Intergovernmental Oceanographic Commission
Training Course Report 81

First ODINCARSA-II Data Management Training Workshop

Ostend, Belgium
November 7-18, 2005

UNESCO

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1. INTRODUCTION AND BACKGROUND

The ODINCARSA program has been arranged among the coastal States of South America and the Caribbean area to provide capacity-building workshops and resource materials in the areas of marine data management and marine information management. ODINCARSA is a sub-program of the International Oceanographic Data and Information Exchange Program (IODE) of the Intergovernmental Oceanographic Commission (IOC). The principle focus of the program is to provide sufficient training to mid-level professionals in the participating countries, so that National Ocean Data Centers (NODCs) and associated marine libraries can be founded and well managed. The NODCs will, in turn, become part of the international network of ocean data facilities, which feed data into the World Data Center system. Through these activities, prospective data managers learn about sources of global and regional data, useful software systems for managing and analyzing the data, formats and other specifics concerning the data, and general information about the international systems and programs involved.

The training resource used by the IODE in all marine data and information capacity-building work is OceanTeacher (www.oceanteacher.org), a multidisciplinary, modular, online resource for formal and informal education. It consists of an encyclopedic Digital Library of resource documents and a series of thematic Course Manuals that direct students through the topical materials. The Digital Library and the Courses have been under continuous development since 2001, stemming from earlier training resources in previous IODE capacity-building programs, mainly in Africa. This workshop is the beginning of a second cycle of data manager training in the ODINCARSA region. The first cycle began in 2002, resulting in a cadre of six fully qualified instructors who are already working locally and regionally to further international marine data activities. The present group consists of additional students from some of these same countries as well as from entirely new participant States.

2. VENUE

The workshop was held at the IOC Project Office for IODE in Ostend, Belgium (http://www.iode.org/projectoffice/), from November 7-18, 2005. Locally, the meeting was hosted by Dr. Vladymyrov, with assistance from the Flanders Marine Institute (VLIZ; http://www.vliz.be/) and financial support from the Government of Flanders.

3. PARTICIPANTS

The ODINCARSA regional coordinator, Mr. Rodney Martinez, instituted a graduated application procedure for the workshop, involving the review of curricula vitae from prospective students, followed by the requirement that sponsoring organizations provide documentation of their agreement to maintain the student's placement and active participation throughout the proposed 3-year schedule for training and

further development. This resulted in an excellent roster of very skilled mid-level scientists from thirteen ODINCARSA States. A special addition to the ODINCARSA group was made possible by the concurrent presence of a graduate trainee from the Dominican Republic, working in the Flanders Oceanographic Data Centre, who joined the class at the request of the Centre. In addition, at the request of the Government of Flanders, three additional students from Morocco were added to the class. These excellent scholars had just completed the UNESCO Floating University program of at-sea training (mainly in geological oceanography). All of the participants are listed in Annex II.

4. COURSE PROGRAMME

4.1 LECTURES AND PRACTICALS

4.1.1 Workshop Objectives

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

- 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 training activity for the second cycle of ODINCARSA data managers covered the BASIC Training Level identified in the OceanTeacher curricula structure. In addition, it was the first ever use of a higher-level workshop agenda that alternated theoretical and practical lessons throughout the 10-day program. This new design was developed to avoid "reader fatigue" during initial days, which had earlier been occupied solely by reading exercises. The results of this first use are discussed below.

4.1.2 Workshop Technical Outline

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

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 Disciples Research Oceanography Survey Oceanography Operational Oceanography Geopolitics of Oceanography Programs & Organizations

DM 102: Ocean Data Collection Management

GOALS	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 To demonstrate some basic data analysis functions in popular ocean software programs
CONTENTS	Area of Interest Creation of Data Collections Basic Data Analysis Collection Housekeeping Exporting ODV Products Adding Other Data Special Purpose Collections Methods for Operational Data

DM 103 Ocean Data Products & Synthesis

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

4.1.3 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.

4.1.4 Invited Presentations

- Dr. Marc Goovaerts: Introduction to Marine Information Management (original notes by Linda Pikula)
- Dr. Sergey Konovalov: Special Purpose [Data] Collections – What type of collections you may need or may be requested?
- Dr. Edward Vanden Berghe: Introduction to Biological Diversity Data Concepts

4.2 EVALUATION & TESTING

Due to the excellent progress shown by this class, resulting in time saved during many lessons, it was decided to re-institute the former custom of measuring classroom performance with an informal examination on the final day. The basic structure of the exam (minus specifics relating to the exact locations of the data to be used) were provided to the class 4 days prior to the examination (Annex IV). Students were given 2 hours to perform the examination, using any notes or other materials, including OceanTeacher itself.

Using a standard grading curve, the following “marks” would have been given if the examination were formal: seven A+, one A, one B, one C. This is a remarkable achievement, in view of the very short time involved (10 total classroom days) and the large amount of material covered.

5. RESULTS AND RECOMMENDATIONS

The new cycle of ODINCARSA students continues the tradition of excellence begun in 2002 with the first group of students. Also, the added students from Morocco performed extremely well. The total performance level of this group was noted by all observers to be among the “highest and best” ever observed. The interactions among the group were intellectually stimulating and always professional. Assistance between students was always conducted liberally and skillfully, leading quickly to the establishment of a real community spirit. The Instructor observed publicly that this group could accomplish absolutely anything, and they were a genuine pleasure to work with.

Both in the ODINCARSA area and for ODINAFRICA, this class provides a new group of trainers who can easily and effectively assist National and Regional professionals in advancement of data management skills and practices. The ODINCARSA and ODINAFRICA regional coordinators are encouraged to use these talents appropriately and immediately to meet training needs, and to further the establishment of active marine data centers.

ANNEX I – Lesson Schedule

This revised schedule includes alternating "reading" and "hands-on" student activities, in order to keep up student interest levels. Within each Course (i.e. the columns) the subjects are followed sequentially, according to the original, formal structure of their Manuals. But, following the initial orientation to ocean data (i.e. DM 101) the schedule alternates between THEORY and PRACTICE.

GENERAL	THEORY	THEORY	THEORY	THEORY	PRACTICAL	PRACTICAL	
Special Activities	ID 100: Introduction to OceanTeacher	ID 103 Information, Data & Metadata	ID 104 Introduction to Oceanography	DM 101 Introduction to Ocean Data	DM 102 Ocean Data Collection Management	DM 103 Ocean Data Products & Synthesis	Approximate Date
Formal Opening							7
	Introduction to OceanTeacher						7
				1. Oceanographic Parameters			7
				2. Oceanographic Measurements Units			7
				3. Temperature & Salinity Scales			7
				4. Standard Depths			7
				5. Collecting Data			7
				6. Data Format Types			8
				7. Oceanographic Data Formats			8
				7A. Code Tables			8
				7B. Geography: Locations			8
				7C. Geography: Charts			8
				7D. Date & Time			8
				7E. Quality Flags			8
					1. Area of Interest		9
		2. Data Availability & Access					9
		3. Metadata					9
					2. Creation of Data Collections		10
		5A. World Data System					10
		5B. IODE Data Center System					10

ANNEX II – List of Participants

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ANNEX III - IODE OceanTeacher Digital Library Table of Contents

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. GTSPP
            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 – Basic Oceanographic Data Management Workshop Final Examination

From the TEACHER computer, copy the ODINCARSAexam folder into your DESKTOP. Then place the results from each of the following exercises into the proper place in the sub-folders. [Number of possible points for each question.]

1. Go to the World Ocean Database download site and download Nansen Cast data for the following Area of Interest: top=3 N, right=3 E, bottom=3 S, left=3 W. Put the downloaded data file (*.GZ) into the 01_DATA folder. [2]
2. Create a new Ocean Data View (ODV) collection (using WOD01 variables for the structure) with these data. Place the inventory file for the collection (*.INV) in the 02_INVENTORY folder. [2]
3. Use map mode in ODV to create a large map of the station locations for the collection. Export a graphic image of the map (in JPG format) and place it in the 03_MAP folder. [1]
4. Use scatter mode in ODV to create a TS diagram for the collection. Export a graphic image of the TS diagram (in JPG format) and place it in the 04_TSPLOT folder. [2]
5. Export an ODV spreadsheet of DEPTH, TEMPERATURE, SALINITY and OXYGEN data for the WINTER MONTHS at a standard depth of 50 meters. Include in the file only those records that have all 4 of these parameters present. Place the *.TXT file in the 05_SPREADSHEET folder. [2]
6. The folder 06_ARGO contains a *.TGZ file containing data from drifting floats. Unzip the file into the 06_ARGO folder. [1]
7. Convert the *.NC file of ARGO data to *.JOS format and place the result in the 07_JOS folder. [2]
8. In SURFER, grid the OXYGEN data (from #5 above), using the kriging algorithm and a 7-by-7 grid, with the same dimensions as the Area of Interest (in #1 above). Place the *.GRD file in the 08_GRID folder. [3]
9. Contour the *.GRD file, using any contour intervals and color scheme you like. Save the resulting figure as a *.SRF file (the special SURFER format for completed images) and place it in the 09_CONTOURS folder. [3]
    a. EXTRA CREDIT: Export the contours as a DXF file and place the result here also. [2]
10. The folder 10_HDF-JPG contains a single HDF file. Use the appropriate browser/viewer program to extract and save the contained image to JPG format. Save the *.JPG image in the 10_HDF-JPG folder. [2]
11. The folder 11_HDF-TXT contains a single HDF file. Use the appropriate browser/viewer program to extract and save the contained image to ASCII TXT format (i.e. a spreadsheet). Save the *.TXT file in the 11_HDF-TXT folder. [2]

a. EXTRA CREDIT: Convert the TXT file to XYZ and place the result here also. [2]

ANNEX V – Acronym list

- IOC Intergovernmental Oceanographic Commission (of UNESCO)
- IODE International Oceanographic Data and Information Exchange Program
- IODE International Oceanographic Data and Information Exchange Program
- GOOS Global Ocean Observing System (IOC-WMO-UNEP-IOSU)
- IOC Intergovernmental Oceanographic Commission (of UNESCO)
- IODE International Oceanographic Data and Information Exchange Program
- DM Data managers
- CB Capacity Building
- ODINAFRICA Ocean Data and Information Network for Africa
- DNMI Norwegian Meteorological Institute
- HYCOM Hybrid Coordinate Ocean Model
- JEP Jamboree Experimentation Plan
- JCP Joint Comprehensive Environmental Action Program for the Baltic Sea
- BSRP Baltic Sea Regional Project
- LME Large Marine Ecosystem
- GEF Global Environment Facility
- IOC Intergovernmental Oceanographic Commission (of UNESCO)
- IODE International Oceanographic Data and Information Exchange Program
- DVD Digital versatile disk
- ID Interdisciplinary
- DM Data Management
- ODV Ocean Data View
- GIS Geographic Information Systems
- HDF Hierarchical Data Format
- WOD World Ocean Data
- AOI Area of Interest
- GEBCO General Bathymetric Chart of the Oceans
- CDF Channel Definition Format