

# **JGOFS International Data Collection.**

## **Volume 1: Discrete Datasets**

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# **JGOFS International Data Collection.**

## **Volume 1: Discrete Datasets**

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### **I. Introduction**

#### **A. Joint Global Ocean Flux Study**

The Joint Global Ocean Flux Study (JGOFS) is an international and multi-disciplinary project with participants from more than 20 nations. JGOFS was launched in 1987 at a planning meeting in Paris under the auspices of the Scientific Committee of Oceanic Research (SCOR), a committee of the International Council for Science (ICSU). Two years later, JGOFS became one of the first core projects of the International Geosphere-Biosphere Programme (IGBP). In the fall of 1988, long-term ocean time-series projects were established at sites near Bermuda and Hawaii, and the following year, the multinational North Atlantic Bloom Experiment (NABE) set the standard for future process studies in other oceans.

The operational goal of JGOFS is to assess more accurately, and understand better the processes controlling, regional to global and seasonal to interannual fluxes of carbon between the atmosphere, surface ocean and ocean interior, and their sensitivity to climate change.

#### **B. Data Management Task Team**

The JGOFS data management plan was developed so each country had a data coordinator responsible for that country's data. Data are either managed by a national JGOFS data manager (e.g., Australia, Canada, France, Germany, India, Japan, U.K. and U.S.), or reside with individual Principal Investigators. A Data Management Task Team (DMTT) was formed to coordinate the data management efforts.

The Data Management Task Team agreed that their primary responsibility is:

- To develop, test and implement timely data exchange mechanisms between the national groups participating in the JGOFS Process Studies, the Global CO<sub>2</sub> Survey and the Time Series Stations,
- To identify ways in which the management of JGOFS data at the national level may be initiated, encouraged and developed,
- To develop mechanisms for the integration of national data management initiatives at the international level,

- To develop an integrated JGOFS data inventory at the international level and make this available to the scientific community,
- To monitor the international acceptance of, and compliance with, the statement on data submission and access adopted by the JGOFS Scientific Steering Committee (SSC) at its Third Session (September 1989), and to recommend changes to this policy if needed,
- To liaise with other international programs and organizations such as WOCE, IGBP, IOC and appropriate national and international data centers,
- To provide advice and direction to the JGOFS data management resources within the International Project Office (IPO), and
- To report to the SSC and implement its recommendations.

### **C. International Project Office**

The JGOFS International Project Office (IPO) is the permanent link between the International JGOFS Scientific Steering Committee (SSC), the JGOFS Working Groups and Task Teams, and the National JGOFS Committees. The responsibilities of the International Project Office are to assist the SSC in planning and carrying out new scientific research, data management, and synthesis and modeling activities. It also compiles information on national and regional programs of global change research relating to the project to ensure that there is no unnecessary duplication of effort, so that the project makes effective use of existing knowledge in its analysis of processes and change at global scales.

## **II. About this product**

### **A. Introduction**

The ***JGOFS International Data Collection. Volume 1: Discrete Datasets*** is an assembly of existing datasets produced by member countries participating in JGOFS. This DVD product is a compilation of individual data sets that were acquired and compiled by data managers from those countries. In some countries, data were published on CD-ROMs and these were copied “as is” onto the DVD. In other countries, data were placed online. Therefore, each dataset will have its own unique format, documentation, citation policy, and machine compatibility limitations (some products are designed for single platform use). This product was created to facilitate access to the numerous data sets collected by the international scientific community and to ensure they are preserved for future generations. A description of the format and software requirements can be found in the file “*format.pdf*”.

The members of the DMTT, throughout their tenure, worked toward securing funding that would lead to the production of a single file and data format. These

efforts were not successful, but due to the continuous dedication of its members, the DMTT was successful in acquiring the rich collection of biogeochemical data contained in this DVD. We hope the International JGOFS DVD is both a fair representation of the national JGOFS data managers' efforts, and a way to emphasize, for future programs, the importance of appropriate funding efforts needed to integrate datasets at the international level.

## **B. Citation Policy**

Please note this is a compilation of individual datasets and each carries its own citation policy. Please refer to the documentation within each "COUNTRY" directory for the correct citation. Where the information is provided, please use the following "**PI name(s)**, "**Data set title**" followed by the CD-ROM titles provided below.

### **AUSTRALIA**

"OzGOFS Equatorial Pacific CD-ROM". 2001, Division of Marine Research, Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia

### **CANADA**

"JGOFS Canada (Canadian Joint Global Ocean Flux Study) -- Data Sets 1989-1998, Version 1.0". 2000, Marine Environmental Data Service (MEDS) of the Department of Fisheries and Oceans (DFO), Canada

### **FRANCE**

"France JGOFS/PROOF Data Sets", May 2003, Data Management Office, Observatoire Océanologique de Villefranche-sur-Mer (OOV), France

"Matter flux in the Tropical North Atlantic Ocean in selected EUtrophic, MEsotrophic, and oLIgotrophic situations (EUMELI) (1989-1992)". France-JGOFS / PROOF Data Management Office, May 2003, Observatoire Océanologique de Villefranche-sur-Mer (OOV), France

"PROductivity of PElagic Oceanic Systems (PROSOPE)(1999)". France-JGOFS / PROOF Data Management Office, May 2003, Observatoire Océanologique de Villefranche-sur-Mer (OOV), France

"ANTARES, Modelling fluxes of material in the Southern Ocean (1992-1999)". France-JGOFS / PROOF Data Management Office, May 2003, Observatoire Océanologique de Villefranche-sur-Mer (OOV), France

"DYFAMED Time Series Station (SODYF) DYnamique des Flux de mAtière en MEDiterranée". May 2003, France-JGOFS / PROOF Data Management Office, Observatoire Océanologique de Villefranche-sur-Mer (OOV), France

### **GERMANY**

"JGOFS German Data Collection (1989-2000)", German Data Management, Institute for Marine Research (Kiel) and WDC-MARE, Germany.

### **INDIA**

"JGOFS - INDIA Arabian Sea Process Study Data & Information (1992-1997)". 1999, Indian National Oceanographic Data Centre, NIO, India

## **JAPAN**

"NOPACCS - Northwest Pacific Carbon Cycle Study, Data Set (1990-1996)." 1998, Japan Oceanographic Data Center (JODC), New Energy and Industrial Technology Development Organization (NEDO), Kansai Environmental Engineering Center, Co. & National Institute for Resources and Environment (NIRE), Japan.

## **NETHERLANDS**

"CD-ROM Database of the JGOFS expedition cruise ANT X/6 aboard R.V. Polarstern (1992)", 1997, Data Management Group at the Netherlands Institute for Sea Research (NIOZ), NL

"Dutch JGOFS and JGOFS-related data", 2003, Data Management Group at the Netherlands Institute for Sea Research (NIOZ), NL.

## **NEW ZEALAND**

"SOIREE - The Southern Ocean Iron Release Experiment - CD-ROM Appendix". 2001, reprinted from Deep-Sea Research II, 48(11-12), C. S. Law, P. W. Boyd & Andrew J. Watson, Guest Editors, © 2001, with permission of Elsevier.

## **NORWAY**

"Norwegian JGOFS Data 1990-1998", Norwegian Marine Data Centre, Institute for Marine Research, Bergen, Norway, © 2003, with permission of Institute for Marine Research (IMR) and Norwegian Marine Data Centre (NMD).

## **PAKISTAN**

"North Arabian Sea Environment and Ecosystem Research (NASEER)", 2002. National Institute of Oceanography, Pakistan by funding of Office of Naval Research (ONR), USA

## **SPAIN**

"FRUELA -- A Carbon Flux Study in the Antarctic Peninsula Area"; Ricardo Anadón and Marta Estrada; (c) 2003. Spanish National Plan for Antarctic Research of the Comisión Interministerial de Ciencia y Tecnología (CICYT), Project ANT94-1010.

## **UNITED KINGDOM**

"Biogeochemical Ocean Flux Study (BOFS) North Atlantic Data Set (1989-1991)". 1994, British Oceanographic Data Centre (BODC), UK © with permission of the Natural Environment Research Council, UK

"Arabesque Data from RRS Discovery Cruises 210 (27 Aug. - 4 Oct. 1994) and 212 (16 Nov. - 19 Dec. 1994)". 1998, British Oceanographic Data Centre (BODC), UK © with permission of the Natural Environment Research Council, UK

"BOFS Sterna92 CTD, XBT & SeaSoar Data". 2002, British Oceanographic Data Centre (BODC), UK © with permission of the Natural Environment Research Council, UK

"Biogeochemical Ocean Flux Study (BOFS) Underway Data Set (1989-1991)". 2002, British Oceanographic Data Centre (BODC), UK © with permission of the Natural Environment Research Council, UK

## **UNITED STATES**

"Hawaii Ocean Time-Series (HOT) Program: A Decade of Interdisciplinary Oceanography (1988-1998)". 1999, SOEST Technical Report 99-05, Roger Lukas & David Karl, Editors, SOEST, University of Hawaii, USA

PI name(s). "Data set title." United States JGOFS Process Study Data 1989-1998; CD-ROM volume 1, version 1, Woods Hole Oceanographic Institution, USA: U.S. JGOFS Data Management Office, April 2003

“Bermuda Atlantic Time-series Study (BATS)”, Bermuda Biological Station for Research, Bermuda.

## **C. Acknowledgements**

This type of multi-national, multi-variable project would not have been possible without the support of numerous funding agencies, national institutions, data managers, and principal investigators. Each country acknowledges the contribution of its principal investigators and funding agencies within the datasets, but we would like to also acknowledge the funding agencies that contributed to the DMTT efforts. We also would like to thank Todd O’Brien and Olga Baranova (US NODC/WDC for Oceanography) for their invaluable help in producing this DVD.

### **a. DMTT-represented Countries**

#### ***Australia***

CSIRO Divisions of Fisheries and Oceanography  
Antarctic Cooperative Research Center  
Institute of Antarctic and Southern Ocean Studies  
Department of Industry, Science and Technology  
Greenhouse Project  
Australian Antarctic Division

Individual Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/country/inventory\_AU.pdf*” file.

#### ***Canada***

Marine Environmental Data Service (MEDS), Department of Fisheries and Oceans, Canada  
Institute of Ocean Sciences (IOS), Department of Fisheries and Oceans, Canada

Individual Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/country/inventory\_CA.pdf*” file.

#### ***France***

Centre National de la Recherche Scientifique (CNRS) / Institut National des Sciences de l'Univers (INSU)  
Institut français de recherche pour l'exploitation de la mer (IFREMER)  
Institut de recherche pour le Développement (IRD), [former Office de Recherche Scientifique et Technique Outre-Mer (ORSTOM)]  
Institut polaire français Paul Emile Victor (IPEV), [former Institut Français pour la Recherche et la Technologie Polaires (IFRTP)]  
Centre National d'Etudes Spatiales (CNES)

Individual Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/country/inventory\_FR.pdf*” file.

## **Germany**

Federal Ministry of Education and Research - Bundesministerium für Bildung und Forschung (BMBF)

Individual Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/country/inventory\_GE.pdf*” file.

## **India**

Department of Ocean Development (DOD), New Delhi  
National Institute of Oceanography (NIO), Goa  
National Chemical Laboratory (NCL), Pune  
Physical Research Laboratory (PRL), Ahmedabad  
Centre for Mathematical Modeling and Computer Simulations(C-MMACS), Bangalore  
Department of Ocean Development, New Delhi

Individual Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/country/inventory\_IN.pdf*” file.

## **Japan**

Japan Oceanographic Data Center  
New Energy and Industrial Technology Development Organization  
National Institute for Resources and Environment

Individual Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/country/inventory\_JP.pdf*” file.

## **United Kingdom**

British Oceanographic Data Centre (BODC)  
Natural Environment Research Council (NERC)

Individual Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/country/inventory\_UK.pdf*” file.

## **United States**

Department of Energy (DOE)  
National Aeronautic and Space Administration (NASA)  
National Oceanic and Atmospheric Administration (NOAA)  
National Science Foundation (NSF)  
Office of Naval Research (ONR)  
Woods Hole Oceanographic Institution (WHOI)  
World Data Center A for Oceanography (WDC)

Individual Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/country/inventory\_US.pdf*” file.

## **b. Countries not Represented by the DMTT**

### ***The Netherlands***

Nederlands Instituut voor Onderzoek der Zee (NIOZ) - Netherlands Institute for Sea Research  
Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO) - Netherlands Organisation for Scientific Research

Individual Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/inventory\_NL.pdf*” file.

### **New Zealand** (for SOIREE)

Natural Environment Research Council (NERC, UK) (SOIREE grant GR3/A1431)  
National Institute for Water and Atmospheric Research (NIWA, New Zealand)

Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/inventory\_NZ.pdf*” file.

### **Norway**

Norges forskningsradet (NFR) - Research Council of Norway (NRC)  
Havforskningsinstituttet (HI) - Institute of Marine Research (IMR)

Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/inventory\_NO.pdf*” file.

### **Pakistan**

National Institute of Oceanography, Pakistan  
Office of Naval Research (ONR, USA)

Scientists at the Rosenstiel School of Marine and Atmospheric Science, University of Miami, USA, worked with the Pakistani investigators to prepare their data for submission to the international JGOFS Data Collection.

Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/inventory\_PK.pdf*” file.

### **Spain**

Spanish National Plan for Antarctic Research of Comisión Interministerial de Ciencia y Tecnología (CICYT), Project ANT94-1010.

Chief Scientists are listed in the “*DMTT\_DOCS/Cruises/inventory\_SP.pdf*” file.

The DMTT and IPO wish to thank the following data managers and scientists, from countries not represented on the DMTT, for their help in acquiring some of the datasets included in this product

(see file: *DMTT\_DOCS/Documents/Acknowledgements\_non\_DMTT.pdf*)

### **SOIREE**

Dorothee Bakker, University of East Anglia, UK  
SOIREE was an international project with participations from New Zealand, Canada, UK, Australia and USA.

### **NASEER**

Shahid Amjad, National Institute of Oceanography, PAKISTAN and Sharon Smith, Rosenstiel School of Marine and Atmospheric Science University of Miami, Miami, USA

### **Polarstern ANT X/6**

Joop Rommets, Netherlands Institute for Sea Research, THE NETHERLANDS

### **Dutch-JGOFS**

Taco de Bruin, Netherlands Institute for Sea Research, THE NETHERLANDS

### **FRUELA**

Ricardo Anadón Alvarez, Universidad de Oviedo, SPAIN



## **NGOFS**

Helge Sagen, Norsk Marint Datasenter, NORWAY  
Andersen Jan Roger, Norsk Marint Datasenter, NORWAY

### **c. International Institutions**

#### ***International JGOFS Parent Bodies***

International Geosphere-Biosphere Programme (IGBP)  
Scientific Committee on Oceanic Research (SCOR)

#### ***JGOFS International Project Office***

Norges forskningsradet (NFR) - Research Council of Norway  
Universitetet i Bergen (UiB) - University of Bergen, Norway

## **III. Accomplishments of the DMTT**

### **A. Introduction**

The first meeting of a JGOFS Working Group on Data Management occurred in Halifax, Nova Scotia in 1988. This meeting laid the foundation for a solid and workable data policy for JGOFS. Since that meeting, the JGOFS Data Management Task Team has

- Changed the attitude of data managers and scientists regarding the management of non-physical data,
- Given data management a high profile throughout JGOFS,
- Contributed to the establishment and maintenance of a data sharing culture in JGOFS,
- Generated an extensive portfolio of data sets published on CD-ROM,
- Required all data be submitted to the WDC system for long term archive,
- Documented the published data sets in NASA's Global Change Master Directory,
- Contributed data to the production of the World Ocean Database products,
- Provided recommendations to funding agencies and science managers on data management for future international projects,
- Worked toward integrated data products in collaboration with WDC MARE,
- Encouraged and promoted exchange between data managers and scientists,
- Assisted the OCEANS Transition Team in the preparation of their data management component,
- Incorporated JGOFS data from countries not represented by the DMTT into this final product,
- Integrated Data Products (delivered)
  - Arabian Sea CTD CD-ROM
  - JGOFS Cruise Inventory
- Integrated Data Products (attempted)

- NABE data sets
- JGOFS Data Index

## **B. Lessons Learned**

During the JGOFS Project, key biological and chemical variables were sampled by over 20 countries at the regional scale (process studies in the North Atlantic, Arabian Sea, Equatorial Pacific, Southern Ocean and North Pacific), global scale (carbon survey) and from long-term measurements at key ocean sites. The JGOFS Project has been highly successful in providing new insights into global biogeochemical cycling in the oceans through a multi-national effort. A considerable effort was invested in new measurements of ocean properties during JGOFS. Yet, a much smaller stress was directed toward ensuring the accessibility and ultimate stewardship of these expensive and irreplaceable data through a coordinated international data management effort.

The Data Management Task Team (DMTT) was formed to coordinate the data management efforts in JGOFS, but in effect, the DMTT does not represent all nations involved in JGOFS activities, and does not have the manpower or financial resources to go far beyond coordination and cataloguing of data collections carried out nationally. The lack of a centralized International Data Center severely hampers the use of JGOFS data for synthesis and model validation, now and in the future. Other problems were identified with the JGOFS Data Management approach:

- Ambiguity in many countries as to what constitutes a JGOFS cruise;
- No time limit, and in most countries, no requirement for delivery of data to a National Data Center from where it can be disseminated and archived;
- Reluctance by PIs to share data; and
- Data in diverse formats with incomplete documentation or missing key core JGOFS parameters.

Yet, JGOFS was proactive in setting a data policy and establishing an international data management committee very early in the Project, and the JGOFS system became a model for other programs (e.g., GLOBEC).

Efforts to acquire funds to compile all JGOFS international data into a common file and data format, to be distributed internationally, failed in the U.S.A. An initiative for JGOFS Data Management was started at the World Data Centre for Marine Environmental Sciences (WDC-MARE, Germany) during the Fall 2001. However it was unsuccessful because of the lack of funding (except for the German JGOFS data). Other national funding agencies were not approached. These efforts failed mainly because such supporting activities, although extremely important to make optimal use of the scientific data, have fared poorly in competition with proposals to initiate new science projects. This is very unfortunate, since the acquisition of data is very costly compared to the small

cost of effective data management. JGOFS thus faced continuous difficulties in its data management, nationally and mostly internationally.

A number of actions were undertaken over the last years, in order to increase the awareness and the efforts needed for proper data management in marine science, and seek support from the national and international funding agencies. A first official letter, prepared in 2001, requested assistance from about forty national contact persons and SSC members in the establishment of the complete cruise inventory, metadata cataloguing and datasets collection. A second letter was sent in 2002 to present recommendations to funding agencies and managers of the next generation of ocean biogeochemistry/climate programs under the auspices of IGBP and SCOR. It was intended to help move toward a new and better, integrated data management system after the lessons learned from JGOFS.

As new programs are being designed and implemented, the JGOFS data management experience makes it possible to offer the following set of recommendations for proper data management (DM) practices, to ensure the rapid dissemination of data and its long-term preservation and accessibility:

- Establish a coherent, suitable DM framework for the project (DM objectives, activities, timeline specified in the implementation plan);
- Establish & support an International Project Data Center, designed to provide end-to-end DM by establishing guidelines, providing advice, and facilitating exchange of knowledge and expertise among data managers and all agencies / bodies;
- Establish & support experienced, full-time national data managers / coordinators;
- Set a time limit for data submission at the national and international levels;
- Establish a coherent set of data delivery and exchange standards for reporting / exchanging data and metadata; and
- Work with funding agencies to insure compliance with data policies.

### **C. DMTT Membership as of May 2003**

The following is a list of the current membership of the Data Management Task Team. A complete listing of past and current members of the DMTT can be found in the file named "**DMTT\_DOCS/Documents/DMTT\_membership.pdf**".

Margarita Conkright (Chair), National Oceanographic Data Center (NODC) / NOAA US  
Cyndy Chandler, US JGOFS Data Management Office / WHOI USA  
Brian Griffiths, CSIRO Marine Research (CMR) / Australia  
Joachim Herrmann, German-JGOFS Data Management / IFM, Kiel Germany  
Roy Lowry, (past Chair), British Oceanographic Data Centre (BODC) / NERC UK  
Takeharu Miyake, Japan-JGOFS Data Management / JODC Japan

Jaswant Singh Sarupria, Indian Oceanographic Data Centre(IODC) / NIO India  
Donald Spear, Marine Environmental Data Service (MEDS) / DFO Canada  
Marie-Paule Torre, France-JGOFS Data Management / CNRS/OOV/PROOF France

In addition, Dr. Bernard Avril (2001 to present) and Beatriz Baliño (1996-2000), IPO Assistant Executive Officers, have assisted the DMTT in the coordination and development of JGOFS data and information management activities by maintaining: a DMTT page on the International JGOFS website, inventories of national JGOFS cruises, records of DMTT achievements and documents related to JGOFS data management, rescue of JGOFS data within the countries not represented in the DMTT (such as the Netherlands, New Zealand, Norway, Pakistan and Spain), and assisting the DMTT in its preparation and edition of the *International JGOFS Data Collection*.

## **D. Publications**

### **a. DMTT Meeting Reports and Related Publications**

The following publications are reports that document the DMTT activities and meetings. These reports can be found on the DVD under **DMTT\_DOCS/Publications**.

- Summary Report on the Meeting of the JGOFS Data Management Task Team, BODC, 4-5 May 1993 (file: *DMTT\_report\_1993*).
- JGOFS DMTT November 1994 Business Meeting Report & Chairman's Recommendations to JGOFS-10, May 1995 (file: *DMTT\_report\_1994*).
- Draft Minutes and Report, JGOFS Data Management Task Team Meeting, BODC, January 27-28, 1997 (file: *DMTT\_report\_1997*).
- International JGOFS Report No. 19. Protocols for the Joint Global Ocean Flux studies (JGOFS) core measurements (reprint). June 1996 (file: *JGOFS\_19.pdf*)
- International JGOFS Report No. 29. JGOFS Data Management and Synthesis Workshop, September 1998. January 1999 (file: *JGOFS\_29.pdf*)
- International JGOFS Report No. 37. DMTT Meeting Minutes, June 2000 & January 2002. August 2002. (file: *JGOFS\_37.pdf*)
- U.S. JGOFS Newsletter, 11(4), 18-19. April 2002. DMTT Update: Dissemination and Stewardship of JGOFS data, Margarita E. Conkright and Bernard Avril (file: *USJN\_April2002.pdf*)
- Report on the Ispra "Data Rescue" Meeting, June 2002. (file: *Ispra\_Data\_June2002.pdf*)
- Report on the PANGAEA – JGOFS Meeting for the International JGOFS Master Dataset, January 2003 (file: *PANGAEA\_Bremen2003.pdf*)
- U.S. JGOFS Newsletter, 12(2), in press. March 2003. Update on JGOFS data and information management, Bernard Avril (file: *USJN\_March2003.pdf*)

### **b. List of JGOFS Core Variables**

With help from the IPO, DMTT members have updated the list of JGOFS core parameters, along with the most common units and metadata. During their 17th Meeting (September 2002), the members of the JGOFS Scientific Steering Committee (SSC), the DMTT and IPO reached a consensus on a minimum list of

JGOFS parameters that participating countries should focus on in their submissions to the *International JGOFS Data Collection*. This list can be found in “**DMTT\_DOCS/Documents/JGOFS\_core\_parameters.pdf**”.

### **3. JGOFS Cruise Inventory**

JGOFS cruises, identified by each individual country, and compiled by the IPO and DMTT are listed under **DMTT\_DOCS/Cruises**. These cruises are sorted either by basin or by country. Cruises from Belgium, Chile, China-Beijing, China-Taiwan, Italy, Russia, and South Africa have not been updated since July 2002.