



# **First ODINAFRICA-III Training Course in Marine Data Management**

**Supported by the IOC and the Government of Flanders**

Ostend, Belgium  
April 11 – 29, 2005



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## **1. INTRODUCTION AND OBJECTIVES**

The First ODINAFRICA III Training Workshop in Marine Data Management was held in Ostend, Belgium, April 11-29, 2005 and was attended by students from eleven African nations, representing the IOCINCWIO (Western Indian Ocean) and IOCEA (Central Eastern Atlantic) regions of the IOC. ODINAFRICA is a data and information project working towards establishing a lasting network of marine and aquatic institutes in Africa. Its headquarters is located at the central United National Environmental Program offices in Nairobi, Kenya. Through its information services to the scientific community, the project aims at promoting the scientific capabilities of this continent. The objectives of the ODINAFRICA project are as follows:

- a) Provide marine scientists in Africa with the necessary bibliographic and scientific literature
- b) Make full use of the scientific literature available in Africa
- c) Promote and facilitate communication between marine scientists in Africa
- d) Promote and facilitate communication in Africa and other regions
- e) Promote the scientific activities of the marine and coastal scientists within and outside Africa
- f) Provide scientific information, and equipment, software and training to make full use of this information

Under the leadership of the IOC, and with funding generously provided by the government of Flanders, the workshop was designed to address the final objective listed above. The workshop was organized locally by Dr. Vladimir Vladymyrov of the IOC Project Office for IODE in Ostend.

The marine data management-training curriculum developed by the IOC's International Oceanographic Data and Information Exchange Program (IODE) is based on an extensive collation of international public documents on marine data, formats, software, program and data management procedures, manuals, protocols, and associated tutorials. The main resource, entitled OceanTeacher, is a 1.5 gigabyte Digital Library of primary documents -- accompanied by various thematic Course Manuals - that has been under development by the IOC training staff since 1997 (see outline in Annex III). OceanTeacher is the principal training resource used during data management courses, currently available on the World Wide Web and soon to be published on DVD (digital versatile disk).

## **2. PARTICIPANTS**

Participants included five countries which have already been involved in previous ODINAFRICA training workshops (Cameroon, Cote d'Ivoire, Guinea, Morocco and Seychelles) and six countries new to the program (Algeria, Angola, Congo, Egypt, Gabon and Namibia). The first group of

countries included those where previous students have moved on to other positions, or where remedial training had been recommended. Invited data managers from Australia, Belgium, France, the United States of America, and the IOC provided lectures. The list of participants and lecturers is provided as Annex II.

### **3. COURSE PROGRAMME**

#### **3.1 LECTURES AND PRACTICALS**

##### **3.1.1 Workshop Objectives**

The ODINAFRICA III Marine Data Management training curriculum has been designed to provide participants with knowledge and skills in the following areas:

- Basic computer skills
- The importance of marine data in general, and particularly within participants' national and regional environments
- How to set up an oceanographic data center within the IODE System
- The infrastructure requirements, including hardware and software tools
- How to manipulate and analyze the principal types and formats of marine data
- How to produce ocean data products and to disseminate these products, both over the Internet and by traditional methods

This first workshop in the new cycle of ODINAFRICA training had been designed to cover materials formerly covered in two sequential years of work in previous cycles. It included all of the more complex topics – especially in the area of data and data-product synthesis. Particular emphasis is now placed on obtaining data directly from Internet website sources, rather than the previous heavy reliance on specially prepared CD-ROMs.

##### **3.1.2 Workshop Technical Outline**

The following is the outline of the relevant Course Manuals prepared and selected for use in this workshop. [ID = Interdisciplinary; DM = Data Management] All of the following topics were covered in lectures and practical exercises, using basic reference materials contained in the IODE OceanTeacher Digital Library (outlined in Annex III).

**ID 100: Introduction to OceanTeacher**

GOALS	<p>To provide orientation to new students, on the structure and contents of OceanTeacher</p> <p>To provide instructions on the use of the Course Manuals to access topical information in the Digital Library</p>
CONTENTS	<p>Digital Library</p> <p>Software</p> <p>Data &amp; Information Exercise</p> <p>Course Manuals</p>

**ID 101: Computer Basics**

GOAL	<p>To introduce the data manager to computer systems, tools and practices necessary to operate a modern ocean data center</p>
CONTENTS	<p>Skills Assessment</p> <p>Computer Hardware</p> <p>Operating Systems</p> <p>Software: Introduction</p> <p>Software: Editors</p> <p>Software: Browsers</p> <p>Software: Spreadsheets</p> <p>Software: Databases</p> <p>Software: Compression</p> <p>Computer Networks</p> <p>Computer Maintenance</p> <p>Computer Media</p>

**ID 102: Internet Basics**

GOALS	<p>To describe the functional components of the Internet/World Wide Web and the protocols and software that make it work</p> <p>To acquaint students methods to obtain ocean data and information on the Internet</p>
CONTENTS	<p>Internet Overview</p> <p>General &amp; Introductory</p> <p>World Wide Web</p> <p>Internet Service Providers</p> <p>Email</p>

	Outlook Express
	FTP
	Markup Languages
	Websites
	Information Seeking
	Client-Server Concepts
	Selected Information Product Websites
	Selected Data Product & Analysis Websites
	Downloading Data

### **ID 103: Information, Data and Metadata**

GOAL	To introduce students to fundamental "bridging" concepts and current activities between oceanographic information management and data management
CONTENTS	Information Availability & Access Data Availability & Access Metadata Information Centers Data Centers World Data Center System IODE Data Center System DNAs, NODCs and RNODCs Other Ocean Data Centers Information Catalogs Data Catalogs OPTION: MEDI Cataloging Prerequisite: DM 101 or equivalent experience Information & Communication Programs & Organizations

### **ID 104: Introduction to Oceanography**

GOAL	To provide students with an overview of the ocean sciences today
CONTENTS	Background Major Oceanographic Disciplines Research Oceanography Survey Oceanography Operational Oceanography



<p>Geopolitics of Oceanography Programs &amp; Organizations</p>
---------------------------------------------------------------------

**DM 102: Ocean Data Collection Management**

<p>GOALS</p>	<p>To show students how to create a National Data Collection, using the World Ocean Database 2001, other published or unpublished data sources, and near real-time operational data</p> <p>To demonstrate some basic data analysis functions in popular ocean software programs</p>
<p>CONTENTS</p>	<p>Area of Interest</p> <p>Creation of Data Collections</p> <p>Basic Data Analysis</p> <p>Collection Housekeeping</p> <p>Exporting ODV Products</p> <p>Adding Other Data</p> <p>Special Purpose Collections</p> <p>Methods for Operational Data</p>

**DM 103 Ocean Data Products & Synthesis**

<p>GOALS</p>	<p>To demonstrate a broad suite of basic analysis methods for ocean data (including remote sensing data) using popular software systems</p> <p>To demonstrate basic methods for combining data products in Geographic Information Systems (GIS)</p>
<p>CONTENTS</p>	<p>Gridding &amp; Contouring with Surfer</p> <p>Surfer Vector Charts</p> <p>Managing HDF Files</p> <p>Bathymetry and Topography Products</p> <p>Managing Image Files</p> <p>Synthesis in GIS</p>

**3.1.3 Invited Presentations**

Several special invited presentations were interspersed throughout the regular schedule of lessons, provided by these resource persons (listed in Annex II).

- Ms. Linda Pikula: Introduction to Marine Information Management

- Mr. Loic Petit de Villeon: CORIOLIS Data Center Quality Control Procedures and ARGO Data
- Mr. Vladimir Vladymyrov: The IOC and the IODE
- Dr. Edward Vanden Berghe: Introduction to Biological Diversity Data Concepts
- Dr. Hassan El Ouizgani: Practical Aspects of NODC Website Publication
- Dr. Malika Bel Hassen-Abid: Overview of the IODE MEDI Software

#### **3.1.4 Special Materials**

The workshop attendees were provided with the following special training materials, provided by the indicated sources:

- General Bathymetric Chart of the Oceans (GEBCO) Digital Atlas, 2003. A joint product of the IOC and the International Hydrographic Office; CD-ROM copies provided by the British Oceanographic Data Centre.

### **3.2 RESULTS AND RECOMMENDATIONS**

The workshop schedule was successfully accomplished, including a number of special invited lectures on topics of interest. The students exhibited a wide range of individual skills, a situation that has been noted previously in all ODINAFRICA workshops. The most serious deficiencies include inexperience with the Windows operating system for personal computers, a matter of serious concern to the IODE OceanTeacher program, and relatively poor knowledge of marine science shown by some students from allied disciplines. The time lost to assistance with operating system problems is considerable, when these problems are known. Unfortunately it is not possible always to identify these problems within the workshop setting, and situations that should have been addressed immediately (thereby also losing time) might have gone unnoticed. The OceanTeacher training curriculum practitioners (i.e. the IODE trainers) remain strongly concerned with the under-preparation shown by some participating students, a situation which we do not feel is still explainable by cultural or national economic milieu.

As with previous workshop cycles, students will be presented with sequential projects to complete over the next year, and these will be publicized by a special website. IODE and ODINAFRICA national coordinators will be kept informed of individual progress.

ANNEX I

**COURSE PROGRAM AND TIMETABLE**

Course	Lesson Title	Lecturer(s)	Duration (hrs)	Date
<b>Opening Activities</b>	N/A	N/A	2	11
<b>ID 100</b>	Introduction to OceanTeacher	Brown	1/2	11
<b>ID 101: Computer Basics</b>	1. Skills Assessment	Brown	1	11
	2. Computer Hardware	Sims	1/2	11
	3. Operating System	Sims	1	11
	4. Software: Introduction	Brown	1/2	11
	5. Software: Editors	Brown	1/2	11
	6. Software: Browsers	Sims	1/2	12
	7. Software: Spreadsheets	Brown	1/2	12
	8. Software: Databases	Brown	1/2	12
	9. Software: Compression	Brown	1/2	12
	10. Computer Networks	Sims	1/2	12
	11. Computer Mintenance	Sims	1/2	12
	12. Computer Media	Brown	1/2	12
<b>ID 102: Internet Basics</b>	1.A. Internet General & Introductory	Sims	1/2	13
	1.B. World Wide Web	Brown	1/2	13
	1.C. Internet Service Providers	Sims	1/2	13
	1.D. Email	Brown/Sims	1/2	13
	1.D.1. Outlook Express	Brown/Sims	1/2	13
	1.E. FTP	Sims	1	13
	2. Markup Languages	Quizgani	1	13
	3. Websites	Quizgani	2	13
	4. Information Seeking	Brown	1/2	14
	5. Client-Server Concepts	Sims	1/2	14
	7. Selected Data Product & Analysis	Brown	1/2	14
	8. Downloading Data	Brown	1	14
<b>ID 103: Information, Data and Metadata</b>	2. Data Availability & Access	Brown	1/2	14
	3. Metadata	Brown	1/2	14
	5.A. World Data Center System	Brown	1/2	14
	5.B. IODE Data Center System	Brown	1/2	14
	5.C. DNAs, NODCs and RNODCs	Brown	1	14
	5.D. Other Ocean Data Centers	Brown	1	14
	7. Data Catalogs		1	14
	8. MEDI Cataloging	Reed/Bel Hassan	2	18
	9. Information Programs & Organizations	Brown	1	15
<b>ID 104: Introduction to Oceanography</b>	1. Background	Brown	1/2	15
	2. Major Oceanographic Disciplines	Brown	1/2	15
	3. Research Oceanography	Brown	1/2	15
	4. Survey Oceanography	Brown	1/2	15
	5. Operational Oceanography	Reed	1	15
	6. Geopolitics of Oceanography	Brown	1/2	15
	7. Programs & Organizations	Odido	1	15
<b>DM 101: Introduction to Ocean Data</b>	1. Oceanographic Parameters	Brown/Brown	2	18
	2. Oceanographic Measurement Units	Brown	1	18

	3. Temperature & Salinity Scales	Brown	1/2	18
	4. Standard Depths	Reed	1/2	18
	5. Collecting Data	Reed	1	18
	6. Data Format Types	Brown	1	18
	7. Oceanographic Data Formats	Brown	1	18
	7.A. Code Tables	Reed	1/2	19
	7.B. Geography: Location	Brown	1	19
	7.C. Geography: Charts	Reed	1/2	19
	7.D. Date & Time	Brown	1	19
	7.E. Quality Flags	Brown	1/2	19
<b><u>DM 102: Data Collection Management</u></b>	1. Area of Interest	Brown/Reed	6	20
	2. Creation of Data Collections	Brown/Reed	4	21
	3. Basic Data Analyses	Brown/Reed	4	21
	4. Collection Housekeeping	Brown/Reed	1	22
	5. Exporting ODV Products	Brown/Reed	6	22
	6. Adding Other Data	Brown/Reed	5	22
	7. Special Purpose Collections	Brown/Reed	1	25
	10. Methods for Argo Data	Brown/Reed	3	25
<b><u>DM 103: Data Products &amp; Synthesis</u></b>	1. Gridding & Contouring with Surfer	Brown/Reed	6	25
	2. Surfer Vector Charts	Brown	3	26
	4. Bathy/Topo Products	Brown	2	26
	5. Managing Images	Brown	3	27
	7. GIS Synthesis	Brown	6	27
	OPTIONS and make-up work	Brown	?	28
<b>Final Activities and Workshop Close</b>	N/A	Brown	1	29

ANNEX II

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ANNEX III

**IODE OceanTeacher Digital Library  
Table of Contents**

[NOTE: Underlines indicate materials currently present, at least in draft form. Otherwise, no material is yet provided for the specific category]

1. Global Oceanography Today
  1. Sciences of Oceanography
    1. Biological Oceanography
    2. Chemical Oceanography
    3. Geological Oceanography
    4. Physical Oceanography
    5. Remote Sensing
    6. Ancillary & Applied Sciences
    7. Oceanography Glossary
  2. Collecting Data
    1. Introduction to Ocean Datasets
    2. Oceanography Data Fundamentals
      1. Oceanographic Parameters
      2. Oceanographic Measurement Units
      3. Temperature and Salinity Scales
    3. Ocean Measurement Technology
      1. Sampling Devices
        1. Tools of Oceanography
        2. Biology
        3. Chemistry
        4. Geology
      2. Platforms
        1. Vessels
          1. Boats & Ships
          2. Submersibles
        2. Fixed Platforms
          1. Piers
          2. Moored Buoys
          3. Offshore Structures
        3. Drifting Buoys & Floats
        4. Autonomous Underwater Vehicles
        5. Benthic Observatory Nodes
        6. Animals
      3. Instruments & Sensors
        1. Biology
        2. Chemistry
        3. Geology
        4. Physics
      4. Instrument Data Processes
        1. Within Instruments
        2. On Vessels
        3. Post-Processing
          1. Seabird Training Class Handouts
    4. Remote Sensing Technology
      1. Parameters & Sensors
      2. Sensors & Missions
      3. Missions & Data
    5. Manuals & Guides

3. Geopolitics of Oceanography
4. Research Oceanography
  1. General & Introductory
  2. Biological Oceanography
  3. Chemical Oceanography
  4. Geological Oceanography
  5. Physical Oceanography
  6. Remote Sensing
5. Survey Oceanography
  1. Resource Surveys
  2. Long Time-Series
6. Operational Oceanography
  1. Overview
  2. Economics of Ocean Observations
  3. Data & Information Infrastructure
  4. Global Ocean Observing System
    1. Local Systems
      1. Rutgers
      2. Oregon
      3. ICON
      4. NYHOPS
      5. PORTS
      6. REINAS
      7. SDCOOS
      8. SCMI
    2. Medium-Scale Systems
      1. Black Sea GOOS
      2. BOOS
      3. EuroGOOS
      4. GCOOS
      5. GoMOOS
      6. GOOS-Africa
      7. IOCARIBE-GOOS
      8. IOGOOS
      9. IOOS
      10. MedGOOS
      11. NEAR-GOOS
      12. NOOS
      13. PI-GOOS
      14. SEACAMP
      15. SEACOOS
      16. WAGOOS
    3. Observatories
      1. ESONET
      2. HAWAII-2
      3. LEO-15
      4. MARS
      5. MVCO
      6. NEMO
      7. NEPTUNE
      8. OOI
      9. ORION/GEOSTAR
    4. Global Systems
      1. ARGO
      2. GDP
      3. GLOSS

4. GOS
5. GTSP
6. OceanSITES
7. SOOP
8. Tropical Moored Buoys
9. TSUNAMI
10. VOS
11. WWW
5. Future Technological Needs
7. International Programs, Agencies & Organizations
  1. CEOS
  2. CLIVAR
  3. DBCP
  4. DIVERSITAS
  5. FAO Fisheries
  6. GAIM
  7. GCOS
  8. GEWEX
  9. GLOBEC
  10. GODAE
  11. GODAR
  12. GOSIC
  13. GTOS
  14. IAPSO
  15. ICES
  16. ICSU
  17. IGBP
  18. IGOS
  19. IHDP
  20. IHO
  21. IMBER
  22. IOC
  23. IOCCG
  24. IODP
  25. IPCC
  26. IUGG
  27. JCOMM
  28. JGOFS
  29. LOICZ
  30. OOPC
  31. PAGES
  32. PICES
  33. POGO
  34. SCOR
  35. SOLAS
  36. START
  37. UNEP
  38. WCRP
  39. WMO
  40. WOCE
  41. Societies & Associations
2. Information Technology & Scientific Communication
  1. Computer Technology
    1. Computer Systems
      1. Storage Media
      2. Hardware

3. Operating Systems
  1. Windows
  2. UNIX
4. An Educator's Guide to School Networks
5. Maintenance
6. Viruses
2. Databases & Database Management Systems
  1. MS Access
  2. Other Systems
3. GIS
  1. UNESCO GIS Modules
  2. Marine GIS
  3. GSDI
4. General Applications Software
  1. Excel
  2. ASCII Editors
5. Oceanographic Software
  1. IOC Software Toolbox
    1. Adobe Reader
    2. ArcExplorer
    3. Apache Tomcat
    4. Argo Data Explorer
    5. CuteFTP
    6. Data Thief
    7. DXF2XYZ
    8. GeoTIFF Examiner
    9. GRADS
    10. HDF Browser
    11. HDFView
    12. IrfanView
    13. Java/JRE
    14. Java OceanAtlas
    15. MEDI
    16. ncBrowse
    17. Ocean Data View
    18. Ocean Sneaker Tool
    19. Oceanic Calculator
    20. OPeNDAP Collector
    21. PFE
    22. SpreadsheetApps
    23. Surfer
    24. USGS VPV
    25. WinZip
  2. IOC Software Catalog
  3. Format Conversion Software
6. The Internet
  1. World Wide Web
  2. Internet Service Providers
  3. Electronic Mail
  4. Websites
7. Other Telecommunications
8. Markup Languages
  1. HTML
  2. XML
9. Client-Server Concepts
10. Electronic Navigation Systems

2. Metadata
  1. Formal Descriptions of Resources
  2. Classifications, Taxonomies, Ontologies
  3. Thesaurus Systems
  4. Discovery & Descriptive Metadata
  5. Metadata Standards & Formats
  6. Crosswalks
3. Information Seeking in Electronic Environments
  1. Searching Information
  2. Text Retrieval
  3. Saving Information
4. Document Production
  1. Internal Reports
  2. Production
  3. Distribution & Sales
  4. Document Imaging
  5. Full Text
  6. Graphics & Images
  7. Animation & Video
  8. Charts & Graphs
  9. Scientist Support
  10. Copyright
  11. Bibliographic Citation Standards
  12. Publishers' Requirements
5. Information & Technology Programs & Organizations
  1. BIOCASE
  2. CENDI
  3. CODATA
  4. DGIR
  5. DMAC
  6. ESIP
  7. GSDI
  8. ICSTI
  9. IEEE
  10. IETF
  11. ISO
  12. MarineXML
  13. MMI
  14. OAI
  15. OCLC
  16. OIT
  17. OPeNDAP
  18. OpenGIS
  19. OpenIOOS
  20. THREDDS
  21. UNICODE
  22. W3C
  23. Societies & Associations
3. Information Management Principles - Under construction
4. Ocean Information Management - Under construction
5. Data Management Principles
  1. Data Formats
    1. ASCII
    2. Binary
    3. Format Types
      1. Document

2. Geo-Referenced Image
  3. Gridded
  4. Hard Copy
  5. Header
  6. Mapping-List
  7. Mapping-XY
  8. Mapping-GIS
  9. Message
  10. Relational Database
  11. Self-Describing (SDS)
  12. Simple Image
  13. Spreadsheet
  14. Stratified
4. Complexity Progression
2. Scientific Metadata & Systems
  3. Quality Control Strategies
  4. Data Availability & Access
  5. Physical Storage & Safekeeping
  6. Data Searching Strategies
6. Oceanographic Data Management Processes
    1. Data Operations
      1. Planning Documents
      2. Data Management Policies & Guidelines
      3. Oceanographic Metadata
      4. Taxonomic Complexities of Biological Data
        1. Taxonomy
        2. Data Systems
      5. Quality Control
        1. Programmatic Aspects
        2. Technical Aspects
          1. Standards & Comparisons
          2. Research & Survey Data
          3. Operational Oceanography Data
          4. Remote Sensing Data
          5. Meteorological Data
    6. Oceanographic Formats
      1. Marine Data Format Fundamentals
        1. Codes
        2. Geography
          1. Geographic Location
          2. Geographic Direction
          3. Ocean Squares & Mapsheets
          4. Charting
        3. Dates & Time
      2. Integration Among Major Formats
        1. BLN
        2. BMP
        3. DXF
        4. GeoTIF
        5. GIF
        6. HDF
        7. JOS
        8. JPG
        9. NetCDF
        10. SHP
        11. TSV-O

12. WOD01
13. XYZ
3. Format Integration Schematics
4. Format Conversion
2. Data Centers & Systems
  1. Ocean Data Centers
    1. Intergovernmental Centers
      1. IODE Data Center System
        1. NODCs and DNAs
          1. Establishing an NODC
          2. NODC Business Functions
        2. RNODCs
        3. NODC Websites
      2. Hydrographic Service (ICES)
      3. Data Standardization
    2. Research Project Centers
    3. Topical & Operational Data Activities
  2. World Data Center System
  3. Other Centers & Systems
3. Data Catalogs & Gateways
  1. MetOcean Data
    1. CSR
    2. MEDI
    3. EDMED
    4. GCMD
  2. Remote Sensing Data
  3. Ancillary & Applied Data
4. Virtual Centers & Distributed System
5. Data Analyses & Products
  1. Working with Biological Data
  2. Working with Chemical Data
  3. Working with Geological Data
  4. Working with Physical Data
  5. Working with Remote Sensing Data
  6. Working with Meteorological Data
  7. Working with Ancillary & GIS Data
    1. Preparing Atlases
  8. Catalog of Selected Data Analyses & Products
6. Earth System Modeling
  1. Modeling the Ocean
  2. Modeling Ecosystem Processes
    1. Hydrochemical Processes
    2. Biological Processes
    3. Sedimentation & Erosion
    4. Fates & Effects Modeling
  3. Operational Modeling
    1. FOAM
    2. HYCOM
    3. MERCATOR
    4. MFSTEP
    5. NCEP
    6. NLOM
    7. TOPAZ
    8. UK Shelf Seas
    9. UK Wave
  4. Climate Modeling

7. Operational GIS

7. Examples

8. Exercises

1. Information Technology Exercises

2. Information Exercises

3. Data Management Exercises

1. Instructor Whiteboards

1. Africa Whiteboard

2. South America Whiteboard

2. Hand Contouring

3. Data Roadmaps

4. Data Processing with Excel

5. Processing Seabird CTD Data with Seabird Software



## ANNEX IV

### Acronym list

- ODINAFRICA Ocean Data and Information Network for Africa
- IOC Intergovernmental Oceanographic Commission (of UNESCO)
- IOCINCWIO IOC Committee for the Cooperative Investigation In the North and Central Western Indian Ocean
  
- IOCEA IOC regional Committee for the Central Eastern Atlantic
- DNA Designated National Agency
- NODC National Oceanographic Data Center
- RNODC Responsible National Oceanographic Data Centre
- MEDI Marine Environmental Data Index
- DM Data managers
- IODE International Oceanographic Data and Information Exchange Program
- ODV Ocean Data View
- HDF Hierarchical Data Format
- GEBCO General Bathymetric Chart of the Oceans