invite centres to comment on M+G 17, Vols. 4 & 5, GF3-Proc documentation	MIAS	Planned 11/88	
3.4	Submit IOC M+G 17 Vols. 4 & 5, GF3-Proc documentation for publication in E,F,S,R	MIAS, IOC	Planned 11/88	
3.4	Submit IOC M+G 17 Vol. 6, "GF3 Reference Sheets" for publication in E,F,S,R	MIAS, IOC	Planned 11/88	
3.4	Distribute GF3 Newsletter to all IODE National Coordinators, and GF3 contacts	MIAS, ICES, IOC	Planned 09/88	
3.4	Promote GF3 system and publications through IMS Newsletter	IOC	Continuing	

Agenda item	Action	Responsibility	Status	Comments
ROSCOP SYSTEM				
4	Prepare revised draft of ROSCOP form	MIAS, ICES	Planned 11/88	
4	Circulate revised draft for ROSCOP to National Co-ordinators for comment	IOC	Planned 12/88	
4	Final approval new ROSCOP form	Chairman TC-IODE, Chairman GETADE, IOC	Planned 06/89	
4	Consider standards for computerized storage of ROSCOP information	GETADE	Planned 02/90	
GF3 APPLICATIONS				
5.2	Inform Chairman TT on Oceanographic Data Quality Control of requirement for quality control guidelines	IOC	Planned 01/89	
NEW TECHNOLOGY IN IODE				
6	Write issue paper and distribute to GETADE	MEDS	Done 12/88	
6	Conduct survey on existing technologies used by IODE data centres and by scientists and data users	IOC, IODE National Coordinators	Planned 10/89	
6	Circulate report of Canadian user requirements study to GETADE	MEDS	Done 12/88	
6	Supply copy work statement for Canadian User Requirement Study to IOC Secretariat	MEDS	Done 07/88	
6	Obtain statements of user requirements from participants in IODE Training Courses	IOC, MEDS, VNIIGMI, JODC	Continuing	
6	Request IODE TT on Data Centre Services to give views on a user and technology survey	Chairman TC-IODE, IOC	Planned 01/89	
6	Seek statement user requirements for IODE from Ocean Climate Data Management Workshop	IOC	Planned 02/91	
6	Seek information on worldwide telecommunication networks from ACCIS	IOC	Planned 02/89	
6	Request IODE system data centres to supply any user requirement information that they have obtained	IOC	Planned 02/89	
6	Seek information from donor agencies on user needs for ocean data	IOC	Continuing	Discussed with ICOD, July 1988
6	Collate information on technical issues and user requirements for planning Workshop on application of new technology in IODE	IOC	Planned 10/89	
6	Prepare and hold small Workshop on Application of New Computer Technology and Telecommunications to Oceanographic Data Management	IOC, MEDS, NODC	Planned 12/89	

Agenda item	Action	Responsibility	Status	Comments
TEMA RELATED TO TADE				
7	Organize and fund GF3 training program in South America	IOC, Chairman GETADE	Planned 12/90	
7	Explore possibility of special emphasis on GF3 and GF3-Proc training in 1989 JODC ocean data management course	IOC, JODC	Planned 09/89	
7	Hold training course on GF3 for candidates from medium-sized to large data centres	VNIIGMI, IOC	Planned 10/89	
7	Define purpose and functions of proposed ocean data management package for small data centres and developing nations	Chairman TT on Data Centre Services, GETADE	Planned 04/89	
FOLLOW UP OF GETADE SESSION				
8, 11	Produce final version GETADE-IV Summary Report with draft action plan for 1988-1991	IOC	Done 01/89	
10	Choose location for and organize GETADE-V	IOC, Chairman GETADE	Planned 12/91	