United Nations
Educational, Scientific and
Cultural Organization

Intergovernmental
Oceanographic
Commission

H.C.M.R

SeaDataNet

Intergovernmental Oceanographic Commission
Workshop Report No 219

IMDIS 08

INTERNATIONAL CONFERENCE ON MARINE DATA MANAGEMENT AND INFORMATION SYSTEMS

Athens, 31 March – 2 April 2008

Proceedings

IMDIS 2008

International conference on Marine Data Management and Information Systems

Athens, Greece
March 31 - April 2, 2008

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This conference was jointly organized by the Hellenic Center for Marine Research (HCMR), SeaDataNet Consortium and the European Commission (EC), the Intergovernmental Oceanographic Commission / International Oceanographic Data and Information Exchange (IOC/IODE).

IOC Workshop Report No. 219

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Bibliographic reference

Giuseppe M.R. Manzella, Catherine Maillard, Efsthatios Balopoulos, Athanasia Iona, Robert Keeley, Gilbert Maudire, Peter Pissierssens, Dick Schaap, Roy Lowry (Eds). *Proceedings of the International conference on Marine Data Management and Information Systems, Athens, 31 March - 2 April 2008.* Paris, UNESCO/IOC, 2009. 431 pp. IOC Workshop Report, 219

Cover by: Eric Loddé

Published in 2009 by:

United Nations Educational, Scientific and Cultural Organization
Intergovernmental Oceanographic Commission
1 rue Miollis
F-75732 Paris Cedex 15
France

Printed in UNESCO's workshops

(IOC/2009/WR/219)

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PROCEEDINGS

Content page

page

page

page

Introduction to the Proceedings

Giuseppe M.R. Manzella, ENEA, Italy; Efsthatios Balopoulos, HCMR, Greece; Sissy Iona, HCMR, Greece; Robert Keeley, DFO-MPO, Canada; Roy Lowry, BODC, UK; Catherine Maillard, IFREMER, France; Gilbert Maudire, IFREMER, France; Peter Pissierssens, IOC IODE, The Netherlands; Dick Schaap, MARIS, The Netherlands

The International Conference on Marine Data Management and Information Systems IMDIS2008 was held in Zappeion Conference Centre of Athens (Greece) from March 31 to April 2 2008.

More than 200 participants met to overview the information systems on marine environmental data, and show the progresses on development of efficient infrastructures for managing large and diverse data sets.

The Conference has presented different systems for on-line access to data, meta-data and products, communication standards, adapted technologies, interoperable platforms. Information systems have an increasing role in the society and a strong impact on science, technology and business. They are moving resources in software, hardware and telecommunication networks for managing information, allow the access to products through services. The fundamental principle defined during the Conference is that data should be a public good. The implication is that it is necessary to provide services to end users.

The Conference allowed to map out and analyze the major information systems so as to identify improvement and requirements for improved systems. Mission of the existing data network is data curation, archiving, preservation, facilitation of a long term and sustainable access to interoperable, high quality data necessary to understand the geological, biological, chemical and physical behavior of the seas and oceans.

Due to the diverse technologies and methodologies, interoperability has been defined as one of the priorities, in order to ease the user access to different kind of products in oceanography, fishery, biology, geology. Another priority discussed during the conference is the development of common vocabularies/conventions. Also education has been considered an important issue to be considered in all programs.

IMDIS 2008 has represented the 'agora' for the different communities working on information systems. It has created collaborative links and understandings of common problems. Some of the priority issues discussed during the conference are herewith discussed and solution for future improvements are presented:

- standards
- common vocabularies
- interoperability
- education

Results from the IODE/JCOMM Forum on Oceanographic Data Management and Exchange Standards

Robert Keeley, DFO / MPO, Canada

Introduction

The organization of the meeting goes back, at least, to IODE-XIX (International Oceanographic Data and information Exchange) held in March 2007. It was evident in the discussions at IODE and a subsequent SeaDataNet meeting that in order to improve the exchange of data and information in the oceanographic community, there was a strong need to develop common approaches to handling and structuring data. Though this is not a new idea, the importance is increasing because of the ease that computer communications networks provide for exchanging data files and information. The development of common approaches is occurring within the SeaDataNet project, but broader participation is needed. It was to address the need to develop and broaden the use of standards that the idea for this meeting was born.

The meeting was held between 21 and 25 January, 2008 at the IODE Project Office in Oostende, Belgium. There were 18 participants from organizations in 8 countries and representatives from IOC/IODE (Intergovernmental Oceanographic Commission), ICES (International Council for the Exploration of the Seas) and WMO/JCOMM (World Meteorological Organization / Joint Commission on Oceanography and Marine Meterology). The meeting was financially supported by the governments of Flanders and the United States of America. It was chaired by Greg Reed, a co-chair of the IODE committee and Bob Keeley, chair of the JCOMM Data Management Programme Area (DMPA). A full report is available from http://www.oceandatastandards.org under the 2008 Forum menu.

The meeting brought together a relatively small number of representatives of organizations who are involved in ocean data management. It was purposely kept small in order to have a manageable size for the first meeting. Organizers endeavoured to get the participation of individuals with strong technical expertise in one or more areas and who are able to influence their national organizations to adopt the agreements that ensued from the meeting.

It was recognized that in order to be successful, the meeting had to produce some concrete results. These were:

a. To develop a process of accepting submissions of proposed standards and following these through to a recommendation.

b. Agreement on some topics that were ready for consideration as a recommended standard.

c. Agreement on other topics that needed more work before submission of a proposal for a standard.

Agreeing on a process for accepting a standard was particularly important to carry forward momentum generated from the meeting. The process needs to be open to the IODE and JCOMM community not only to submit proposals but also in the vetting process and final recommendation. It is necessary to ensure there is wide community understanding of the existence and objectives of the standards process. Participants and others in the international arena must work hard to test and improve the process and then to encourage others to use it. Finally, we must all work to implement the recommendations in our national organizations.

Documentation

Visibility of the work of agreeing on standards needs high visibility to aid international acceptance. To this end the meeting agreed to establish a web site, http://www.oceandatastandards.org, on which material would be placed. This site holds reference material both from the meeting and produced otherwise as well as being the repository of documentation of recommended standards. It forms the hub for the standards acceptance process allowing communications among reviewers and ensuring the process is transparent. Already there is some material on the site (see resource pool) that shows what was available to the meeting as well as a one page summary of the results of the meeting.

Topics Ready for Submission

The agenda of the meeting included a list of about 20 topics ranging from marine metadata (for data discovery purposes), vocabularies, code lists and ontologies, quality control of marine parameters (including surface waves, sea level, currents, water temperature and salinity), and types of quality control flags. It was understood going into the meeting that the list of topics that could be covered and that would produce an agreed standard was ambitious. It was expected that some agreements could be reached but that for other topics the state of current practices was such that no agreement at this time was possible.

Participants were able to come to a conclusion on three topics. Selected participants agreed to use the drafted submission form from the meeting to propose the following standards:

- The use of ISO 8601 (extended form) for the representation of date and time
- The use of ISO 6709 for horizontal and vertical position. Included in this is a recognition that positional information should be referenced to a Coordinate Reference System which should be explicitly stated and accompany the data.
- The use of ISO 3166 (-1 and -3) for country codes.

It was recognized that in some instances, there are limitations to the applicability of these standards. For example, use of the time standard is cumbersome with time series data and can increase the complexity of using or displaying the data. These conditions and limitations will be described in the submission. These three will form the initial test cases for both the documentation and the standard acceptance process.

Topics Not Ready for Submission

A. Quality Control

The many other topics that were discussed were considered to be in various stages of readiness for proposing as a standard. Some already have a document prepared by an expert panel that is completed or very near so. This is the case for the quality control of sea level and the documentation produced by GLOSS (Global Sea Level Observing System). It was thought that with a bit further review it will be ready to propose and to pass through the standards process that was formulated (and will be described later in this document).

In the case of quality control of temperature and salinity observations, a similar result as for sea level was obtained for such profile data. The chairs of IODE and JCOMM-DMPA requested the chair of GTSPP (Global Temperature Salinity Profile Project) to put on his work agenda the preparation of a submission of the procedures used for consideration as a standard. In the case of surface temperature and salinity data, the meeting felt that the reviewed procedures (those of the GOSUD (Global Ocean Surface Underway Data) Project) were highly focused on data derived from the thermosalinograph instrument and so not quite general enough for a standard. The chairs of IODE and JCOMM-DMPA asked the chair of GOSUD to update the quality control procedures, and to make these available through the web site.

With regard to quality control of currents, the discussions recognized that there are different instruments involved and that there would likely be different procedures needed. As an example, radars measuring surface currents have different operating characteristics and return data that is significantly different in type from data returned from a subsurface mooring of a vector averaging current meter or from an acoustic Doppler current profiler mounted on a ship. Select participants agreed to assemble the different material that is pertinent to these types of current measurements and to make these available from the new web site.

Concerning surface wave measurements, the contents of IOC Manuals and Guides #26 needed to be updated and based on the update, a submission should be made for acceptance as a standard. This will be carried out by select participants.

B. Quality Flags

There are a wide variety of schemes to indicate the quality of data. In fact, there are different definitions of what is meant by a "quality flag". Some represent an overall assessment of the quality of the data value such as is done in the SeaDataNet operations.

In other instances, the quality flags are used to record the results of the individual tests conducted on the data. The overall quality of the value is left to the user to decide.

The meeting came to no conclusion except to remark that trying to combine all of this information into a single indicator becomes very complicated. However, it was suggested that if the intention is to provide an indicator of overall quality, the flag set used by SeaDataNet is a sensible one to use.

C. Vocabularies and Ontologies

The meeting had a good presentation on ontologies. The Marine Metadata Interoperability Project, http://marinemetadata.org/ , describes an ontology to be a controlled vocabulary and for which the classifications, aggregations or generalizations are embodied in concepts that are defined explicitly by creating classes. In addition to this, an ontology needs to conform to strict hierarchical subclass relationships between the classes and the classes have properties and relations among them.

In simple terms, a controlled list of ships, the instruments on board each, the variables they measure and the characteristics of the instruments can all be linked together into an ontology. While some initial ontologies have been built (see the MMI site) the development of these is still neither routine nor complete. Participants at the meeting recognized the value of this work and supported its continuance.

In the meantime, there are many opportunities to develop controlled vocabularies. A number of candidates were considered by the meeting including those for countries, platforms, platform types, instruments, parameter names, institutions, projects, units, keywords and taxonomies.

In the case of country codes, rather than develop a new controlled list, it was recognized that the ISO (International Standards Organization) maintains such a list that includes existing countries as well as those that no longer exist. This latter category is quite important in providing information on the originators of data, for example.

In the case of taxonomic schemes, there are a number that exist with different attributes and at different stages of maturity. No one list was an obvious choice to the participants, many of whom had limited expertise in this area. It was decided that this matter should be passed to the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practises (GE-BICH) for their advice.

Concerning keywords, and especially those suited to data discovery, it was concluded that the GCMD (Global Change Master Directory) has an excellent keyword list. However, it was noted that when lists are revised, there are sometimes deletions of words. This is bad practice since it orphans entities indexed by this key word. This was communicated to the group that maintains the GCMD key words.

For the other lists, the meeting came to no conclusions. The lists that currently exist for the various topics are often many. Before the lists become controlled vocabularies, there needs to be an organization that takes ownership of maintaining the list and engages wide participation in the upkeep and support. In some cases, this exists and in others it does not. It is hoped that individual groups or organizations will take up this task to consolidate the many lists in a topic area and to submit a proposal for a standard.

D. Metadata

This topic was focused on standardized metadata, largely for data discovery purposes. The WMO has produced a profile based on the ISO19115 standard and that is used within the WMO Information System (WIS) developments. (http://wis.wmo.int/2006/metadata/WMO%20Core%20Metadata%20Profile%20(October%202006)/documentation.htm). Likewise the ocean community through the work carried out at the Australian Data Centre has produced the Marine Community Profile (http://www.aodc.org.au/index.php?id=37). In addition to this, there is the metadata standard used within SeaDataNet, the CDI (http://www.sea-search.net/cdi_documentation/CDI_XML_V0_documentation_3_00_June07.doc),

and the North American Profile (http://www.fgdc.gov/standards/projects/incits-l1-standards-projects/NAP-Metadata). All of these are profiles based on the ISO19115 standard. This means that although all may not contain the same metadata, when the same metadata are present, they will be structured in the same way.

The differences between these represent the differing views and purposes of the authors to describe the data of their community. The meeting endorsed the ISO19115 standard as the basis for any data discovery metadata scheme. The author of the Marine Community Profile agreed to examine the differences between these (except the North American Profile) to attempt to consolidate them into a single profile. The result will form the basis of a submission to the standards process.

Standards Process

This first meeting addressed some standards, but it was noted that there are so many topics that would benefit from standardization, it would be impossible to deal with them without some ongoing process. As a starting point, participants looked at existing standard processes used by different organizations. It deemed that the one closest to our needs was that formulated by the DMAC (Data Management and Communications) initiative in the United States. So, a breakout session was organized and a rough draft was produced of what a joint IODE / JCOMM process could be like. This was the basis for documentation that was prepared after the meeting. What is reported here is the latest version (as of early March, 2008) with some details still to be decided.

An important consideration in the discussions was not only the process itself, but how the process can be sustained with a minimum of overheads and costs.

The standards that are produced by this process are intended primarily for the use of the marine meteorological and oceanographic community. If they have wider applicability, they may be submitted to appropriate international standards bodies, such as ISO. However, after recommendation, their use will be widely encouraged within IOC and WMO.

Process description

The overall process is shown in figure 1. There are a number of steps in the process and a number of individuals and groups that have roles to play. These individuals and groups, and their roles and responsibilities are described here.

Much of the activity related to submission and approval of the standard will take place electronically. There will be face to face meetings of the team responsible for guiding submissions through the process, but approval is not tied to this meeting schedule. At this stage, time frames for resolution of the various steps in the process have been proposed. These figures have not been debated as yet, and so may change in an updated version.

The process from submission through evaluation may result in a recommended standard for IOC and WMO member / member states. Documentation of the proposal and comments generated through the review will be available on the web site.

The entire process is intended to be limited to a maximum of no more than 8 months. Although the timing described should result in a decision more quickly than this, there may be some time expended in identifying individuals to take part in the review.

There are expected to be instances of proposals very well prepared and tested or of an application of an existing international standard. In these cases, there is a fast track process that can be taken (though not yet formulated). The determination of whether the proposal meets fast tracking criteria occurs early and allows for a more rapid determination of suitability.

Polling of individuals and member / member states is an important part of the process. It is through such polling that it will be clear if there is wide spread support for a proposal. Polling will be conducted electronically, with a set period for response. If a response is requested, but none received, this will be interpreted as being unopposed to acceptance of the recommendation.

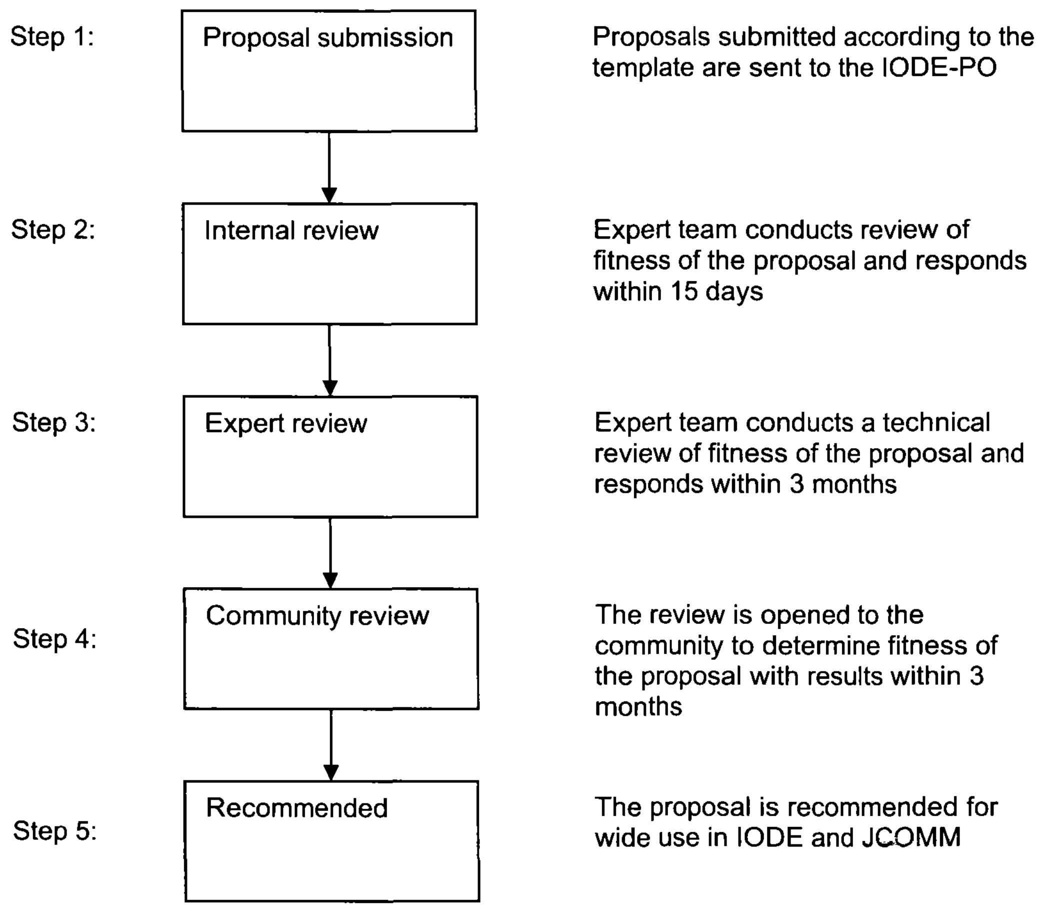

Figure 1: IODE / JCOMM Standards Process overview

Step 1: Submission of a proposal

A proposal to be presented to the IODE / JCOMM Standards Process can be prepared by any group within IODE and JCOMM, and by any member / member state of IOC and WMO. In addition, other groups that have interests in the management of marine meteorological and oceanographic data may submit proposals for consideration.

The scope of proposals should be related to collection, management and exchange of marine meteorological and oceanographic data between IOC and WMO member / member states. The emphasis is on improving the interoperability of data. As such, this would include:

- Developing vocabularies that permit unambiguous and machine processable data and information descriptions.

- Methods that encourage the convergence from multiple solutions of a problem, to fewer, more robust solutions
- Methods that can be used widely in the marine meteorological and oceanographic community.
- Well tested methods for managing data or information that if widely used would provide greater consistency in treatment.

In order for a proposal to be considered, it must be prepared using the template for that purpose and available through the web site.

Proposals should be submitted to the IODE Project Office (IODE-PO) IODE/JCOMM Standards Process They will be placed on the appropriate pages of the standards process web site maintained by the IODE-PO.

Step 2: Internal Review

The purpose of this step is to ensure that the proposal is complete and fully informative of what is being proposed. If information is lacking or the proposal is unclear, the proponent will be contacted and provided with comments about what changes are deemed necessary.

The internal review will be initiated by the IODE-PO by sending a copy to members of the joint IODE/JCOMM Expert Team on Data Management Practices (ETDMP). Members will read the proposal and respond with comments within 15 days of notification. This review will examine the proposal and consider such questions as

a. Is the purpose of the standard well defined and clear?

b. Is there sufficient detail in the proposal to allow for an expert review?

c. Is the proposal clearly written and complete?

d. Are there any obvious weaknesses?

e. Is there another competing potential standard that has equal merit or should be considered?

f. Does this proposal address a pressing issue at this time?

g. Can the standard be applied widely by the IOC and WMO member / member states?

h. Is the proposal suitable for a fast track approach? Criteria to consider include:

    i. Has the submission come from a formal group responsible for managing data affected by the proposal?

ii. Does the proposal recommend circumstances for the application of an existing standard?

iii. Is it likely that the appropriate members for the technical internal review will come from the same group that submit the proposal?

Responses will be collated by the IODE-PO, and reviewed by the chair of ETDMP. Based on comments received, the proponent will receive one of the following notifications.

a. the proposal will be fast tracked and therefore moved to "proposed" status

b. the proposal will be moved to "submitted" status

c. the collated comments of the internal review will be sent to the proponent so that the proposal can be amended

d. the proposal will not be considered at this time

The proponent whose proposal requires a change will be given 15 days to respond with an amended proposal. If the submission arrives later than this, it will re-enter the stream as a new proposal.

The comments will be placed on the appropriate pages of the standards process web site maintained by the IODE-PO and associated with the proposal. The outcome of the review will be clearly indicated.

Step 3: Expert Review

Moving a proposal to Expert Review changes its status to "Submitted".

The first action is taken by the ETDMP. They must identify and recruit members of an expert team to examine the proposal. Members may be drawn from ETDMP itself, or may be requested from other groups of IODE and JCOMM. In some circumstances, team members may be drawn from outside these organizations, to be sure adequate technical background is available.

The ETDMP must then work with the expert team to develop appropriate criteria for the review. These will be used to guide the discussions.

The IODE-PO will establish an on-line forum for discussions of the expert team. This forum will be password protected and discussions will not be made public.

ETDMP will designate a "Moderator" for the review. This person may be a member of ETDMP or of the expert team. Their role is to guide the review, ensuring that all discussions reach a conclusion and consensus is reached if possible.

The review should be conducted as expeditiously as possible. During the course of the review, the expert team, through the Moderator, may contact the proponent to clarify aspects. These exchanges should be minimized since if they become too frequent, it is an indication that the proposal has not been written clearly enough.

The Moderator should provide a brief monthly report to the chair of ETDMP. This report should summarize progress in the review and indicate what is left to do. The Moderator may poll expert team members at any time to determine if the proposal should pass to "Proposed" status. This will occur if the proposal achieves support of at least 75% of the expert team.

At the end of 3 months, if no decision has been reached by the expert team, a poll of expert team members will be taken. If there is sufficient support of members that favour the proposal it will be moved to "Proposed" status.

If support is insufficient, the chair of the expert team will write a review of the discussions and provide this to ETDMP. These comments will go back to the proponent who will be given a period of 1 month to address the technical shortcomings. The revisions will be passed back to the expert team, to judge and make a decision. If not enough support is garnered in a subsequent poll, the chair of the expert team will summarize the shortcomings and report to the chair of ETDMP. The chair of ETDMP will notify the proponent, provide the report to them and invite them to revise and resubmit the proposal at a later date.

At the end of this step, the IODE-PO will close the internal forum and archive the discussions. The ETDMP will dissolve the expert team used in the internal review.

The comments will be placed on the appropriate pages of the standards process web site maintained by the IODE-PO and associated with the proposal. The outcome of the review will be clearly indicated.

Step 4: Community Review

When a proposal goes to Community Review it results in changing the status to "Proposed". This stage opens discussions up for wide community comment.

At this step the IODE-PO will undertake the following actions

a. It will open a public, on-line forum for discussion of the proposal.

b. It will use methods such as Circular Letters, emails, notices on web pages and other communications means to notify the public that the standard has been proposed.

c. It will provide the login information and invite comments for a period of 3 months.

d. It will invite interested parties to experiment with the proposed standard to assist in evaluating its utility.

The ETDMP will appoint a Moderator to guide the public discussion. In most cases, this would be the same person who played this role for the internal review, since they will know the previous discussions and so will be able to short cut discussions that do not progress the evaluation. The Moderator's role is to foster discussion and evaluation. They should refrain from detailed explanations of the proposal since if this is required it means the proposal is not clearly written or defined.

A poll to gauge support for passing the proposal to "Recommended" status may be taken at any time, but will occur no earlier than 3 months after the proposal achieved "Proposed" status. All IODE and JCOMM member / member states will be polled with one vote per member. If the proposal attains support from 75% of members, it will pass to the "Recommended" step.

If the proposal does not achieve sufficient support, the moderator will summarize the discussions of the forum, and provide a list of shortcomings identified. This will be provided to ETDMP.

ETDMP may decide:

a. to return the proposal to the proponent, along with the comments and an invitation to resubmit a modified proposal.

b. to cease further consideration of the proposal in which case the proponent will be provided with the comments and decision.

c. to suspend the proposal. Reasons for doing so may include that there has been insufficient testing performed, or that the proposal though sound, needs better clarity. The moderator will work with the proponent to improve the description, or identify means to conduct further tests. In no more than 3 months, the revised proposal, with perhaps new results from testing will again be put to a vote. If sufficient support is achieved, the proposal passes to the "Recommended" stage, or if not well supported it is removed from the process.

At the end of this step, the IODE-PO will close the public forum and archive the discussions.

The comments will be placed on the appropriate pages of the standards process web site maintained by the IODE-PO and associated with the proposal. The outcome of the review will be clearly indicated.

Step 5: Recommended

Having achieved "Recommended" status, the standard will be widely advertised.

The IODE-PO will undertake the following actions

a. It will use methods such as Circular Letters, emails, notices on web pages and other communications means to notify member / member states of IOC and JCOMM that the standard has been recommended.

b. It will provide the URL where information about the standard can be found

c. It will invite all member / member states of IOC and JCOMM to implement the recommended standard as soon as feasible.

d. It will establish a registry where member / member states can indicate when and in what circumstances they have achieved compliance with the recommended standard.

The chair of IODE and the chair of the DMPA will prepare appropriate resolutions on the use of the recommended standard to be submitted to parent bodies for ratification.

Conclusions

The Forum on Standards was a very intensive meeting with a wide variety of topics and issues addressed. There was strong participation by everyone. Three topics were deemed sufficiently mature to be submitted for immediate consideration as standards. A further half dozen or so were deemed sufficiently close that with a little more preparation they may be submitted for consideration. Some topics were either outside the domain of expertise of participants or not yet sufficiently mature for a standard to be considered.

Of great importance is the development of a well defined process for agreeing on standards. This process uses an existing group in IODE and JCOMM as the guiding body. Experts needed to advise on submissions can be drawn from other IODE and JCOMM groups and teams as appropriate. The process does not rely on face to face meetings for progress. Instead, it will use Internet based infrastructure to support reviews, documentation, reporting, and voting. The IODE-PO will provide this infrastructure as an extension to present services. All of these decisions were taken with careful consideration of the resource costs both manpower and financial. To the extent possible, these are reduced by taking advantage of existing groups and facilities.

The development of standards is a means to an end, not an end in itself. It is through the development and adoption of clearer data descriptions, common data structures, documented and common data processing, and standard exchange protocols that data exchange will be improved. Improvements mean easier, well defined and routine data exchanges with reduced manual intervention. This will improve products and services in both IODE and JCOMM.

The single most crucial step is the broad scale implementation of whatever recommendations are produced. Member / member states of IODE and JCOMM are not only committing to a process to agree on standards but also a process to adopt and implement the agreed standards as expeditiously as possible.

Common Vocabularies: further improvements and the development of ontologies

Roy Lowry, British Oceanographic Data Centre, Dick M.A. Schaap, Maris BV

The GF3 Era

The first serious attempt to establish a set of common vocabularies to facilitate oceanographic data exchange was made by the Intergovernmental Oceanographic Commission (IOC) International Oceanographic Data and Information Exchange (IODE) Group of Experts on Technical Aspects of Data Exchange (GETADE) as part of the GF3 standard. This was published (UNESCO 1987) as a series of printed tables and included lists for:

- Country names
- Character encodings
- Platform types
- Validation Flags
- Parameter codes
    - General purpose
    - Date and time within day
    - Time and frequency
    - Position and navigation
    - Physical oceanography
    - Waves
    - Meteorology
    - Geophysics
    - Chemistry
    - Special purpose

These GF3 vocabularies were quite well thought out and developed to a high standard, particularly the parameter vocabulary, which included comprehensive definitions of many terms. Their problem was that they were published in print. It is impossible for any group of people to produce a complete description of a domain that will be valid forever. Science moves on and domain scope can change. If they are to survive in this environment then vocabularies must evolve. Whilst GETADE was able to provide the content governance for such development, the cost of regularly reprinting updated vocabularies was prohibitive. Consequently, the GF3 vocabularies were perceived as unchanging and therefore not fit for the purpose of supporting the developing field of oceanographic data management.

Early computerisation

During the 1990s many data centres developed computerised controlled vocabulary systems. Whilst many of these were initially based on the GF3 vocabularies, they were maintained and extended locally with no centralised co-ordination or even communication between the centres. The result was analogous to the evolution of finches on the Galapagos Islands resulting in many similar but significantly different versions of the same thing.

The problem was exacerbated by the centres giving very little attention to vocabulary content governance. New terms were often added under pressure with milliseconds of thought by relatively unskilled personnel. An extreme example of this was a metadata entry tool formerly used in BODC by vacation students that included an 'add vocabulary entry' button. Terms were also added just as terms with no definitions, further reducing the amount of intellectual input that went into vocabulary development. The result were vocabularies that at best contained duplicate terms and terms with highly variable granularity and at worst contained terms that were pure unadulterated garbage, such as the Dutch for 'not specified' being included in an English language list of sea level datums.

A further problem that beset these weakly governed lists was the addition of inappropriate terms. This had two main causes. The first may be described as entity semantic drift. Vocabulary terms may be regarded as instances of a class, which should also be clearly defined. This problem may be clearly seen in the development of the ICES Ship Code list which includes platform classes (e.g. helicopter), ferry routes and locations in the North Atlantic in addition to the attributes of instances of the 'ship' platform class.

The second cause was shoe-horning to overcome inadequacies in data models. Consider the case where it is discovered that a one-to-one relationship in a populated data model should really have been one-to-many. Correcting such an error properly requires significant effort with changes to both the data systems and their associated software. It is much easier to effect a cure through the creation of vocabulary entries that are instance lists. The problem is that the result is a local vocabulary variant that is very difficult to reconcile with other vocabulary lists.

Sea-Search Common Data Libraries

The EU Sea-Search project recognised that there was a problem with vocabulary management and made an initial attempt to address it through the specification of a set of 'Common Data Libraries'. Whilst this was a laudable step in the right direction, the initiative fell short in three areas:

- The model for content governance was that responsibility for a specific vocabulary was assigned to an individual. Whilst there was some communication with other project partners, this was usually a broadly specified request for input and individuals were still left to make the critical decisions on matters of detail in isolation. Experience has proved that moderated group discussion significantly improves the quality of this type of decision.

- The technical governance was weak. The Data Libraries were published as CSV files located either on the BODC FTP server or the Maris web site with rudimentary file system timestamps and no formal versioning.

- There was no mechanism to enforce usage of the centralised 'master version' of the vocabulary. Problems encountered by BODC during EDMED record import clearly demonstrated that there were multiple versions of vocabularies in use, each with its own local extensions.

SeaDataNet

The SeaDataNet Technical Task Team (TTT) decided to significantly improve the standard of vocabulary management at the outset of the project. The improvements implemented were:

- Adoption of permanent labels known as Universal Resource Names (URN) for field content in metadata documents.

- Provision of content governance through SeaDataNet TTT discussion for 'internal' topics and through SeaVoX, an open international vocabulary discussion forum under the joint auspices of SeaDataNet and the IODE Marine XML Steering Group for topics deemed to be of wider interest.

- Provision of improved vocabulary content, including development of term definitions, through utilisation of this governance.

- Provision of technical governance through adoption of the NERC DataGrid Vocabulary Server technology, which provides formally versioned vocabulary storage together with centralised serving.

- Provision of non-programmatic access to end-users by a client interface for searching, browsing and CSV-format export of selected entries.

- Provision of XML schema extensions based on Schematron that ensured through verification at source that metadata fields were populated with valid entries from the 'master' vocabulary.

The NERC DataGrid Vocabulary Server

The NDG Vocabulary Server data model comprises concepts that are represented by an identifier, a term label, an abbreviation and a definition. These are grouped into lists, sometimes termed vocabularies, that are each designed to populate a specific metadata element.

The concepts are stored in an Oracle relational database incorporating automatically maintained timestamps and audit trails that allow the vocabularies to be reconstructed as they were at any time in the past. Each vocabulary is formally versioned, with a new version created whenever one or more changes have been made to the vocabulary during the previous day. The vocabularies are delivered from the database as XML documents that are dynamically created by a Java software layer.

Each concept has a concrete web presence. The vocabulary and term identifiers may be encoded together with some standardised text to form a URL. For example, the concept 'amphibious vehicle' may be represented by the URL http://vocab.ndg.nerc.ac.uk/term/L062/current/95. This URL (and similar URLs for every concept in the vocabulary server) returns and XML document describing the concept thus:

```
<?xml version="1.0" ?>

<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:skos="http://www.w3.org/2004/02/skos/core#"
xmlns:dc="http://purl.org/dc/elements/1.1/">

<skos:Concept rdf:about="http://vocab.ndg.nerc.ac.uk/term/L062/2/95">

<skos:externalID>SDN:L062:2:95</skos:externalID>

<skos:prefLabel>amphibious vehicle</skos:prefLabel>

<skos:altLabel />

<skos:definition>A self-propelled platform capable of operating on land

 and within or on the surface of a water body.</skos:definition>

<dc:date>2008-02-26T14:25:51.822+0000</dc:date>

<skos:narrowMatch rdf:resource="http://vocab.ndg.nerc.ac.uk/term/L061/6/9A"
/> !DUKW
```

```
<skos:narrowMatch rdf:resource="http://vocab.ndg.nerc.ac.uk/term/L061/6/9B"
/> !Hovercraft

</skos:Concept>

</rdf:RDF>
```

The document presents the concept URL, the term label (skos:prefLabel), an abbreviated label (skos:altLabel: in this case null) and its definition (skos:definition). It also includes an external identifier (skos:externalID), which is the SeaDataNet URN for the concept. From this document it can be seen that the concept URL may be derived from its URN through by simply substituting 'http://vocab.ndg.nerc.ac.uk/term/' for 'SDN:' and replacing the other colons by slashes.

The XML document format conforms both to the W3C Resource Description Framework (RDF) and Simple Knowledge Organisation System (SKOS) standards and is therefore compatible with Semantic Web technologies. In addition to describing the concept, the document also provides mappings through the skos:narrowMatch elements to other concepts, in this case to 'DUKW' and 'Hovercraft', which are two types of amphibious vehicle. Thus the Vocabulary Server is capable of serving both lists and their relationships, which is one definition of domain ontology.

In addition to direct concept URLs, and similar URLs for lists, the information held in the server may be accessed through a more sophisticated API. This is documented at **http://www.bodc.ac.uk/products/web_services/vocab/methods.html** and implemented both as 'HTTP-POX' (http get returning plain old XML) or as SOAP as described by a WSDL available from **http://vocab.ndg.nerc.ac.uk/**. The API is compliant to WS Basis Profile 1.1, which is adopted as standard for all Web Services in SeaDataNet.

At the time of preparation for the IMDIS conference (2008-02-25), the Vocabulary Server currently held 105 public lists, 120878 concepts and 75766 mappings (RDF triples). Additional content is added on a daily basis. It is servicing approximately 3000 list requests per month.

Ontologies and the Road to Interoperability

The fact that the document server delivers domain ontologies has significance for semantic interoperability between metadata documents. Consider the use case where BODC wishes to produce a GCMD DIF document from an EDMED V1.2 document.

The "parameter" sections of the two documents are populated using different vocabularies (BODC PDV and GCMD Science Keywords).This situation is addressed in conventional crosswalks by excluding the parameter section from the GCMD document.

However, with the vocabulary server it is possible to list the BODC PDV terms from the EDMED document as URNs, for example:

- SDN:P021:24:TEMP
- SDN:P021:24:PSAL
- SDN:P021:24:CPWC

Each URN may then translated into a list of URLs thus.

- http://vocab.ndg.nerc.ac.uk/term/24/TEMP
- http://vocab.ndg.nerc.ac.uk/term/24/PSAL
- http://vocab.ndg.nerc.ac.uk/term/24/CPWC

These URLs may be rolled into an HTTP get request thus:

http://vocab.ndg.nerc.ac.uk/axis2/services/vocab/getRelatedRecordByTerm?subjectTerm=http://vocab.ndg.nerc.ac.uk/term/P021/current/TEMP&subjectTerm=http://vocab.ndg.nerc.ac.uk/term/P021/current/PSAL&subjectTerm=http://vocab.ndg.nerc.ac.uk/term/P021/current/CPWC&objectList=http://vocab.ndg.nerc.ac.uk/list/P041/current&predicate=255&inferences=true

This returns an XML document containing the GCMD Science Keywords that map to the three BODC terms as both text labels and URLs, which may be reformatted using XSLT or XQuery to generate the "parameters" section for the DIF.

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Standards and Interoperability

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Introduction

A few years ago, information was discrete and disconnected, assembling data from many different sources was inherently time consuming, and was made for specific studies, such as evaluation of trends in ecosystems, climatology productions, etc. In fact, data managed from multiple heterogeneous data sources needs to be combined, requiring complex processing such as content mediation(?) and aggregation. This is not a simple task, because of the different legacies of data management and processing systems. In information systems, there exist various types of heterogeneity to be addressed (Sheth 1998):

- Information Heterogeneity
  - Semantic Heterogeneity
  - Structural, Representational/Schematic Heterogeneity
  - Syntactic, Format Heterogeneity
- System Heterogeneity
  - Information System Heterogeneity
  - Digital Media Repository Management Systems
  - Database Management Systems (heterogeneity of DBMSs, data models, system capabilities such as concurrency control and recovery)
- Platform Heterogeneity
  - Operating Systems (heterogeneity of file system, naming, file types, operation, transaction support, IPC)
  - Hardware/System (heterogeneity of instruction set, data representation/coding)

During the last decade, with the advent of Internet-based system architectures, a fundamental shift has occurred. The digitization of all kinds of data, the implementation of computer networks and the availability of broad band have provided the basis for the connection of a vast amount of data and information. Internet, Web, distributed information systems and computing infrastructures have been changing the working way in science, engineering, business, and education. Today, advances in all kinds of application domains are often related, opening up the possibility to access heterogeneous information and, with related tools, to understand and use them.

The need to access data residing in different disciplinary information environments has made interoperability a key consideration for people working on cross-disciplinary systems and applications.

Interoperability is not a new concept in information science. The idea has always been to ensure that data and information can flow as efficiently as possible between people and systems, with different kinds of software systems working easily together.

Information systems have an increasing role in society and a strong impact on science, technology and business. Resources are moved in software, hardware and telecommunication networks for managing information and to allow the access to products through services. In the actual world -still characterised by large distributed autonomous, diverse and dynamic information sources- access to relevant and accurate information can be very complex.

The Marine domain

In the marine domain, different scientific and technological communities are working together to develop federated information systems by applying interoperability solutions and recognising that:

- Data in the marine sciences are being used by a far broader community than ever before.
- Metadata are critical for recording the provenance of marine data, including processing steps and quality control certification (who, what, where, when, which, why, how).
- Auto-harvesting the information, selecting interoperability standards, exchanging metadata, and synchronizing metadata with evolving standards and needs are important and difficult challenges.
- A basic international goal is the definition of a standard set of metadata to define an oceanographic cruise, and a mechanism for exchanging the acquired information.

Due to the diverse technologies and methodologies, interoperability has been defined as one of the priorities in order to ease users access to different kind of products in oceanography, fishery, biology, and geology.

Interoperability Aspects

Having in mind the different types of heterogeneity in information systems, corresponding interoperability concerns are recognized. Thus, interoperability encompasses three important aspects:

- Semantic interoperability: its objective is ensuring the precise meaning of exchanged information is understandable by any application involved.
- Technical interoperability: it is concerned with the technical issues of linking up computer systems, the definition of open interfaces, data formats and protocols.
- Organizational interoperability: this deals with modeling organizational processes, aligning information architectures with organizational goals, and helping these processes to co-operate.

Technical interoperability involves solutions to deal with syntactic and structural heterogeneities characterizing data and information. Examples of these heterogeneities are, respectively: differences in machine-readable aspects of data representation (also referred to as formatting), and data modelling constructs and structured databases multiplicity.

While significant progress has been achieved in technical interoperability, several advances in software technologies are continuing to bring focus to semantic issues and semantic interoperability.

Semantic interoperability means enabling different agents, services, and applications to exchange information, data and knowledge in a meaningful way, on and off the Web [3]. Therefore, semantic interoperability is a necessary component in achieving full interoperability since it is concerned with ensuring that the precise meaning of exchanged information is understandable by other parties.

The Marine domain cannot be expressed adequately with a taxonomy, or with a thesaurus which models term relationships, as opposed to concept relationships. Conceptual models have been used in order to seek to model a portion of the domain that a database must contain data for or a system must implement systems for. UML is the paradigmatic modeling language [4] used by domain experts. These conceptual models require human semantic interpretation; hence, conceptual or abstract interoperability is a sine qua non for heterogeneous data models semantic interoperability. In this context, semantic interoperability is about defining mappings between concepts within the data models, which requires content analysis.

As far as organizational interoperability is concerned, the creation of a common shared data infrastructure entails complex negotiations relating to the relative institutional weight of the different actors, the nature of their disciplinary organization and domain work. In fact, institutions have a range of motives for subscribing or not to interoperability strategies. According to their disciplinary nature they are characterized by different reward structures, openness to interdisciplinary work, and history of use of large datasets. Moreover, institutions work differentiates for degree of commitment to long-term data storage and re-use, decay rate of data over time, and need to draw on large federate datasets.

Interoperability Strategies: the Standardization Process

Interoperability is underpinned by standards developed at the international level –that includes Community interoperability specifications considered as "de-facto" standards. According to several experts, we are at the same point in time as the industrial revolution where the infrastructure of the industrial age was underpinned by standards [5]. In fact, there exists an universally adopted standard infrastructure for distributed computing: Internet. Enabled by this capability, a multiplicity of interoperability standards have been introduced for information modelling, encoding, transformation, and access. Most of these standards have been implemented by commercial and open source software solutions; they are recognized and adopted by scientific and industrial sectors of the Society. Valuable cases in point are: semi-structured data models (i.e. XML) and Service Oriented Architectures (i.e. Web Services).

This approach is particularly useful for building public sector systems. In keeping with it, cross-disciplinary interoperability strategies should include:

- The universal adoption of common standards used on the Internet and World Wide Web.
- Open Standards documented, freely implementable and available to the public at large.
- The adoption of XML as the primary standard for data model encoding.
- Interoperability and presentation tools for all public sector systems and the use of XML Schema Definition Language (i.e. XSD) to support Web Services through Web Services Description Language (WSDL) based interfaces.
- W3C compliant browser as the key human interface –all public sector information systems to be accessible through browser based technology.
- Security functionalities (e.g. authentication, authorization, audit, etc.) supported by standards to assure a secure computing environment.
- Scalability, i.e. the capacity to be scaled to satisfy changed demands made on the system, such as changes in data volumes, number of transactions or number of users.

There are a number of standards development organizations (SDOs), that provide specifications for interoperability standards. They are either international organizations releasing interoperability standards (e.g. ISO, FGDC, CEN), or information Communities specifying interoperability arrangements for specific domains (e.g. the OPeNDAP organization, UNIDATA, the Taxonomy Database WG, etc.). The main interoperability aspects covered by these technical specifications are: information modelling, metadatation(?), and encoding; registering, storing, processing, discovery, and access shared data, metadata, and products; service and resource oriented systems (e.g. Web Services and RESTfull systems), distributed computing platforms (e.g. Internet, GRID computing).

Considering the multiplicity of interoperability specifications, GEOSS [6] created a Standards and Interoperability Forum (SIF) [7] to discuss and recognize the supported interoperability standard and arrangements; INSPIRE is going to release specific guidelines for standard implementations of the European Directive Implementing Rules.

Some common interoperability standards and arrangements are briefly listed in the appendix.

Interoperability Layers

As far as Earth Science multi-disciplinary systems are concerned, the set of existing international standards are not yet sufficient to assure a complete interoperability. It is necessary to understand to what extent the disciplinary systems legacy can be maintained by developing appropriate middleware (e.g. mediation and brokering services).

As previously discussed, interoperability can be applied at different levels. Some specific problems are presented here, as well as the solutions adopted in the EC project SeaDataNet.

- Data format: the number of formats can be reduced but it is hard to believe that a unique data format will be adopted by different communities: however it could be very important to define a common data model. SeaDataNet has recognized three 'interoperability arrangement' formats (MedAltlas, ODV and NetCDF) and is developing the solutions to transform one onto another.

- Data access protocols: the rich structure and semantic of data has, as a consequence, multiple protocols for data access; the flexibility in data access can be reached by connecting the individual, heterogeneous, distributed data sets to data system through wrappers and mediators, which homogenise the access: this is the data federation. SeaDataNet is accepting any kind of "well accepted" community protocol for data access (ftp, http, OPeNDAP, ncWMS, etc).

- Catalogue service: Catalogue service interface standards support the ability to publish and search collections of descriptive information (metadata) about geospatial data, services and related resources. Providers of resources use catalogues to register metadata that conform to the provider's choice of an information model; such models include descriptions of spatial references and thematic information. Client applications can then search for geospatial data and services in very efficient ways. SeaDataNet data discovery and query is achieved through the Common Data Index (CDI), and interoperability with other catalogues and inventory services, such as THREDDS, will be assured by implementing a specific interface compliant with the OGC CS-W/ISO specification.

- Presentation: the explosion of Internet and the Web caused a universal rush to create Web pages providing on-line access to the vast legacy of existing heterogeneous information, without any relocation, reformatting and restructuring of data. This layer is responsible for the delivery of information for further processing or display. SeaDataNet is offering the on-line data selection and access and offline data visualization.

Steps Forward

There are many barriers to the provision of data to intermediate and end users, some of them being related to information technology (formats, standards, information systems). The Open System Interconnection (OSI) layered model of network architecture developed in the framework of ISO is providing an abstract description for a network protocol design. Although it has been superseded by newer IEFT and IEEE, OSI is still a good generic model to be adopted for building an interoperability architecture.

The EU INSPIRE directive is providing the guidelines for an interoperable infrastructure in terms of data specification, metadata, network services, application schemas and resource (i.e. data and service) catalogues, coordinate referencing and units of measurements model, security, data policy, etc.

To address the needs stemming from environmental changes, population stress, susceptibility to natural disasters and increasingly interdependent economies, governments are collaborating through the Group on Earth Observations, GEO, to link together thousands of observing systems that, until now, have operated in isolation. GEO is creating a Global Earth Observation System of Systems (GEOSS) to bring societal benefits through improved access to, and synergy among, current and future Earth observing systems. The convergence of Earth observing systems is pursued promoting interoperability arrangements agreed to by consensus.

One effort to be done in the near future is the development of a general and common data model that can be used in many applications. Identical efforts must be devoted to an advanced catalogue services interface specification.

SOA and Web Services must be considered. They enable interoperability of heterogeneous systems and allow the best use of breed. To facilitate matchmaking between providers of Web services and candidate users of those services a common language for describing these services would be extremely useful. Service-Oriented Architecture is based on the notion that it is beneficial to decompose a large problem into a collection of smaller, related pieces. This helps to establish a high form of abstraction that encapsulates both application and process logic. Services act as "black boxes," hiding their details from the outside world [11]. Web services enable the decoupling between user systems (service consumers) and servers (service providers) through a well defined interface. This allows an independent development of components. SOA and Web services are a flexible, extensible architectural framework that reduces cost, increases revenue, and enables rapid application delivery and integration across organizations and "siloed" applications.

Quality of Services (QoS) is expected to become a value added capability of emerging web services.

The advantages of Web services are relate to:

- the possibility to allow interoperability among different application software on different platforms;
- uses of 'open' standards and protocols, protocol and data format is, where possible, in textual form (??textural data formats?)
- there is no need to change security rules at local level if HTTP is used for the message transport
- allowing the use of yet to be developed infrastructures and applications and are relatively independent on modification on them

Conversely, some Web services specifications are not yet mature or widely adopted, and performances might be worse than with other alternative approaches (e.g. Java RMI).

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Education and Information sciences

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Introduction

The Earth System is the unified set of physical, chemical, biological and social components, processes and interactions that together determine the state and dynamics of the Earth. Earth System Science is the study of the Earth System, with an emphasis on observing, understanding and predicting global environmental changes involving interactions between land, atmosphere, water, ice, biosphere, society, technologies and economies. Education in Earth System Science is of fundamental importance for the society. Human activities are playing a major role in Earth System: man is driving changes and at the same time is affected by them. Earth System Science is than offering a good opportunity for students to pursue the natural desire to understand the environmental problems and work to improve the quality of the environment and make the world a better place where to live.

Due to the complexity of the Earth System Science, it is not practically possible to teach it during normal university course. However, it is possible to 'simplify' the study approach by giving a particular attention to a sub-system of the Earth System. In this regard, Oceanography is particular challenging, since allow to study the dynamic and complex interactions (e.g. energy balance, water cycles, biochemical cycles) among the different components of the ocean processes and interaction with other disciplines (atmosphere and biosphere *in primis*). Multi temporal and spatial scales are especially relevant as oceanography is applied to key issues such as climate variability, coastal management, biodiversity. Using the Oceanography case, students can understand how society interacts with environment, acquire technical and scientific skills and interdisciplinary interests in science, technology, engineering and mathematics.

A key issue of education in Oceanography, as well as in Earth Science, is the link between research and education. This encompasses both teaching and learning of knowledge, proper conduct and technical competency. The educational setting must be done in a way to enhance skills, mental and moral attitudes.

Education calling Research

The importance of a strong link between research and education for the benefit of society has been derived by the US NASA initiative to develop Earth System Science programs (www.essedesignguide.org), starting from a diagram prepared by the Earth System Science (ESS) Subcommittee of the NASA Advisory Council (http://oceanworld.tamu.edu/resources/oceanography-book/earthsystems.htm).

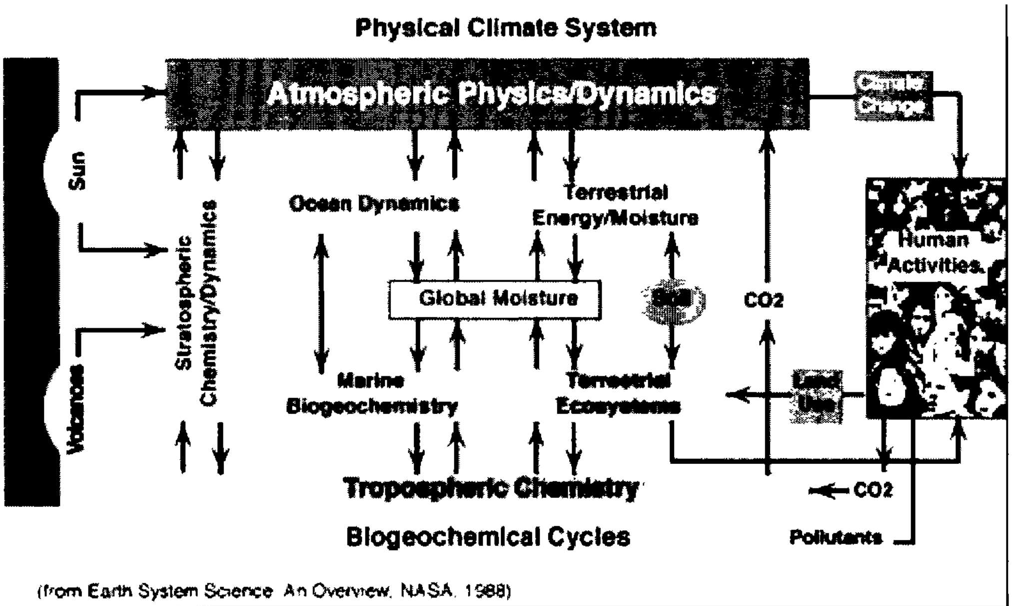

Figure 1. The generic scheme of a 'systemic' approach to Earth System Science (NASA)

This diagram illustrate the "systemic", interdisciplinary interactions between what were once practiced as isolated, scientific disciplines. An examination of the ESS diagram reveals that there are huge difficulties in putting the complex Earth System Science in the educational arena. In fact the study of disciplines and of relationship among them cannot be done in the normal four year time allotted for undergraduate education. However, it is important to derive the important concepts of multi-disciplinarity and systemic approach, by providing to students some demonstrative examples. In this case oceanography and data management are used.

Data are the base for a knowledge based educational system and for the understanding of functioning of any system. At the same time their interpretation requires scientific and technological knowledge. In figure 1 it is synthesized the links between disciplines and data and the use of these for societal benefit. To collect data it is necessary to know the ecosystem functioning, and have also knowledge in mathematics in order to be able to model the ecosystem and define an optimal sampling strategy. Once data are collected, the must be organized (possibly in an Information System), analyzed and information on complexity of the ecosystem extracted.

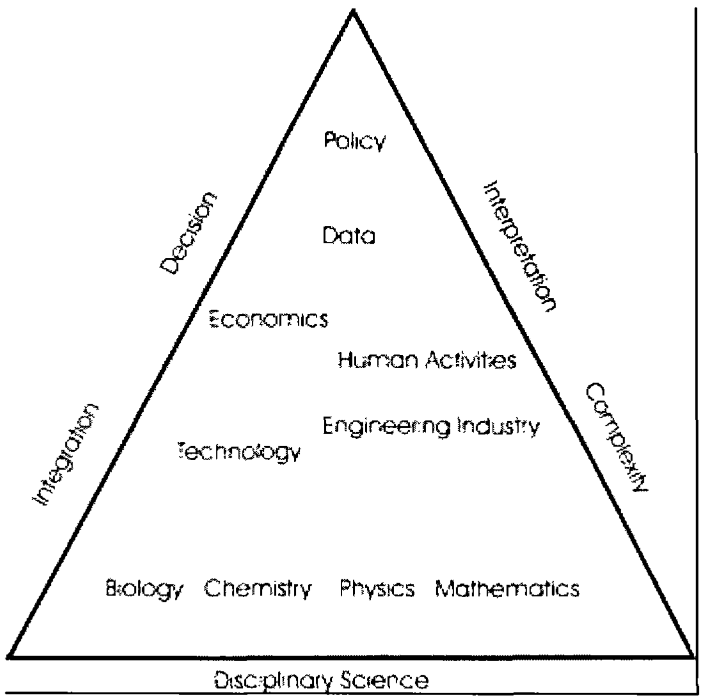

Figure 2. A schematic view of the importance of data and interdisciplinary approach in oceanography in support to management of marine environment.

Here it is important to underlie the ethical aspects in data interpretation. Data analysis and interpretation is used also for policy issues, any error or misinterpretation could lead to negative environmental management options.

Role of research: Need to access data

The relevant interactions among physical, chemical, biological and dynamical processes is emphasized in the figures 1 and 2. The spatial and temporal scales associated to processes in Oceanography varies from microns to thousands kilometers and from millisecond to thousands years. This means that education must focus both on single component as well as on complex system.

The knowledge of Oceanography has advanced dramatically with the advances in technologies for the observations. A huge amount of data are produced daily, these must be processed and made available to user in a short period of time, possibly in near real time.

Research has a relevant role in education, since must provide open access to data and tools for their analysis. To be of use, the data must be transformed into information that is the result of processing, manipulating and organizing data in a way that adds to the knowledge of person receiving it. Having a students able to extract information from observation, educators form a well informed citizen for the future.

Several sophisticated and less sophisticated tools are available to process and analyze data and present the derived information in visually effective way. Existing Information Systems offer many opportunities to view the data and derive some simple products (e.g. maps). Models are more refined tools that are driven by data and simulate the state and evolution. Together, data, tools and models are fundamental for examining a complex system and provide understanding.

Data acquisition, integration, manipulation, analysis and visualization through the use of various techniques and tools help to unfold the mysteries of the Earth ocean.

The interpretation of data requires the knowledge of the observed system, but requires also appropriate information (the metadata) that can guarantee an appropriate analysis.

Role of Educators

An important role of educators is the provision to students of scientific and technical knowledge as well as tools that can be used for assessment, find strengths and weaknesses of research results and technological developments. The students should be educated to pose some fundamental questions (e.g.):

- Why this is important?
- What can be hypothesized?
- What are the consequences?

Some background lessons are of importance for the education of students:

- must be informed on the history of the ocean science. The results that the modern science has achieved are derived from theory and experiments done in most of the cases with instruments that have been technologically improved in recent years
- history of ocean has pragmatic and systemic viewpoints: in terms of pragmatic learning, men have a long interest and curiosity about (e.g. ship sailing, wind and waves, conservation of mammal species). These subjects had a long pragmatic scientific importance for survival of many populations. The systematic viewpoint is more recent and is based on the development of the fundamental disciplines of physics, chemistry, biology, geology and mathematics.
- natural systems cannot be controlled and, as a consequence, cause-effect processes must be examined; teaching interactions, feedbacks, and implications are fundamental to ocean science
- unlike closed laboratory experiments, ocean is an open integrated system in which relationships interact to establish feedbacks that lead to implications which are not obvious

The students must be inspired by educators to engage in science, technology, engineering and mathematics studies. In classrooms and laboratories the students must find encouragement and guidance to develop their hypothesis, generate new ideas, assess effectiveness of solutions to problems. The students must be educated also to self-assess the confidence levels in their ability to do science.

Steps forward

In the second half of the 20th century the inter-disciplines of ocean science began to make the transition to new disciplinary components, such as ocean weather prediction and data management systems, with the aim to provide products and services to the society. This is having a huge impact on the science as well as on education, since is requiring a more 'holistic' approach and the integration of physics, chemistry, biology, mathematics. Computer science and data management are part of this new approach.

In education opportunities for international collaboration must be explored in order to give major impetus to sustainability issues, extended career and professional development.

Education can only be based on the development and maintenance of a network of professional educators (linked with research centers) who can comprehend, communicate and address complex issues. The practical consequence of this approach is the capability to form students able to enter the context of sustainable development.

Data are of paramount importance in this context. They are at the base of international programs such as Global Ocean Observing System (GOOS), Group for Earth Observation (GEO), Global Monitoring for Environment and Security (GMES), etc. They will provide new content and material for knowledge and education.

Advances in Information Systems and related infrastructures will help educators and students and will provide a wider audience to science. Information technology will help the learning methodology by giving faster access to data and related bibliographic information, information retrieval and integration, collaboration and communication. Visualization of two - three dimensional fields will continue to evolve as a tool for education.

But there is one important issue that has received a minor attention up to now: the need to have an international cooperation also in education, by calling for specific action in this field and providing financial support for international initiatives.

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IMDIS Programme

Monday 31 March 2008	
Introduction	
	Opening Address
Invited	De Strobel Federico NURC - History and evolution of the oceanographic instrumentation and data collection-management systems
Invited	Ioannidis Yannis, Athens University - Historical excursus on computer and communication technologies
1 - Marine environmental data bases: infrastructures, metadata and data systems	
	Miller Stephen - Preservation and Access across Decades and Disciplines
Keynote speaker	Maudire Gilbert, Ifremer - SeaDataNet: Pan-European Marine data and information management infrastructure
Keynote speaker	Jensen Hans Mose, ICES & Pinto, Carlos - ICES EcoSystemData – an integrated solution from data collection to data product
	Levitus Sydney,NODC/NOAA,Sydney - World Ocean Database 2005: An Ocean Profile Database for Ocean and Climate-System Research
	Appeltans Ward, Flanders Marine Institute - A World Register of Marine Species (WoRMS) for use in marine and biodiversity data management
	Arvanitidis Christos, HCMR - The Biological Geography of the European Seas: results from the macrofaunal inventory of the soft-substrate communities
	Papaconstantinou Costas, HCMR - Development of an integrated management system to support the sustainability of Greek fisheries resources (IMAS-Fish)
	Guevel Guenole, OSI SAF - Météo-France - EUMETSAT Ocean and Sea Ice SAF : Production and distribution of operational products for key parameters of the ocean surface – atmosphere interface
	Poster session 1

	Miles Peter, NOC Southampton - The development of a geophysical database: Avoiding the cost and environmental impact of seismic re-acquisition.
	Diviacco Paolo, OGS - Towards a collaborative research data space in Geophysics
	Schaap Dick, MARIS - SIMORC – System of industry metocean data for the offshore and research communities
	Fusco Luigi, ESA-ESRIN - GENESI-DR perspectives and goals for the Earth Science community
	Mikhailov Nikolay - National IPY data access and management system
	Solovyev Vladimir P.P.Shirshov Instutute of Oceanology - A coastal cabled observatory.
Tuesday 1 April 2008	
1 - Marine environmental data bases: infrastructures, metadata and data systems	
	Palazov Atanas, Institute of Oceanology, Bulgarian Academy of Sciences - WEB publishing of geographic and oceanographic data and information
	Fedortsov Alexanser, RIHMI-WDC - Optimisation of the technical and informational structure of the ESIMO center in RIHMI-WDC.
	Comert Çetin, KTU - Integrated Coastal Management, Marine Spatial Data Infrastructures, and Semantic Web Services
	Lassoued Yassine, CMRC - An OGC-Service-Oriented Architecture for Marine Aggregates Resources Decision Support System
	Poster session 1 (continuation)
2 - Standards and interoperability	
Keynote speaker	Keeley Robert, Dept of Fisheries and Oceans - Results of the IODE-JCOMM Standards Forum
Keynote speaker	Lowry Roy, BODC - Putting Meaning into SeaDataNet

	Coatanoan, Christine, IFREMER - Delayed Mode Quality Control on ARGO floats at the Coriolis Data Center
	Ward Robert (Captain), International Hydrographic Organization - S-100 - The New Hydrographic Geospatial Standard for Marine Data and Information
	Barde Julien, MBARI - Multi-standards metadata cataloguing tools for ocean observatories
	Erdmann Michael, ontoprise - Semantics for the Sea of Data
	Simoes Maria, EMEPC – Oceanographic Information in INFORM@R : Data Interoperability through XML
	Nativi Stefano, CNR-IMAA/University of Florence - CDI/THREDDS Interoperability in SeaDataNet
	Holdsworth Neil. ICES - Platform code governance, how it works and how we can improve it.
	Poster session 2 – References 94 – 102
3 - User Oriented services and products	
Keynote speaker	Beaudoin Yannick, UNEP/GRID Arendal - The UNEP Shelf Programme and the ONE STOP DATA SHOP
Keynote speaker	Lykiardopoulos Angelos, HCMR - State of the art technologies for GIS Management Systems: Implementation through European Community Research Projects
	Falkingham John; Canadian Ice Service - Sea Ice Information for Navigation and Science
	Di Natale Antonio, Acquario di Genova - AquaRing, Accessible and Qualified Use of Available Digital Resources about Aquatic World In National Gatherings: a new semantic search engine for the web.
	Prospathopoulos Aristides, Hellenic Centre for Marine Research, Institute of Oceanography - Integrating a Web-based GIS to a marine pollution monitoring and forecasting system

Tuesday 2 April 2008	
3 - User Oriented services and products	
	Harscoat Valérie, Ifremer - A GIS interface to the French Fisheries Information System
	Constantinou Iacovos, Cyprus Oceanography Centre - Enhancing information design for oceanographic applications
	Bruschi Aldo, Lasertec - Development of an information service system based on GOOGLE graphical interfaces
	Blanc Frederique, CLS - The ATOLL information system: products and services
	Poster session 3
	Petihakis George, Hellenic Centre for Marine Research-HCMR - Development and implementation of a Data Integration System for Eutrophication Assessment in Coastal Waters in the framework of INSEA Project
	Treguer Mickael, Ifremer - Sextant: Online services for marine geographical information
	Barkai Amos, Olrac - OLFISH: Commercial electronic fishery management system : A demonstration of a unique, electronic solution for the collection, management, presentation and utilization of commercial fishing data.
	Schlitzer Reiner, AWI - Interactive Analysis and Visualization Tools
	Krasemann Hajo, GKSS Research Centre - Integrating Real Time Data on North Sea and Baltic Waters as Web-Services for Monitoring and Risk Assessment
	Alvera Aida, GHER-ULG - Data Interpolating Empirical Orthogonal Functions (DINEOF): a tool for geophysical data analyses
4 - databases and tools for education	
	Rommens Wouter, IODE - IODE Capacity building in Ocean Data and Information Networks (ODINs): current status and challenges for the

	future
	Martinez Rodney, CIIFEN - Portal OCEANICO, the regional ocean portal for the Caribbean and Latin america
	Scott Lucy, Agulhas and Somali Current Large Marine Ecosystem (ASCLME) Project - The African Marine Atlas; challenges and opportunities for a web-based atlas of public domain data for Africa
	Simon Claus, Flanders Marine Institute, Belgium - The Coastal and Marine Wiki: an Internet encyclopaedia providing up-to-date high quality information for and by coastal and marine professionals
	Fichaut Michele, Ifremer/IDM/Sismer - Tools for education and capacity building developed in the frame of the SeaDataNet European project
	Poster session 4
Discussion and Conclusions	

1) List of Abstracts

Session	Ref.	First Author and Title
Introd.	1	De Strobel Federico NURC - History and evolution of the oceanographic instrumentation and data collection-management systems
Introd.	2	Ioannidis Yannis, Univ. of Athens - Historical excursus on computer and communication technologies
1	3	Miller Stephen - Preservation and Access across Decades and Disciplines
1	4	Maudire Gilbert, Ifremer - SeaDataNet: Pan-European Marine data and information management infrastructure
1	5	Jensen Hans Mose, ICES & Pinto, Carlos - ICES EcoSystemData – an integrated solution from data collection to data product
1	6	Aguilar Glenn, University of the Philippines Visayas - Development of fisheries management tools for local government units
1	7	Levitus Sydney,NODC/NOAA,Sydney - World Ocean Database 2005: An Ocean Profile Database for Ocean and Climate-System Research
1	8	Appeltans Ward, Flanders Marine Institute - A World Register of Marine Species (WoRMS) for use in marine and biodiversity data management
1	9	Arvanitidis Christos, HCMR - The Biological Geography of the European Seas: results from the macrofaunal inventory of the soft-substrate communities
1	10	Papaconstantinou Costas, HCMR - Development of an integrated management system to support the sustainability of Greek fisheries resources (IMAS-Fish)
1	11	Guevel Guenole, OSI SAF - Météo-France - EUMETSAT Ocean and Sea Ice SAF : Production and distribution of operational products for key parameters of the ocean surface – atmosphere interface
1	12	Miles Peter, NOC Southampton - The development of a geophysical database: Avoiding the cost and environmental impact of seismic re-acquisition.
1	13	Diviacco Paolo, OGS - Towards a collaborative research data space in Geophysics

Session	Ref.	First Author and Title
1	14	Schaap Dick, MARIS - SIMORC – System of industry metocean data for the offshore and research communities
1	15	Fusco Luigi, ESA-ESRIN - GENESI-DR perspectives and goals for the Earth Science community
1	16	Mikhailov Nikolay - National IPY data access and management system
1	17	Solovyev Vladimir P.P.Shirshov Instutute of Oceanology - A coastal cabled observatory.
1	18	Palazov Atanas, Institute of Oceanology, Bulgarian Academy of Sciences - WEB publishing of geographic and oceanographic data and information
1	19	Fedortsov Alexanser, RIHMI-WDC - Optimisation of the technical and informational structure of the ESIMO center in RIHMI-WDC.
1	20	Comert Çetin, KTU - Integrated Coastal Management, Marine Spatial Data Infrastructures, and Semantic Web Services
1	21	Lassoued Yassine, CMRC - An OGC-Service-Oriented Architecture for Marine Aggregates Resources Decision Support System
1	22	Aloui Wided, INSTM - HydroBase: a tool for discovering and downloading physical and bio-chemical oceanographic data
1	23	Al-Rifaie Kholood, Kuwait Institute for Scientific Research - Establishment of Oceanography Data and Information Systems at Kuwait Institute for Scientific Research (KISR) for Kuwait's Waters in the Northwestern Arabian Gulf
1	24	Appeltans Ward, Flanders Marine Institute - EurOBIS, an online atlas for European marine species distribution data
1	25	Awad Morad, NIOF - A sea bottom imagery database for the study of the Mediterranean tectonics off the Nile Delta, Egypt
1	26	Azzopardi Joel, University of Malta - Upgrading the Malta Marine Data Management System to SeaDataNet requirements
1	27	Barde Julien, IRD - Safeguarding, Integrating and Disseminating Knowledge on Exploited Marine Ecosystems : The Ecoscope
1	28	Bilashvili Kakhaber,Tbilisi State University - Creation of E-Catalog of Oceanographic Data in Georgia

Session	Ref.	First Author and Title
1	29	Bradshaw Elizabeth, BODC - The Global Sea Level Observing System (GLOSS) delayed-mode data centre.
1	30	Brandao Filipe, EMEPC - The InforM@r Project
1	31	Bulgakova Kristina, RIHMI-WDC - Web-services for codes of marine environment and marine-related activities
1	32	Casas Antonia, IEO - DAMAR: a marine data and metadata management system
1	33	Cygler Karl, EWTS - A new method of Electronic At-Sea Data Collection: A Case Study from the Northeast Industry-Funded Scallop Program, New England, USA
1	34	Dadic Vlado, IOF-Split - Implementation system for data management in croatian operative oceanography
1	35	De Bruin Taco, NIOZ - JCADM, new Directions in Antarctic & Southern Ocean Data Management
1	36	Deneudt Klaas, VLIZ - Setting up a general data collection system integrating different types of oceanographic survey data
1	37	Didziulis Viktoras, CORPI - European Alien Species Database: an overview
1	38	Didziulis Viktoras, CORPI - Biological Invasions' Early Warning System integrated with the European Alien Species Database.
1	39	Dittert Nicolas, WDC-MARE MARUM - PANGAEA ® - an ICSU World Data Center as a Networked Publication and Library System for Geoscientific Data
1	40	Eremeev Valery, Maine Hydrophysical Institute - Data base of the drifter buoys for the Black Sea
1	41	Eremeev Valery, Maine Hydrophysical Institute - The Oceanographic data bank of the Mairne Hydrophysical Institute
1	42	Fabri Marie-Claire, Ifremer DEEP/LEP - Biocean : Taxon-based System for deep-sea benthic ecological studies
1	43	Fichaut Michele, IFREMER/IDM/SISMER - Data Centre for French Coastal Operational Oceanography

Session	Ref.	First Author and Title
1	44	Folorunsho Regina. Nigerian Institute for Oceanography and Marine Research - Oceanographic data and information input into recent coastal infrastructural development along the Lekki peninsular Lagos: a case study
1	45	Gertman Isaac, Israel Oceanographic & Limnological Research - Data management dedicated for assessing and modeling of the Mediterranean and Black seas ecosystem changes (SESAME integrated project).
1	46	Hadjizadeh Zaker, Nasser, Faculty of Environment, University of Tehran, Iran, - Capacity Building in Ocean Data and Information Management and Networking in the Indian Ocean
1	47	Hansson Lars, SMHI - A new national database for Swedish marine monitoring data
1	48	Ioannidis Yannis, Univ. of Athens - D4Science: E-Infrastructures for Fisheries Resources Management
1	49	Iona Athanasia, Hellenic Centre for Marine Research/Hellenic National Oceanographic Data Centre - HCMR/HNODC - Managing oceanographic data collated from on-line Information Systems
1	50	Ivankovic Damir, Institute of Oceanography and Fisheries - Integrated web oriented data management on Institute of oceanography and fisheries, Split
1	51	Kassis Dimitris, HCMR - POSEIDON Data Management and Quality Control
1	52	Kioroglou Sotiris, Hellenic Centre for Marine Research - A web-GIS database for the Eastern Mediterranean, within the framework of the HERMES Project
1	53	Kobelev Alexandr, RIHMI - Interfaces of the observation networks monitoring subsystem
1	54	Kroener, Ulrich, JRC - Qualitative analysis of fisheries data: harmonization of logbook, observer report, landings, and VMS
1	55	Kuznetsov Alexander, RIHMI-WDC - Development of multidisciplinary database in the framework of relational data model
1	56	Lakkis Sami,Lebanese University - Multi-decadal Oceanographic Database in Lebanese Seawaters (Levantine Basin)

Session	Ref.	First Author and Title
1	57	Loch Steve, BODC - Edserplo - A fast integrated oceanographic visualisation tool
1	58	Mahmoud A. Hassaan, Alexandria University - Suitability analysis of wetlands for human activities using GIS techniques: Case study Lake Maryuit, Egypt
1	59	Martinez Rodney, ODINCARSA - Regional Ocean Data Base of the South Eastern Pacific: applications on Climate Forecast and marine ecosystems management
1	60	Mishonov Alexey, NODC/NOAA - Global Transmissometer Database - now part of World Ocean Database'05
1	61	Mondal, Abdul Matin, NOAMI - Sea Level Rise Monitoring Along the Coast of Bangladesh
1	62	O'Grady Eoin, Marine Institute - The Irish Marine Data Repository (MDR) - spatial data warehouse
1	63	Ortiz-Martinez Ruby Viviana, Colombian Oceanographic Data Center (CECOLDO) - Implementation of international standards for colombian oceanographic data and information management using open source web software – case study
1	64	Pesant Stéphane, CNRS-LOV - EUR-OCEANS Data Management, Portals and Tools for meta-analysis in Ocean Science
1	65	Podymov Oleg, SBSIO RAS - Use of problem-oriented database for statistical analysis of hydrochemical characteristics of redox-layer of the Black Sea
1	66	Ratner Yuriy, MHI - Validation hydrophysical fields obtained by MHI near-operational Nowcasting/Forecasting system for the Black Sea
1	67	S. Martin Corinne, Canterbury Christ Church University - Channel Habitat Atlas for Marine Resource Management (CHARM project): making the results of this multidisciplinary project accessible on the Internet.
1	68	Sabour Waad,Tishreen University - Marine Fishery Database in Syrian Seawaters
1	69	Saeed Moghimi - Needs for Establishment of Caspian Sea International Data Center

Session	Ref.	First Author and Title
1	70	Schaap Dick, MARIS - SeaDataNet: unified access to distributed data sets
1	71	Schaap Dick, MARIS - NODCi- National Infrastructure for access to oceanographic and marine data and information in The Netherlands
1	72	Scory Serge, BMDC - Managing oceanographic data in the frame of large multidisciplinary programmes, a Belgian experience
1	73	Selenica Agim, Polytechnic University of Tirana - The management procedures for data in the Albanian Adriatic Sea
1	74	Sergeyeva Oleksandra, IBSS - Integrated data and information management system of the marine research institution
1	75	Sergeyeva Oleksandra, IBSS - Specialized Biodiversity Information System to Support Monitoring of Marine Ecosystem
1	76	Sjur Ringheim Lid, Institute of Marine Research - Cruise Meta-database
1	77	Stanchev Hristo, Institute of Oceanology-BAS - GIS Spatial database for coastline classification – Bulgarian case study
1	78	Sun Charles,US NODC - The Global Temperature and Salinity Profile Program
1	79	Tosello Vanessa, Ifremer - Processing and Quality Checks of Shipboard ADCP Data
1	80	Tsabaris Christos, Hellenic Centre for Marine Research - In situ acquisition, storage and on line data availability for marine radioactivity
1	81	Valcheva Nadezhda, Institute of Oceanology - Assessment of quality and statistical analysis of oceanographic temperature and salinity data for the Western Black Sea region
1	82	Vinci Matteo, OGS - OGS NODC Metadata standardization, discovery and reporting from a relational database
1	83	Wichorowski Marcin, Institute of Oceanology PASl - In situ data acquisition, storage and online data availability assurance system
1	84	Zhuleva Helene, P.P.Shirshov institut of oceanology - The data model of the seamounts geomorphic information system

Session	Ref.	First Author and Title
2	85	Keeley Robert, Dept of Fisheries and Oceans - Results of the IODE-JCOMM Standards Forum
2	86	Lowry Roy, BODC - Putting Meaning into SeaDataNet
2	87	Coatanoan, Christine, IFREMER - Delayed Mode Quality Control on ARGO floats at the Coriolis Data Center
2	88	Ward Robert (Captain), International Hydrographic Organization - S-100 - The New Hydrographic Geospatial Standard for Marine Data and Information
2	89	Barde Julien, MBARI - Multi-standards metadata cataloguing tools for ocean observatories
2	90	Erdmann Michael, ontoprise - Semantics for the Sea of Data
2	91	Simoes Maria, EMEPC – Oceanographic Information in INFORM@R : Data Interoperability through XML
2	92	Nativi Stefano, CNR-IMAA/University of Florence - CDI/THREDDS Interoperability in SeaDataNet
2	93	Holdsworth Neil. ICES - Platform code governance, how it works and how we can improve it.
2	94	Brion Emilie, Ifremer - In-situ delayed mode QC at Coriolis Data Center - Reprocessing 2002-2006
2	95	Cotton David, Marine Data and Information Partnership - MDIP and MEDAG: Working to deliver improved access to and stewardship of UK Marine data and information
2	96	Hicham Mansouri, School of Industrail Engineering - A Pipeline Support Vector Regression Method to Thin Large Sea Data On-Line
2	97	Khaliulin Aleksey, Maine Hydrophysical Institute - Development of quality control procedure for the Black Sea in the Maine Hydrophysical Institute
2	98	Lauret Olivier, CLS - The ATOLL information system: from the needs to products and services deployed
2	99	O'Grady Eoin, Marine Institute - The Irish Spatial Data Exchange - a distributed metadata search facility
2	100	Paraskevi Bourma, NTUA - Quality Control protocol for an autonomous underwater glider

Session	Ref.	First Author and Title
2	101	Ritschel Bernd, GFZ Potsdam - The Global Geodetic Observing Systen (GGOS) - IAGs contribution to GEOSS
2	102	Vanhoorne Bart, Vlaams Instituut voor de Zee/VLIZ, - The Aphia Taxon Match Tool, an online quality control tool for checking your biological data against the World and European Registers of Marine Species.
3	103	Beaudoin Yannick, UNEP/GRID Arendal - The UNEP Shelf Programme and the ONE STOP DATA SHOP
3	104	Lykiardopoulos Angelos, HCMR - State of the art technologies for GIS Management Systems: Implementation through European Community Research Projects
3	105	Falkingham John; Canadian Ice Service - Sea Ice Information for Navigation and Science
3	106	Di Natale Antonio, Acquario di Genova - AquaRing, Accessible and Qualified Use of Available Digital Resources about Aquatic World In National Gatherings: a new semantic search engine for the web.
3	107	Prospathopoulos Aristides, Hellenic Centre for Marine Research, Institute of Oceanography - Integrating a Web-based GIS to a marine pollution monitoring and forecasting system
3	108	Harscoat Valérie, Ifremer - A GIS interface to the French Fisheries Information System
3	109	Constantinou Iacovos, Cyprus Oceanography Centre - Enhancing information design for oceanographic applications
3	110	Bruschi Aldo, Lasertec - Development of an information service system based on GOOGLE graphical interfaces
3	111	Blanc Frederique, CLS - The ATOLL information system: products and services
3	112	Petihakis George, Hellenic Centre for Marine Research-HCMR - Development and implementation of a Data Integration System for Eutrophication Assessment in Coastal Waters in the framework of INSEA Project
3	113	Treguer Mickael, Ifremer - Sextant: Online services for marine geographical information

Session	Ref.	First Author and Title
3	114	Barkai Amos, Olrac - OLFISH: Commercial electronic fishery management system : A demonstration of a unique, electronic solution for the collection, management, presentation and utilization of commercial fishing data.
3	115	Schlitzer Reiner, AWI - Interactive Analysis and Visualization Tools
3	116	Krasemann Hajo, GKSS Research Centre - Integrating Real Time Data on North Sea and Baltic Waters as Web-Services for Monitoring and Risk Assessment
3	117	Alvera Aida, GHER-ULG - Data Interpolating Empirical Orthogonal Functions (DINEOF): a tool for geophysical data analyses
3	118	Aïssi Mehdi, Department of life sciences, Faculty of Sciences of Bizerte - Information system to manage whales distribution in areas with high fisheries activities and intense maritime traffic.
3	119	Asavin Alexey Vernadsky inst. RAS - Internet GIS project and database on geochemistry oceanic volcanoes
3	120	Eliso Kvavadze, Institute of Palaeobiology of National Muzeum of Georgia, 4 Potochnay-Niagvris Str., 0108 Tbilisi, Georgia - A Palynological Database for the Study of the Black Sea Transgressions and climate Changes
3	121	EurOcean - Overarching Marine Research Information in Europe
3	122	Gorringe, Patrick, EuroGOOS - Towards an operational pan-European oceanographic real time data exchange
3	123	Guitton Jérôme, Pôle halieutique Agrocampus Rennes - On line atlas : a portal to improve access and legibility of fisheries data
3	124	Guitton Jérôme, Pôle halieutique Agrocampus Rennes - A west Africa on line atlas on Fisheries
3	125	Hansson Martin, SMHI - Satellite database for the monitoring of cyanobacterial blooms in the Baltic Sea
3	126	Heckendorff Stephan, Alfred Wegener Institute for Polar and Marine Research, - Exploring marine data with Ocean Data View
3	127	Ibragimova Valentina, RIHMI-WDC - Methods and tools of maintaining the ESIMO portal

Session	Ref.	First Author and Title
3	128	Iona Athanasia, Hellenic Centre for Marine Research/Hellenic National Oceanographic Data Centre - HCMR/HNODC - Preliminary results of climatological computations of the hydrological characteristics of the Mediterranean Sea using the Variational Inverse Method
3	129	Jacques Madelaine, GREYC - CNRS UMR 6072, Université de Caen - StatMap: A Statistical Cartographic Viewer Candidate for Statistical Fisheries Information
3	130	Khaliulin Aleksey, Maine Hydrophysical Institute - The software providing the remote data access using the Web technologies
3	131	Krzyminski Wlodzimierz, Institute of Meteorology and Water Management, wlodzimierz - 15 years of ADCP measurements in the Gulf of Gdansk as a basis for hydrodynamic studies and models verification.
3	132	Lakkis Sami, Lebanese university - Marine Fishery Database in Lebanese seawaters
3	133	Lesueur Marie, Pôle halieutique Agocampus Rennes - A French on line atlas on Fisheries
3	134	Lominadze George Institute of Geography - Database for the assement of the techtonic impact on the river Chorokhi and the Black Sea Coastal zone in Adjara, Georgia
3	135	Malacic Vlado, National Institute of Biology - Information System about the Marine Environment in the Gulf of Trieste
3	136	Martinez Rodney, CIIFEN - Eastern Pacific Ocean Analysis Bulletin
3	137	Matishov Gennady G., SSC RAS - A thermohaline database for the study of the Sea of Azov climate fluctuations
3	138	Mavraeidopoulos Athanasios, Hellenic Navy Hydrographic Service - Data management, a crucial factor for reliable mapping
3	139	Navarra Antonio, CMCC - The ADRICOSM STAR GeoPortal
3	140	Nikolovska Aneta, RCOM - Utilizing the sonar data for mapping gas seeps, and estimating their spatial and temporal changes
3	141	Olsonen Riitta, FIMR - The FIMR Data Portal Havaintohaavi

Session	Ref.	First Author and Title
3	142	Palazov Atanas, Bulgarian National Oceanographic Data Centre, Institute of Oceanology, Bulgarian Academy of Sciences - Bilateral cooperation for promoting oceanographic data and information management of the Eastern Mediterranean and Black Seas
3	143	Piliczewski Bogusz, IMGW - Application of the Generic Mapping Tools for automated visualisation of marine data products in the Baltic Sea
3	144	Ryan William B. F., Lamont-Doherty Earth Observatory of Columbia University - The Global Multi-Resolution Topography (GMRT) Synthesis
3	145	Ryan William, Lamont-Doherty Earth Observatory of Columbia University - GeoMapApp - A New Virtual Globe Specifically for Visualization of Marine Environmental Data
3	146	Sheberstov Sergey P.P.Shirshov Institute of Oceanology RAS - A system for acquisition, processing, visualization and storage of satellite and field biooptical data
3	147	Sighomnou Daniel ,Integrated Research Center For Development - Integrated information system for the management of the Logone River Flood in Cameroon
3	148	Sirjacobs Damien,GHER-ULG - DINEOF univariate reconstruction of missing satellite data from the North Sea Belcolour-1 database
3	149	Soukissian Takvor, Hellenic Centre for Marine Research - A new wind and wave atlas of the Hellenic seas
3	150	Stien Lars Helge, Institute of Marine Research - Welfaremeter
3	151	Tarmo Kõuts, Marine Systems Institute - Development of on-line marine data systems in Estonia
3	152	Tel Elena, Instituto Espanol de Oceanografia - MATCOR tool for the management and analysis of time series data
3	153	Tonani Marina, INGV - A gridded climatological dataset for the Mediterranean Sea: technics and preliminary results
3	154	Tronconi Cristina, ISAC - Climatological and Oceanographic data server infrastucture based on THREDDS technology
3	155	Troupin Charles, University of Liège - Hydrostatic and advection constraints in the software DIVA: theory and applications

Session	Ref.	First Author and Title
3	156	Vyazilov Evgeny, RIHMI-WDC - Decision Support on the Basis of Marine Information Systems
3	157	Wang Jianjun, University of Aberdeen - Discovering surface oceanic circulation dynamics in the Mediterranean from remotely sensed data
3	158	Nardone Gabriele, APAT Servizio Mareografico - Italian Sea Waves Measuring Network
3	159	Vasilev Atanas, Institute of Oceanology - BAS - Marine geo-databases – from CI-SR to SI-CR (Where: C–complex; I–ideas; S–simple; R–requirements)
4	160	Rommens Wouter, IODE - IODE Capacity building in Ocean Data and Information Networks (ODINs): current status and challenges for the future
4	161	Martinez Rodney, CIIFEN - Portal OCEANICO, the regional ocean portal for the Caribbean and Latin america
4	162	Scott Lucy, Agulhas and Somali Current Large Marine Ecosystem (ASCLME) Project - The African Marine Atlas; challenges and opportunities for a web-based atlas of public domain data for Africa
4	163	Simon Claus, Flanders Marine Institute, Belgium - The Coastal and Marine Wiki: an Internet encyclopaedia providing up-to-date high quality information for and by coastal and marine professionals
4	164	Fichaut Michele, Ifremer/IDM/Sismer - Tools for education and capacity building developed in the frame of the SeaDataNet European project
4	165	Dolotov Vyacheslav, Maine Hydrophysical Institute - Studying of the Ukrainian coastal zone: data bases, beaches and its dynamic
4	166	Isaac Gertman - Desktop Version of Database management System for MEDACC
4	167	Manzella Giuseppe, ENEA - Educational tools in SeaDataNet
4	168	Uyar Tanay, Marmara University - Data Quality Requirements for Informed Decision Making
4	169	Goschen, Wayne, SAEON - Towards a data management system for long term monitoring of oceans around Southern Africa

Conference Abstracts

Abstract 1

Session: Introduction

History and evolution of the oceanographic instrumentation and data collection-management systems

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The talk briefly describes the evolution of the oceanographic instrumentation from the post world-war period to the present, mainly through the techniques utilized in fifty years of activity at the Saclant Undersea Research Centre (presently NURC) of La Spezia, Italy, the only marine research centre belonging NATO, and other oceanographic laboratories cooperating with the establishment. Mention is made of the pioneering buoy technology development in the 60s-70s period for temperature and water current investigations in Gibraltar strait as well as the technical evolution for application in the Gulf of Lion around the so called Cousteau Buoy, a unique manned floating laboratory moored in the deep waters off the French coast. The beginning of the scientific diving activity in support of these operations is mentioned, including its application to the deep-sea drifting floats technological development for Mediterranean sea current investigations. Early CTD profilers and their application from ships in stationary and towing conditions are also illustrated together with the development of calibration and data management techniques. The 80s-90s period have seen the increased demand of ocean technology for extreme weather and heavily fished coastal-water applications as a result of both military and environmental interest. This has accelerated the technological evolution towards expendable and trawler-safe profilers for rapid environmental assessment of the water column chemical and physical characteristics.

The technology evolution has strongly influenced the quality of data with consequences on the scientific understanding of the marine environment function as well as on the assessment of the quality of the environment.

The concept of data quality must consider the various phases that can assure a high value of the data, from data collection to their use. Three main criteria are at the base of the data management practice:

1) quality assurance of the measurement programme strategy

2) quality assurance of field work

3) quality assurance of collected data

Technology is at the base of the first two criteria. The integrated use of different platforms, for example, can provide a quasi synoptic view of environmental phenomena, and, at the same time, give information on their time evolution. The sensors in the different platforms must assure the acquisition of comparable and reliable data.

The presentation concludes highlighting the need to improve awareness of marine research establishments, often ruled by non appropriated write-off procedures for obsolete instruments, in order to preserve instrumentation, even of recent time, which could have a potentially historical scientific value. This has been one of the motivations behind the recent foundation of the Historical Oceanography Society (HOS). Scope and activities of the society are briefly outlined

Historical excursus on computer and communication technologies

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The past five decades have seen tremendous progress in the technologies related to computers and their communication. This phenomenon has had no parallel in any other field of knowledge and has had significant impact on all human activities, from the most specialized scientific research to the most mundane aspect of our everyday lives. A case in point is related to information and data: nowadays its availability is overwhelming, its diversity is unprecedented, and our opportunities to analyse and manipulate it unlimited. This short write-up takes a quick tour of the history of computer and communication technologies, focusing on the relevant advances of information and data processing. It identifies some major milestones on the way, assesses the current status of the art and practice, and speculates on what the future might look like.

In the early days of data processing, the 1960s, searching for information involved nothing less than full-scale programming, in languages such as Cobol. The information seeker had to be aware of how the data was stored on disc, what access paths (indices) were available to exploit, and all the steps that had to be taken in order to reach the data and extract it. Not only was this tedious and time consuming, but it had to be repeated every time in every different application. Moreover, this dependence of application code on internal physical details of data storage implied that the slightest change in data organization caused modifications in all applications.In parallel to such business-centric data processing, the field of information retrieval was founded, focusing primarily on searching for information in unstructured text.

In the 1970's, the relational data model and the accompanying formal languages of relational algebra and relational calculus were proposed as a way to overcome the deficiencies of early practices. Based on mathematical logic, these allowed the decoupling of application programming from data storage, thus achieving the long sought data independence. Moreover, they led to the development of declarative query languages (such as SQL), which allowed information seekers to focus on what data they are interested in without worrying about how to find it. Sophisticated techniques for query optimisation were then developed in order to bridge the gap between the two efficiently.

In the 1980's and 1990's industrial strength database systems conquered the market and established the technology, while venturing off to other environments as well, sometimes successfully (e.g., distributed/parallel databases, data mining) and sometimes not (e.g., object-oriented databases). In parallel, information retrieval finally flourished as a field, establishing its own scientific methodologies and preparing the way for search engines on the web.

Presently, database systems are a commodity and there is an explosion of ideas that try to push information search and data processing in several interesting directions. Search engines of various types (e.g., multilingual, geographic) remain prominent, also due to efforts to fuse database and information retrieval technologies for mutual benefits. Many of the other future directions stem from putting information seekers at the forefront, instead of the data or information itself, and trying to offer them user experiences that resemble those of real life. Personalized querying, recommendation, context-dependent information retrieval, data uncertainty management, and data trading and negotiations, are some of the highlights of current efforts that promise to shape up an exciting future landscape of data processing and information retrieval.

Preservation and Access across Decades and Disciplines

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With the current interest in global processes and long-term changes, data in the marine sciences are being used by a far broader community than ever before. Many of today's advances are driven by observations made across decades, platforms and disciplines. The era of traditional single-investigator research appears to be waning, replaced by multi-institution collaboration. While the Internet has dramatically improved the speed of collaboration, the re-use of data presents major new challenges, many of them revolving around the need to capture the complete context of an expedition.

Metadata was a word rarely even mentioned in the past, but now appears as a topic in every data workshop, and is the focus of a major international project (MMI; http://marinemetadata.org). Metadata are critical for recording the provenance of marine data (who, what, where, when, which, why, how), including processing steps and quality control certification. However, the marine science community is only beginning to come to terms with the difficulties of auto-harvesting the information, selecting standards, exchanging metadata, and synchronizing metadata with evolving standards and needs. There is continuing debate on the relative metadata and data responsibilities of the chief scientist, the ship operating institution, and data repositories, especially in an era of limited budgets. Cyberinfrastructure tools are emerging to help solve the problems, and ideally insert instrumentation metadata at the moment of acquisition. However the technical aspects at times are dwarfed by the cultural obstacles faced by independent institutions, as they attempt to make a community whole that is greater than the sum of the parts.

One recent example of a basic international goal is the definition of a standard set of metadata to define an oceanographic cruise, and a mechanism for exchanging the information. The US University-National Oceanographic Laboratory System (UNOLS) oversees the vessel and submergence activities of 18 operating institutions, and has recently convened a Data Management Best Practices Committee (http://data.unols.org). One of their first goals is cruise level metadata, and they are working in collaboration with SeaDataNet to establish an international approach.

We will review lessons learned at the Scripps Institution of Oceanography (SIO) which has been operating research vessels for 104 years, supporting a wide range of disciplines: marine geology and geophysics, physical oceanography, geochemistry, biology, seismology, ecology, fisheries, and acoustics. In the last 6 years progress has been made with diverse data types, formats and media, resulting in a fully-searchable online SIOExplorer Digital Library of more than 800 cruises (http://SIOExplorer.ucsd.edu). During the last 3 years the efforts have been extended to the Woods Hole Oceanographic Institution (WHOI), with a "Multi-Institution Testbed for Scalable Digital Archiving" funded by the Library of Congress and NSF (IIS 0455998; http://gdc.ucsd.edu:8080/digarch). The project has implemented a prototype digital library of data from both institutions, including cruises, Alvin submersible dives, and ROVs. In addition, during the last 3 years the technology has been extended to the Site Survey Data Bank (SSDB; http://ssdb.iodp.org) creating a digital library for data sets that support IODP ocean drilling proposals throughout their lifecycles, from initial ideas through proposal review and on to operations, as well as for educational use.

The technical challenges have been largely overcome, thanks to a scalable, federated digital library architecture from the San Diego Supercomputer Center, implemented at SIO, WHOI and other sites. The metadata design is flexible, supporting modular blocks of metadata tailored to the needs of instruments, samples, documents, derived products, cruises or dives, as appropriate. Domain- and institution-specific issues are addressed during initial staging. Data files are categorized and metadata harvested with automated procedures. In the second-generation version of the project, much greater use is made of controlled metadata vocabularies. Database and XML-based procedures deal with the diversity of raw metadata values, detect and repair errors, and map the information to agreed-upon standard values, in collaboration with the MMI community. Metadata may be mapped to required external standards and formats, as needed. All objects are tagged with an expert level, thus serving an educational audience, as well as research users. After staging, publication into the digital library is completely automated

The cultural challenges have been more formidable than expected. They became most apparent during attempts to categorize and stage digital data objects across multiple institutions, each with their own naming conventions and practices, generally undocumented, and evolving across decades. Whether the questions concerned data ownership, collection techniques, data diversity or institutional practices, the solution involved a joint discussion with scientists, data managers, technicians and archivists, working together. Because metadata discussions go on endlessly, significant benefit comes from dictionaries with definitions of all community-authorized metadata values.

SeaDataNet: Pan-European Marine data and information management infrastructure

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SeaDataNet Consortium: IFREMER (France), MARIS (Netherlands), HCMR/HNODC (Greece), ULg (Belgium), OGS (Italy), NERC/BODC (UK), BSH/DOD (Germany), SMHI (Sweden), IEO (Spain), RIHMI/WDC (Russia), IOC (International), ENEA (Italy), INGV (Italy), METU (Turkey), CLS (France), AWI (Germany), IMR (Norway), NERI (Denmark), ICES (International), EC-DG JRC (International), MI (Ireland), IHPT (Portugal), RIKZ (Netherlands), RBINS/MUMM (Belgium), VLIZ (Belgium), MRI (Iceland), FIMR (Finland), IMGW (Poland), MSI (Estonia), IAE/UL (Latvia), CMR (Lithuania), SIO/RAS (Russia), MHI/DMIST (Ukraine), IO/BAS (Bulgaria), NIMRD (Romania), TSU (Georgia), INRH (Morocco), IOF (Croatia), PUT (Albania), NIB (Slovenia), UoM (Malta), OC/UCY (Cyprus), IOLR (Israel), NCSR/NCMS (Lebanon), CNR-ISAC (Italy), ISMAL (Algeria), INSTM (Tunisia)

SeaDataNet is a distributed Pan-European infrastructure for marine data management that has been launched in the frame of an EU integrated research infrastructure project gathering 49 partners including the National Oceanographic Data Centres (NODC) of 35 EU and neighbouring countries, and international organisations IOC, ICES, JRC. The project was launched in April 2006 for 5 years (up to March 2011) with the main objective to develop Infrastructure by networking the existing professional oceanographic in situ and satellite data centres of the countries bordering the North-East Atlantic and its adjacent seas in one "Virtual Oceanographic Data Centre". This project integrates and develops several EU past initiatives and international cooperation, in particular Medar/Medatlas, Edmed, Edios, Sea-search to build a virtual data centre delivering data and information on line via a unique portal.

The SeaDataNet consortium manages an important data holding of in-situ and remote sensing marine observations from national and international programs, primarily focused on water column parameters: Physical, Chemical, Bio-chemical (non species dependant) parameters and also in relationship with other groups: Geophysical, geological and Biological (species dependant) parameters. Standardized metadata are compiled by the partner data centres and attached to these data to facilitate the data search and retrieval. In each NODC, the data and meta-data are submitted to common

procedures for quality checking, in cooradance to the international standards and guidelines published by IOC and ICES. The consortium itself contributes to the international works to enhance these standards. The data quality and availability is assessed in fine by the preparation of gridded data products at regional scales.

The technical system developed to set up the interoperability between these data repositories includes: a portal, discovery services, delivery services, quality control and viewing services, product services (Generic and standard products), safeguarding services (existing at the NODCs) and Monitoring and statistics facilities to assess the system usage & performance. The discovery service is composed of a catalogue system allowing data search and retrieval by data type, cruises summary, observatory, source laboratory, data centre, etc. This catalogue system is standardized ISO19115 for meta-data and common controlled vocabularies developed in an international frame. As answer to any data request, the delivery service will provide integrated databases of standardised quality on-line. Taking into account the various levels and heterogeneity of the local infrastructures, the development, integratrion and interfacing of the different modules of the system represents a real challenge that is described in another article.

The challenge of the virtual data centre is not only technical, but also to enhance the data stewardship and circulation, and to adopt the standardized protocols. Therefore an important task is dedicated to training and capacity building, both for the scientific data management for the Data Quality Checking and for the technical modules development, interfacing and installation.

Another task on which SeaDataNet put a great priority is the international cooperation, key issue for the standards developpement, the access to a wider set of data, the sharing of data processing tools and the targetted interoperability between georeferenced systems. Since 2005, the organization of the cycle of International Marine Data Information System (IMDIS) Conferences aims to provide a forum that contributes to enhance these exchanges.

www.seadatanet.org

Abstract 5

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

ICES EcoSystemData – an integrated solution from data collection to data product

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The EcoSystemData system links the physical, biological and chemical conditions of the sea by including data on oceanography, contaminants and biological effects of contaminants in seawater, sediment and biota, and biological community abundance into one system. For many years these data were held and managed in separate systems. One of the main goals of EcoSystemData is to function as an integrated repository, where different types of data can coexist and interact for multiple purposes, e.g. marine spatial planning, ecosystem management decision support tools, climate change studies and fisheries management.

The ecosystem approach is becoming a more prevalent approach in dynamic marine decision support systems. By taking into consideration the effects of actions on every element of an ecosystem, the ecosystem approach has become one of the most important principles of sustainable environmental management, based on the recognition that all elements of an ecosystem are linked. In the strategic plan for ICES (2001) the ecosystem approach has been given a high priority as a direct reflection of the challenges faced by client commissions when assessing and advising on the marine environment. Within ICES, the working groups REGNS (Regional Ecosystem Study Group for the North Sea) and SGIAB (Study Group on Integrated Assessment in the Baltic Sea) were set up to carry out pilot ecosystem assessments. A multitude of projects on marine protected areas worldwide reflects the growing application of an ecosystem approach in marine spatial planning. At the EU level, the coming Marine Strategy directive will require an ecosystem approach for marine management in order to ensure "good ecological status" of EU marine waters by 2021.

In response to the implications of the ecosystem approach with regards to data management, the ICES data centre has undergone several changes within the last years, ranging from organisational restructuring, investment in new technologies, acquiring new skills to match the new demands, to format conversions and code mappings. The EcoSystemData system and the development of an integrated environmental reporting format are some of the key initiatives for the ICES Data Centre's ability to support integrated data requests covering diverse scientific topics. Both the development of

EcoSystemData and the integrated environmental reporting format has to a large extent been developed in close collaboration with experts and client within the ICES community and the project has received funding from both OSPAR, HELCOM and CEFAS.

The EcoSystemData system consists of three main resources, (1) Database, (2) Web application, (3) Web Services.

The database is designed with a generic structure that can accommodate the diversity of marine data being uploaded to the system. The main generic structural elements are Upload, Station, Sample and Measurement. Upload contains information related to the uploaded data file and functions as a linkage to the ICES accessions system. The Station holds information on geographical position, date-time, station name, etc., the Sample defines the sampling event and contains information on actual sampling time, species examined, sample volume and other related observations. The Measurement contains information on the material examined (e.g. seawater, sediment or fish liver), parameter, unit, the measured value, quality flags etc.

The database structure is flexible, normalised and can easily accommodate other data types than the ones currently maintained in the system.

The web application interfaces the database(s) and allows users to manage, browse, query and visualise data. The Manage part allows the ICES Data managers to insert the data in the database and to detect errors and duplicated data. With the Browse facility any user can view the contents of the database per data uploaded data file. The Inventory facility allows the users to get a summary of contained data from a user defined area and time period. With the Query facility users can request data based on a variety of options in order to download, or visualise them in tables, charts and maps. Additional plans include a model facility, where requested data can be analysed or modelled to create for example gridded data products. This facility could be an important support tool for scientific purposes.

By publishing Web Services the system allows external systems to interface directly with EcoSystemData for multiple purposes (i.e. building their own interface applications).

EcoSystemData is an integrated approach to data management, which we hope will be beneficial for many organisations, scientists and students undertaking assessments and studies based on data from multiple scientific areas. We see it as a initial step, that can be improved on a continuous basis based on user needs and feedback. The flexibility of the system will allow new types of data to be included either in the main database or be interfaced by the web application to allow for integrated products. For example Fisheries data has not been included in the initial phase, but the feasibility of joining with fisheries data will be considered later on.

The possibility to identify different types of data within the same area or timeframe and display the data on a map, all in one application will facilitate studies of data correlating contaminants and environmental impact. For example the effect of high nutrient values during winter months can easily be compared with the recipient eutrophication effects, like algal blooms or oxygen deficiency, in late summer or fall.

Abstract 6

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Development of fisheries management tools for local government units

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Under Philippine law, municipal waters (waters up to 15km) from the shoreline are under the jurisdiction of municipalities or local government unit, a condition requiring much needed support because of the differences in governance inherent in local autonomy. A set of tools were developed to assist local government units manage their fishery. The tools include a system to generate of municipal ordinances based on existing laws of the country (Municipal Fisheries Ordinance Generator-MFOG), a database system for habitat and fishery resources (Monitoring Helper) and useful utilities for information and education about fishing gear types and fish species (Monitoring Tools). The MFOG system assisted many municipalities in generating their ordinances that must conform with an existing law of the country, the Fisheries Code. Likewise, the Monitoring Tools and Monitor Helper assist decision making and other functions of local fishery managers. The programs were also found useful for education purposes. Current work integrating GIS based approaches is found to enhance understanding and acceptability of the said computer based tools for fisheries management.

World Ocean Database 2005: An Ocean Profile Database for Ocean and Climate-System Research

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The "World Ocean Database 2005" (WOD01) is the world's largest collection of ocean profile data available without restriction. It contains measurements of temperature, salinity, oxygen, chlorophyll, nutrients, plankton and other variables including tracers. WOD05 is global, comprehensive, integrated, scientifically quality-controlled and documented, with all data in one uniform format. WOD includes data from 164,411 ocean cruises representing 93 countries and 667 individual institutes. WOD includes data from 6,910 ships and other platforms, e.g., buoys. All data are available on-line as well as DVD. The database has been built with data contributions from IOC Member States and has undergone remarkable growth during the past 10 years due to data management projects supported by the IOC (GODAR Project) and the EC (MEDAR/MEDATLAS Project) which focus on identifying and digitizing and/or preserving historical ocean data which are so valuable for documenting the interannual-to-decadal variability of the world ocean. This talk describes the WOD and on-line access to the WOD, describes some of the history and problems in building the WOD, and documents the utility of WOD and products based on WOD.

Abstract 8

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

A World Register of Marine Species (WoRMS) for use in marine and biodiversity data management

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An authoritative and global register of all marine species is urgently needed to facilitate biological data management and exchange, the integration of ecological and biodiversity data with non-biological ocean data, and to assist taxonomists in describing new species, revisions and correcting past nomenclatural confusion. The exercise of producing this list has added benefits in fostering collaboration between experts at a global scale and maintaining taxonomic expertise. Easy access to the register will allow local ecologists and biologists to use correct taxonomic names, and will encourage addition of overlooked species to the list. This will in turn stimulate a.o. biodiversity science and biogeographical and evolutionary research. This "World Register of Marine Species" (WoRMS) is the logical next step for ocean biodiversity informatics (OBI) to become an everyday and essential supporting infrastructure for the marine sciences, monitoring and environmental management. WoRMS is a standards based, quality controlled, expert validated, open-access infrastructure for research, education, and data and resource management. It builds on experience in developing the European Register of Marine Species and the Ocean Biogeographic Information System, and will collaborate with and contribute to the GBIF's ECAT and planned Global Names Architecture, Species 2000, the Catalogue of Life, the Ocean Biogeographic Information System, the Encyclopaedia of Life, SeaLifeBase, IOC's International Oceanographic Data and Information Exchange, and related initiatives. Currently, well over 100 world leading taxonomists are contributing towards this World Register of Marine Species. For further details see www.marinespecies.org

Abstract 9

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

The Biological Geography of the European Seas: results from the macrofaunal inventory of the soft-substrate communities

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This work has been carried out in the context of the MarBEF (Marine Biodiversity and Ecosystem Functioning) EU Network of Excellence. The hypothesis tested is whether the zoogeographical divisions as defined across the European seas can be validated by soft-bottom macrobenthic community data or not. The systems considered were those proposed by OSPAR, ICES, IHO, LMEs, Longhurst (1998) and Fredj (1974). Data on soft-bottom communities have been stored in the largest data base of this kind ever developed in the EU. Three criteria were proposed to test the biological relevance of the above zoogeographical classification schemas, and tested with each of the faunal groups: (i) proximity, which refers to the expected closer faunal resemblance of the adjacent sectors/provinces/regions; (ii) differentiation, which provides a measure of the uniqueness of the pattern; (iii) randomness, which accepts the inventories of the various sectors, provinces or regions as random samples of the total inventory of each of the systems considered. Results show that only the classification proposed by Longhurst meets the three criteria and that only the polychaete data were showing this. Average island distance from the nearest coast, number of islands and the island surface area were the geographic variables best correlated with the pattern produced by polychaetes. These results are consistent with those produced by datasets previously collected from narrower geographic scales. Zoogeographic patterns suggest a vicariance model dominating over the founder-dispersal except for the semi-closed regional Seas (Baltic, Mediterranean Black Seas) in which, however, a model substantially modified from the second option could be supported.

Abstract 10

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Development of an integrated management system to support the sustainability of Greek fisheries resources (IMAS-Fish)

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This project was submitted as part of the Third Community Support Framework (Natural Environment and Sustainable Development). There are six partners involved from Research (Hellenic Centre for Marine Research (HCMR)), Universities (University of Aegean, University of Thessaly), and industries (Quality & Reliability, INFOMAP and LAMANS), with the HCMR as coordinator. The aim of the project was the development of a complete information system that will provide necessary information for the support of sustainable management of the biological resources of Greek seas. A web-based integrated information system was constructed to manage the established fishery data bank, to support the analysis of scientific and fisheries statistics data and to present the results using a GIS system. A 3-tier client/server architecture was adopted under Oracle database and application server.

The following subsystems constitutes the application: Data entry, classical and advanced fisheries statistical analysis, advanced queries, S-plus integration, fishing fleet analysis, legislation, national fisheries management system and access-security.

Inside the database system, the following data sets were homogenized: a) experimental sampling (benthopelagic, ydroacoustic, large pelagic, net selectivity, ichtyoplankton, pelagic trawlers), b) observations on board (trawlers, purse-seiners. coastals), c) fisheries statistics (official landings from National Statistical Service of Greece, auction fish-market landings, fishing effort, socioeconomics), d) fleet registry, e) market sampling, spatial data (bathymetry, altimetry, coastline, lakes, rivers, fishing ports), f) oceanographic data (CTD, minilog), g) satellite images.

The project made a specific effort to adopt the needs of the rule 1543/2000 in order to support the National data collection project.

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

EUMETSAT Ocean and Sea Ice SAF : Production and distribution of operational products for key parameters of the ocean surface – atmosphere interface

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The OSI SAF was launched in 1997 as an answer to requirements from the meteorological and oceanographic communities of EUMETSAT Member States and Co-operating States for a comprehensive information derived from meteorological satellites at the ocean-atmosphere interface.

The OSI SAF consortium is constituted of Météo-France as leading entity, and Met.no (Norske Meteorologiske Institutt), DMI (Danish Meteorological Institute), SMHI (Swedish Meteorological and Hydrological Institute), KNMI (Koninklijk Nederlands Meteorologisch Instituut) and IFREMER (Institut Français de Recherche pour l'Exploitation de la MER) as co-operating entities.

During the development phase of the project (1997 to 2002) were developed products related to 4 key parameters of the ocean surface – atmosphere interface (Sea Surface Temperature, Radiative Fluxes, Sea Ice, Wind) on various coverage from regional to global.

The Operational production of fully validated and quality controlled near-real time product was implemented during the following phase, the Initial Operational Phase (IOP, 2002 to 2007), using the available satellites, i.e. MSG, NOAA, GOES-E, QUICKSCAT and DMSP, with dissemination relying on FTP servers and EUMETCAST. Archive was also implemented in the production centers.

The main objectives of the current phase, the CDOP (Continuous Development and Operations Phase, 2007 to 2012), taking into account new requirements at international and European level, in particular those expressed in the framework of GMES initiative, are :

- new products (Sea Ice emissivity, Sea Ice Drift)
- extension of the global products range : Wind and Sea Ice products are already global. Thanks to MetOp, the OSI SAF will offer a Global SST in 2008.

- temporal and geographical resolution increasing, with access to some of the products at full resolution, through flexible extraction interface tool on FTP servers, such as NAIAD (in complement with the existing EUMETCAST dissemination of products over predefined areas and projections)
- the preparation for the use of new satellites (NPP-NPOESS, MTG, GOES-G, post EPS) and consider new parameters, such as Ocean Colour.
- Consider to use new satellites such as SENTINEL-3
- offer an access to archived products via the EUMETSAT UMARF in complement with the archive in the production centers.

This paper will give an overview on the project, the products, their validation, their access and availability statistics, and their usage. Information is available on www.osi-saf.org

The development of a geophysical database: Avoiding the cost and environmental impact of seismic re-acquisition

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Metadata should always lead to data, and these data should be accessible and useable. Where no data is at hand, or resources are not available for acquisition, any information about data sets, and details of how they may be accessed, can reduce the need for new surveys. The cost of modern marine seismic survey technology is now at several thousands of Euros a day for the simplest of marine systems, and most data over 10 years old could be improved by new acquisition methods. But apart from cost there is concern over the environmental impact from seismic noise. Therefore metadata centres are increasingly publicizing valuable information on the existence of hitherto inaccessible marine seismic data sets owing to their emergence in various databases. This has nurtured a growing demand for access to these seismic and other marine information of all vintages, driven in part by the requirements of the UNCLOS Law of the Sea submissions, IODP proposal requirements and the needs of new regional resource assessment and environmental monitoring programmes in both academia and industry.

Existing records will also regain value when the cost of new acquisition is avoided. The European Commission (EC) recognized this potential legacy of environmental information by funding development of a seismic data rescue and re-use facility through two successive projects under the names of SEISCAN and SEISCANEX. To date this 5-centre facility has processed over 14,000 A0 size images of seismic record sections from European waters and beyond. This equates to more than 2,000,000 line km of survey with a re-acquisition cost and added value that could be as high as 30,000,000 Euros. The data is managed by the Caldera Graphics 'Collection' image database and negotiated online via www.noc.soton.ac.uk/gg/SEISCANEX/database.html.

A regular need of facility users has been to convert their paper data into SEG-Y format for re-processing and display rather than simply archive the images. This has been possible for some time but what is the accuracy of the reproduced files? - are they a reasonable representation of the original data? Could they realistically be post-processed without generating artefacts or noise, particularly on early non wiggle trace

variable density data? To investigate this, the facility developed its own seismic image to SEG-Y file transcript algorithm – SeisTrans - as a stand-alone application for hands-on use at academic research centres. To date this module has been installed at 15 research centres world wide for use with both marine and land seismic data. This presentation describes the process of generating digital SEG-Y files from scanned images using SeisTrans as an example. We do not attempt to compare solutions but to present what can be expected from SEG-Y files recreated by any method and the differences that can be anticipated. This will be particularly relevant to the wider academic community and beyond so that those considering this option can make informed choices about where it may be beneficial, regardless of the method they consider most appropriate.

The suitability of a record section for conversion and reprocessing depends on the relevance of the survey location to current scientific needs, the data quality, physical condition of the media and its uniqueness - because not all seismic paper records either need, or are suitable for reconstruction to SEG-Y files: Their information may be sufficient as an image. It is also important to stress that Survey chiefs and Principle investigators are often no longer available, and curatorial responsibility can have been in doubt for some time. Third party data sets may have 'owners' who suffer from 'data shyness' - reluctance by some researchers to share data of any age. Paper seismic records come in many sizes, flat, folded or rolled and often fragile from storage but all these can be handled by modern A0 scanners.

Record sections also need to be logged as metadata (in Directory Interchange Format or DIF) so that documentation of derived datasets from scanning and processing will avoid the creation of subsequent layers of 'data sediment'. These DIFs can also convey the survey details contained in seismic logs, cruise reports or on the seismic records themselves to provide information for the seismic geometry necessary in post processing.

Many software solutions for SEG-Y conversion follow similar steps in the processing to reconstruct the seismic waveform. SeisTrans is a trace pixel sampling and numerical derivation routine applicable to all originals. It was specifically designed for line scan data by measuring the +ve wavelet energy in the black pixels and deriving the –ve wavelet numerically. To register the image for digital sampling each observed trace is overlain with a trace baseline. With these, lines at 4ms spacing (variable) determine sample patches over the image, along and between each seismic trace. The digital file is built by construction of a series of finite values between 0 and 1 determined by the proportion of black pixels in each patch. That is, a patch with 10 pixels can have a value of 0 to 1 in 0.1 steps. These values have a +ve bias from the positioning of the trace baselines, and do not sample the negative wiggle trace segment where this is present. To rectify this each trace is adjusted to have a mean value of zero, with the adjusted mean value being subtracted from patches of zero value to emulate the -ve wavelet. In order to re-create the sampled signal the file generated is band pass filtered appropriate to the original record display.

In principle the routine can be applied to any acoustic data set as long as the scan resolution can define the trace structure with sufficient pixels (5-10). However many high resolution seismic and side-scan sonar records are only resolvable as 8-bit greyscale images and are not presently compatible with this approach, but can be processed by alternative routines.

In creating a waveform SeisTrans typically uses interactive, iterative and repeatable steps in a dedicated graphics window. The scanned image is placed into the module to open a work window. Zoom, pan and resolution selection permit the user to control the accuracy of cursor picks, scaling and editing. The process involves 'Definition of axes and scales', 'Elimination of record time lines (Parasites)', 'Definition of traces' and 'Writing the SEG-Y file with headers'. Once created the SEG-Y file headers can be edited with acquisition parameters and reprocessed using contemporary seismic processing packages. This completes access to and re-use of information up to 45 years old. Comparisons of data sets will be demonstrated.

Abstract 13

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Towards a collaborative research data space in Geophysics

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The standard view states that Scientific theories face Observations. Modern epistemology and Sociology of science highlighted that the validation of a theory is a social process which means that the weights and the shapes of ideas are negotiated. This is even more important where research is cross-disciplinary and communities gather carrying each their own connotative background. In the past these two aspects of the life of the scientists were decoupled. Observations remained in the basement archive, when not in a drawer, and theories were discussed in meeting or journals, showing edited results and without the possibility to go back to the original observations.

Most of the existing data systems only improve the efficiency of this traditional view, while Web technologies offer means to introduce an innovative perspective where both activities can be captured in same space. Using hypermedia, researchers could cross-correlate simultaneously theoretical trains of thought with data, experiencing a novel way of making collaborative science.

OGS is currently developing a system aiming at addressing these issues focusing on the field of Geophysics. This latter has several peculiarities if compared to other fields of the geo-sciences, namely the dimensions of data files, the costs of data acquisition and the sensitivity of data in relation to oil exploration. These impose a further burden on the practices of collaborative work among scientists that need to be considered carefully in order to avoid unpleasant situations. Nevertheless and at the same time, the protection of intellectual property can revert to be used to foster new collaborations and consolidate existing research groups. Only seldom researchers own all the needed observations, more often other institutes have to be contacted in order to collect all the relevant data. Since the final aim of all these activities is to publish a scientific work, it is natural that all the data owners wish to take part of the payback. Therefore, joint working groups are established in order to contribute to the research and at the same time control the use of the data.

How to support these activities? Simply avoiding the physical displacement of data from the owner's site, providing means to access them in a controlled manner and providing tools to let the designated community analyze them remotely. This has the positive effect also to bypass the need of high speed network connection since low bandwidth technologies can be used to achieve these results, an issue that could be relevant, for example, in the case of Seismic data or other large dimension files.

Another issue to consider is the profile of who actually is the data owner. If larger Research institute can afford a data management department, smaller ones cannot, so that generally it is the single researcher that controls ("owns") the data. This introduces the necessity of keeping all the administrative activities as simple as possible, automating as many task as possible and using minimal Metadata models. No scientist will ever fill or edit hundreds of fields that will remain simply empty, which means unusable for any query.

Once the working group is established it needs a common space to use. Accessing remotely to observations can be renamed a virtual laboratory and if several scientists enter this common space this can be called a virtual co-laboratory. Here, humans have to interact among them more than with computers, therefore the concern is to be as flexible as possible avoiding prescriptive paths that could harm creativity. Semantics here moves to semiotics, and since signs, icons and figures can be difficult to be framed, there must be the freedom to let them be un-expressed but implicit in a structure.

Prototypes of ongoing work within this perspective are already in use and currently tested both internally within OGS and within the scope of several international initiatives. We will here present the conceptual framework, solutions and first observations of these experiences.

Abstract 14

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

SIMORC – System of industry metocean data for the offshore and research communities

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Access to offshore industry metocean data

The ideal observation point from which to measure sea level, waves, currents, sea temperature, conductivity, air temperate, air pressure and wind is a stationery structure that remains at sea for decades. Fortunately for metocean specialists, scores of such structures already exist in the form of offshore oil and gas production platforms. Over many years oil & gas companies have acquired a large volume of metocean data sets worldwide, often at substantial cost and in remote areas.

The System of Industry Metocean data for the Offshore and Research Communities, SIMORC, is an initiative of the Metocean Committee of the International Association of Oil & Gas Producers (OGP). It brings together a wide variety of metocean data and makes them available to the scientific community and industry through a dedicated internet data service.

SIMORC's service consists of an index metadatabase and a database of actual data sets. Both are accessible via the internet. The index metadatabase is in the public domain and features a geographic–alphanumeric user interface to locate interesting data sets easily. The index is based upon the ISO 19115 metadata standard and provides sufficient information to allow the user to assess the relevance of the data sets and possible related study reports to its particular interest.

The Database contains copies of metocean data sets, worldwide gathered by oil & gas companies. However these have undergone extensive quality control and conversion to unified formats (ASCII and NetCDF), resulting in consistent and high quality, harmonised data sets. Data sets remain the property of the oil & gas companies. Access to the data is regulated by a User Licence Agreement, which gives favourable conditions for access and use of data sets by scientific users for research and educational purposes. Industry users also need to register, albeit that their data requests are always forwarded to the data owners for consent.

SIMORC's user interface contains a shopping basket mechanism by which registered users - scientific and industrial - can specify and submit their data requests. Via a

transaction register users can regularly check the status of their requests and download data sets, after access is granted. Data owners can follow all transactions for their data sets online and can handle requests which require their consent.

SIMORC deals with data from upstream operations the world over. For Europe data sets come from the North Sea, Mediterranean Sea, Norwegian Sea, and the North Western Atlantic shelf. Beyond Europe data sets are available for major offshore activity areas, such as Caspian Sea, offshore Brazil, China Sea, Australasia, Middle East and offshore Africa. SIMORC already encompasses more than 800 data sets from several major oil and gas companies. This coverage is steadily increasing.

Benefits:

- SIMORC facilitates systematic indexing of industry metocean datasets and results of field studies, providing easy overview of available datasets. · SIMORC facilitates systematic archival, providing efficient and harmonised access to available datasets. SIMORC facilitates long-term stewardship of industry metocean datasets and results of field studies, including taking measures against degrading of storage media, safeguarding their on-going availability for future applications, such as climate analyses.
- SIMORC facilitates and encourages the exchange between industry and the scientific community, thereby paving the way for knowledge exchange and co-operations.
- SIMORC facilitates validating the quality of existing datasets and harmonising their documentation and formats, thereby improving the opportunities for further use of datasets in integrated studies and analyses. Therefore SIMORC applies internationally agreed standards for quality control, metadata and data formats, that can be adopted by industry and prescribed to contractors for acquiring and delivering new field datasets.
- SIMORC facilitates and encourages exchange of datasets between industry parties, thereby saving costs and adding value to earlier investments in data acquisition.
- SIMORC encourages relationships between industry and developing countries by providing datasets, that can be used by local and regional communities for analysing their local systems and for educational purposes. This is strengthened by a dedicated SIMORC training module as part of UNESCO's IODE OceanTeacher programme.
- SIMORC complements the activities of the international scientific and governmental communities for implementing infrastructures for indexing and sharing marine and ocean datasets worldwide.

Who?

SIMORC's Service has been developed from June 2005 till end 2007 with cofunding by the European Commission via the SIMORC project, executed by the following partners:

- Mariene Informatie Service "MARIS" BV (MARIS) – coordinator
- International Association of Oil & Gas Producers (OGP)
- British Oceanographic Data Centre (BODC)
- Intergovernmental Oceanographic Commission of UNESCO (IOC-IODE)

MARIS has developed and is operating the SIMORC internet service and (meta)databases. The International Association of Oil & Gas Producers (OGP) coordinates participation by major oil & gas companies, bringing in their considerable data sets. BODC performs quality control on all metocean data sets and unifies their formats. IOC-IODE includes SIMORC in its educational programs for developing countries and has developed a dedicated SIMORC training curriculum as part of its online OceanTeacher programme. From end 2007 onwards SIMORC is run by MARIS and BODC in an arrangement with OGP.

Website: www.simorc.org

Abstract 15

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

GENESI-DR perspectives and goals for the Earth Science community

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GENESI-DR, short for Ground European Network for Earth Science Interoperations - Digital Repositories, has the challenge of establishing open and seamless access to Earth science digital repositories for European and world-wide science users. GENESI-DR will operate, validate and optimise the integrated access and use available data, information, products and knowledge originating from space, airborne and in-situ sensors from all digital repositories dispersed all over Europe to demonstrate how Europe can best respond to the emerging global needs relating to the state of the Earth, a demand that is unsatisfied so far.

GENESI-DR has identified the following priorities:

- To provide a base for (establishing) a world-wide e-infrastructure for Earth science with European leadership;
- To offer guaranteed, reliable, easy, effective, and operational access to a variety of data sources, and demonstrate how the same approach can be extended to provide access to all Earth science data;
- To harmonise operations at key Earth science data repositories limiting fragmentation of solutions;
- To demonstrate effective curation and prepare the frame for approaching long term preservation of Earth science data;
- To validate the effective capabilities required to access distributed repositories for new communities, including education, and assess benefits and impacts;
- To integrate new scientific and technological derived paradigms in operational infrastructures in responds to the latest Earth science requirements.

To reach its objectives, the project proposes a repetitive approach built around a virtuous cycle of innovation where GENESI-DR services and enhanced capabilities will be validated against user needs for accessing and sharing Earth science data, and results of application activities. The proposed technology development and exploitation plan will proceed in line with supporting standardisation and evolution of data policies. To improve the accessibility of all related data, coordination, harmonisation and standardisation activities are an absolute must. GENESI-DR includes such activities and will establish links with relevant major global international Earth science organisations and programmes such as:

- Space agencies and satellites operators coordination bodies (e.g., CEOS)
- Global institutional environmental programmes (e.g., GMES, GEO, GEOSS)
- International Earth science programmes (e.g., IGOS, GCOS, GOOS...)
- Standardisation bodies (e.g., CCSDS, ISO, OGC)

Cooperation with SEADATANET and other key Earth Science initiative to access data is one of the will identified priority activity. The GENESI-DR project, started on January 2008, has the duration is 2 years and it is organised around four Networking Activities, two Services Activities and two Joint Research Activities.

National IPY data access and management system

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Specialized data management system has been developed to provide accumulation and exchange of the IPY 2007/08 data and information. It is based on the technologies and infrastructure developed under the Unified Information System on the State of the World Ocean (UISWO). IPY data management system includes regulatory documents, technological tools for data and metadata collection and WEB-portal IPY-Info.

The formats widely used in different disciplines are recommended for collection and exchange of the data of regular meteorological, geophysical and other observations. Also the format based on CSV specification for text files has been designed in RIHMI-WDC and recommended for exchange of observed data and products. To support this specification the software for data processing which includes procedures for data conversion, visualization, syntactical and simple semantic check have been developed. It is strongly recommended to accompany every data set with data description file (DDF). The format of DDF is standardized and enables to include appropriate metadata in it.

The WEB-portal IPY-Info serves to integrate data and metadata produced in the numerous IPY projects and to provide on-line access to these information resources. It enables the IPY data providers to enter the metadata via tailored WEB-forms and to load data files into centralized holding. The users are enabled to perform remote search, displaying and retrieval of IPY data and metadata (cruise summary reports, data sets description, scientific reports and other documents). The portal makes it possible to monitor IPY data and metadata collection and to produce necessary reports.

To provide on-line access to the distributed information resources on Earth Polar regions accumulated in different institutions the E2EDM technology is applied. This technology provides selection of the information resources stored in SQL databases, structured and object data files.

Data and information managed by the system is available on-line at http://www.mpg-info.ru.

A coastal cabled observatory

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Priority way of studying of the World Ocean is used of cabled observatories for long-term continuous real-time measurements.

Cabled ocean observatories consist of several underwater sensors connected in a uniform cable network, providing in real time gathering, data storage, data processing and transfer to external data centers.

In 2004 - 2007 in P.P. Shirshov Institute of Oceanology of the Russian Academy of Science is developed of a coastal cabled observatory for performing long-term continuous real-time measurements in Blue bay in the Black sea area at South Branch of SIO.

The structure of observatory is geographically distributed. It consists of underwater sensors, junction boxes, communication unit, the territorial center of and the main center of storage and data processing.

The communication unit is hardware box on a pier of South Branch of SIO. It is connected with the territorial center of data gathering on a fiber-optical cable.

The unit contains the equipment, allowing connecting underwater station and moored buoy on various interfaces: Ethernet, RS 232/422/485, WiFi.

The communication unit solves following task:

* receiving and A/D converting of data from the various measuring equipment;
* transforming of data to common standard format for system;
* initial data processing with definition of data quality;
* sending data to database server;

* data exchange with head the centers;

Now cabled observatory has following underwater sensors:

* the complete set of reception lines for measurements of an electric field of currents in a coastal zone;
* hydrophysical underwater stations is equipped by following sensors: conductivity-salinity; pressure / wave measuring, thermonetwork for measurement of a vertical profile of water temperature, they are connected in a uniform underwater network;

The territorial center of data processing serves for data gathering from underwater sensors, primary processing and data transfer via Internet in the main data-processing centre. The territorial center is placed in Blue bay in the Black sea area at Southern branch of P.P. Shirshov Institute of Oceanology of the Russian Academy of Science.

The main center of storage and data processing is located in Moscow in the P.P. Shirshov Institute of Oceanology of RAS. The centers are connected via virtual private network.

The territorial center and the main center solves following task:

* receiving of data from communication units (territorial center for main center);
* data quality control;
* storing and processing of data;
* data analysis;

The central element of observatory is the oceanographic data warehouse which includes both the Ocean DB itself and instrumental means to work with it. To describe the results of field research a data format in XML language was developed and proposed. The proposed standard for describing the oceanographic data was called OceanML.

OceanML describes the structure of the XML document of oceanographic data, possible descriptors and attributes, as well as data types. The description is given in the XML Schema language.

The XML language has been chosen for oceanographic data presentation owing to the following properties: it can be used for the description of diversified complex data; it is understandable to man and computer; it includes both data and their description; it is supported by the leading software producers; XML documents can easily be transformed into any format of presenting HML page, WML page, PDF files with the aid of XSLT language; meets the established international standards.

Practical realization of data warehouse OceanDB is developed on platform Oracle10G. The choice has been proved by significant progress of the given platform in a direction of integration XML c technologies of databases. The application server is developed on platform Oracle Application Server 10G.

This multi-user access system was designed for storing, retrieving and analytical processing of scientific research oceanological data in multi-disciplinary field experiments. The database is designed for systematic accumulation of data with the objective of the analysis, study and comparison, planning of field and other investigations. Access to system is possible through the Internet.

This observatory can be used for long-term continuous complex oceanological observations. It also can be used for studying different dynamic processes in seas and oceans, for example, studying of changeability of World Ocean in wide range of parameters from climatic to synoptic.

WEB publishing of geographic and oceanographic data and information

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It is now commonplace to see maps or other geographic information integrated seamlessly into oceanographic data centre's websites. The Bulgarian National Oceanographic Data Centre (BGODC) has also integrated geographic information system (GIS) interface in its own website . The existing information technologies and scientific standards are used whenever possible in preference to development of own solutions. As well the experience of the leading oceanographic centers is accounted.

The "heart" of the BGODC general data dissemination architecture is a MS SQL Report Server, a Web-based middle-tier layer that receives incoming report requests, generates, renders, and delivers reports. These reporting services are based on network-based model of web services. The BGODC staff has designed a variety of reports and has deployed them to individual. This Reporting System provides interactive Web access 24/7 to reporting at both the portal and individual resource levels, and enables users to:

- Access, download and manage usage data at both the portal and individual resource levels —with a convenient ID and password. Using data driven subscriptions, reports may be "broadcast" to a large audience during off-hours;
- Use predefined formats that also display graphic representations of the data;
- View data at various levels of detail, such as in summary tabular form or in graphics views;
- Download data in a variety of formats, including HTML, or export to a spreadsheet application;
- Create customized reports that will allow for flexibility in your reporting needs. Meet current and emerging standards for reporting oceanographic data, such as ODV format.

The spatial mode data dissemination is based on ArcGIS Server. The GIS projects are shared by first hosting them on ArcGIS Server, publishing as services and buildding web applications that users access through web browser. The main advantages of sharing the GIS projects on a GIS server are the same as sharing information from general databases through Report Server: the data is centrally managed, supports multiple users, and provides clients with the most up-to-date information. Access to the ArcGIS server is embedded inside the web applications developed with ADF (ADF stands for Application Developer Framework) - the set of custom Web controls and templates that can be used to build Web applications that communicate with a ArcGIS server. These include out-of-the-box tasks for query, network analysis, and editing. The controls, tasks, and data sources supported by the ADF are sufficient for many applications. While the ADF are ideal for the map navigation and spatial analyses they are limited due to the following reasons:

- The ADF are restricted concerning query, searching and visualization of attribute data. The developers can use the framework to make your own task but the process is very sophisticated.
- There are many restrictions concerning building relations between spatial data and other attribute data. In ArcMap, relationships can be created by joining or relating tables together. Relationship classes can be created in ArcCatalaog. Tables can also be associated by creating ArcSde spatial and not spatial views. Only in ArcMap in the relationships can be used external sources connected to general databases.

Two avoid sophisticated solutions the standard ADF web application is modified in the following manner:

- The string object returned from task control class after applying map object identification tool is parsed and the result are used for building the query against general data base;
- The corresponding report from Report server is executed and results are obtained.

In this way, the results from the two web applications, ADF created and published through ArcGIS Server and reports published through powerful Report Server, are combined. The advantages of such an approach are:

- The development time is significantly shortening;
- There are no needs to transfer all attribute information to geodatabase when using MS Report services.

The next step in the improvement of BGODC Web publishing system will be embedding Google maps services in web site and combine them with Report server capabilities.

Optimisation of the technical and informational structure of the ESIMO center in RIHMI-WDC

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There is a list of the main problems in existing infrastructure of Unified system of information for World Ocean conditions (ESIMO) in All Russian Research Institute of Hydrometeorological Information - World Data Center (RIHMI-WDC) for example:

- The are some servers of database which are grounded on DBMS Oracle 9i. As a rule, each of these servers is used by one or several groups of creators. The majority of portal technologies are centred on the basic server.
- The usage of one or several JBOSS application test servers.
- Adaptation of four subject-matter databases, which include the same tables.
- The complexity in management of thousands tables within one database.
- Doubling of the atributes within different subschemes.
- The absence of the information about authots of the tables

Union data base dictionaries, codificator platforms, parameters and rubricators of different countries , organisations, geographical regoins are used within one database. When we use the distributing server, all these information structures become replicated.

Insignificant modification in such information structures must lead to the replication of all instances according to the latest change, but in most cases this modification is not adopted by all databases. This inevitably cause some errors in database.

The usage of the basic work server as a test server (not only as a storage for data of the ESIMO) appeared to be one more disadvantage. When the creators use this server as a test server, they may generate resource-intensive query, which may reduce the productivity of the basic server and may lead to logwriting of surplus operations. Maladjustment of the system for soft faults is a really big problem. For example, when database server falls out, the portal work stops untill all errors will be eliminated.

The main aim of this optimisation is to simplify the management of the oceanographic data. In order to achieve this goal it is necessary to accomplish the following tasks:

- Development of the system architecture for the data storage, which will be based on four servers.
- Development of the new storage technology (the new data storage which will be regulary replenished)
- It is nesessary to conduct data restructuring.

At the present time, there was developed and incamated the following technological scheme of the techical and informational infrastructure:

The technology of the data storage, which is based on DBMS Oracle 10g will raise reliability of the data storage and will consentrate the data in one place. This technology will also simply the recovery in case of errors and data lasses. The test server will allow to generate the applications separatly from the basic server. The addition of the reserve data storage and separate test server will increase the portal productivity and reduce the network load.

The future trend of this research is data restructing. At a present it is conducted the development of the new data model which is based on multivariate data model.

Integrated Coastal Management, Marine Spatial Data Infrastructures, and Semantic Web Services

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Spatial Data Infrastructures (SDI) become indispensable where a number of stakeholders are involved and rapid, right decisions are critical. Environmental resources management involves numerous cases where decisions are even crucial concerning sustainable development. Integrated Coastal Management (ICM) is one such case. The word "integrated" in the term "ICM" is for an interdisciplinary analysis of the major social, institutional and environmental issues and options affecting a selected coastal area. The analysis should take into account the interactions and interdependencies among natural resources and different economic sectors (GESAMP, 1996). On the other hand, politics and science have to work together for a successful ICM program. Pointing out this, Olsen (1996) also identifies that some ICM programs have focused too much on peripheral "science" and too little on governance process; others have done the reverse. There are many related cases in Turkey which verify this diagnosis. One of the highlighting examples has been the illegal uses of the coastal areas. Another would be the dispute between the authorities of tourism and aquaculture on the fish cage site selection. There is no science at all in the former while its use has been rather insufficient in the latter cases.

SDI, is an interoperability infrastructure functioning on top of a technical and organizational framework for enabling cooperation among its participating partners. The "participating partners" refers to any provider or requestor of data and services within an SDI. The technical framework will define and determine the technologies and standards for technical implementation of SDI. The organizational framework will guide to the management of SDI by defining the rights and responsibilities of the participators. The two frameworks will guide to both building and maintenance of a SDI. Therefore, setting aside the technical and organizational frameworks is a highly complicated task especially for large scale SDIs. INSPIRE action plan (INSPIRE, 2005) is a proof of this indeed. The Services Oriented Architecture (SOA) and its most popular implementation, Web Services (WS) offers a valuable option for the required technical framework for SDI. The need for such "service-oriented SDIs" has already been realized by a number of

researches in the area, some of which being (Aditya and Lemmens, 2003), (Cömert, 2004), (Cladoveu & Alves, 2005). And there have been plenty of related work in this area. Parallel to these activities, we have been investigating the major issues involved in implementing an SDI with Semantic Web services in our ongoing work. There are many issues of such an undertaking, which would be the subject of a separate work. Nevertheless, it is for sure that the semantic interoperability enabling implementations of SDI will certainly be among the most viable and perhaps the most probable implementation options for SDIs concerning the futures of both SDIs and the Web.

In conclusion, SDIs can provide the data and services needed for the sufficient scientific involvement in the ICM programs. Moving from this point on, a semantic interoperability enabling implementation of SDI with an ICM use case has been performed in this work. Our goal in this work was twofold then. First, to show that an SDI can be implemented in a way that semantic interoperability is possible. The second aim was to identify the need and value of SDIs for ICM programs. Although there have been proposals over the SDI need of ICM such as (Gillespie et al, 2000), (Longhorn, R. 2005), our work differs in being a semantic web services implementation. Also, touched upon in the work is the advantages and disadvantages of our implementation with respect to the current SDI implementations.

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An OGC-Service-Oriented Architecture for Marine Aggregates Resources Decision Support System

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Introduction

This paper describes a web based Geographic Information System (GIS) that has been developed as part of the Irish Sea Marine Aggregates Initiative (IMAGIN). This DSS has been designed to facilitate key regulatory and management processes by supporting decision making associated with the sustainable development of marine aggregates including strategic environmental assessments, (SEA, EIA), Risk Assessment (RA) and also in the wider context of Marine Spatial Planning (MSP).

IMAGIN Prototype-Decision Support System

The IMAGIN Prototype-Decision Support System (DSS) has been designed to help scientists use the datasets provided by the IMAGIN participants in order to answer complex questions like: "Where, within a given area, a potential marine aggregates resource can be exploited without (or with minimum) impact on the seabed and environment? And which period of the year, with relation to the fishing activity and fish abundance, should the extraction be performed or suspended?"

In order to achieve this, IMAGIN prototype DSS needs to integrate the different resources (data, metadata and maps) provided by the IMAGIN participants. A user-friendly graphical interface offers easy access to IMAGIN resources. It allows users to visualise and interact with the data. More advanced users are enabled to query and to download the available resources in order to perform further analysis using their own systems and applications. For this purpose IMAGIN prototype DSS, also provides a set of standard Web services that allow users to search and query IMAGIN resources.

IMAGIN prototype DSS has been designed with a service-oriented architecture that implements the OGC Web service. IMAGIN architecture implements the OGC Web Feature Service (WFS), Catalogue Service for the Web (CSW), and Web Map Service (WMS).

- Web Feature Service - The OGC Web Feature Service (WFS) defines interfaces for data access and manipulation operations on geographic features using HTTP. Via these interfaces, a web user or service can combine, use and manage geospatial data using HTTP requests. Data delivered by WFS are encoded in GML, the Geography Markup Language. GML is the XML grammar defined by OGC to express geographical features and to exchange data geographic data on the Web. The use of a WFS as part of IMAGIN prototype DSS enables users to query, manipulate and download IMAGIN vector data and perform advanced analysis on them. IMAGIN WFS also delivers vector data to the Web Map Server which generates maps. In terms of implementation, IMAGIN prototype DSS uses GeoServer as WFS implementation.

- Catalog Service for the Web - Catalogue services allow users to publish and search collections of descriptive information (metadata) for data and services using HTTP. Implementing an OGC CSW enables IMAGIN prototype DSS users to search and query metadata records using HTTP requests. This facilitates data discovery and access. IMAGIN CSW also delivers metadata records to the graphical user interface. Practically, IMAGIN DSS uses GeoNetwork as CSW implementation.

- Web Map Service - A Web Map Service produces maps of geospatial data dynamically from geographic information. In the IMAGIN prototype DSS, a WMS generates maps from the WFS data and from raster data. The WMS delivers maps both to the graphical user interface and to Web users and applications. In terms of implementation, IMAGIN prototype DSS uses UMN Mapserver as WMS implementation.

The aim of this Web service based architecture is to allow (i) more modularity within the prototype DSS and (ii) more interoperability by making scientists and stakeholders interact (possibly via applications) with a catalogue of the available resources and download data, metadata and maps, through OGC services, to use them locally for more advanced analysis and computations.

The IMAGIN prototype DSS offers an easy-to-use graphical interface that allows dynamic construction of the layer list. Data layers are structured into categories and can be browsed and visualised easily. The graphical interface also handles the relational aspect of the Arc Marine data model by allowing navigation between different related tables based on a foreign key mechanism. Moreover, the IMAGIN prototype DSS handles multimedia data such as photos and videos.

The IMAGIN graphical interface allows users not only to view and query datasets but also to view associated metadata and download data (if made available) through a hyperlink from its metadata file once the data become available online (through the Web Feature Service).

Finally, we mention that the IMAGIN prototype DSS has been developed in PHP and uses MapServer's Mapscript.

Conclusion

Fully compliant with international quality standards, the IMAGIN prototype DSS is founded on robust open sourced elements that are assembled in accordance with modular architecture. These features should ensure that it will endure providing a long lasting, robust, extensible tool principally for use by resource administrators in government and industry. This inherent flexibility also allows considerable scope for extension and modification to suit a range of other marine or terrestrial applications.

Abstract 22

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

HydroBase: a tool for discovering and downloading physical and bio-chemical oceanographic data

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HydroBase is a user oriented discovery, viewing and downloading services of physical and bio-chemical data. It includes CTD and water bottles data collected in the framework of national research cruises in Tunisia. The received data are reformatted to MEDATLAS (ASCII) format and quality controlled using the QCDAMAR tool. Data files are then archived using Oracle 9i archiving software.

Currently, HydroBase contains over 1,000 CTD profiles, 2 CTD time series over 4 year measurements and 7026 measurements concerning 11 bio-chemical parameters. The data cover the geographical area between 6°E and 13°E longitude and between 30°N and 39°N latitude.

In order to facilitate the data discovery and downloading, a PHP Web-based application allows the users to query the database using both spatial and temporal criteria. Data can also be extracted for registered users in an ASCII easily usable format. A statistical tool was implemented to assess the amount of data delivered to the users and to specify their profiles (i.e., public domain, academic, private sector...).

The future development will concern the mapping service, more specifically the visualisation of data layers using geographic mapping tools.

Establishment of Oceanography Data and Information Systems at Kuwait Institute for Scientific Research (KISR) for Kuwait's Waters in the Northwestern Arabian Gulf

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A project was conducted for a twelve-month duration, which was directed towards establishment of the Oceanography Data and Information Systems at the Kuwait Institute for Scientific Research (KISR). This effort was based on the recommendations of the past ODINCINDIO meeting, which encouraged the establishment of the above systems for the ROPME (Regional Organization for the Protection of the Marine Environment) Sea Region as per the guidelines of the IODE. The basic mission of these systems is to compile, quality assure and standardize oceanographic data and information available from the oceanographic research projects at KISR, published documents and repositories resulting in access and exchange of KISR oceanographic and marine data and information between interested marine scientists, both locally, regionally, and internationally. This is the first phase of a long-term process concerning oceanographic database and information systems at KISR. The Oceanography data, which were compiled under this project, were derived from all oceanographic research projects conducted by the oceanography group during the period from 1995 to 2005. Compiled MFD Oceanographic data underwent a series of steps to assure its quality, standards and homogeneity and finally a reliable oceanographic database system was generated. The Information System, which is also a component of this project, is comprised of 367 Journal Articles, 10 books, 459 KISR Reports, and proceedings. In addition 1117 Articles published at local news papers related to the marine environment were included. This Project revealed valuable recommendations to assist oceanography data and information management at KISR.

Abstract 24

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

EurOBIS, an online atlas for European marine species distribution data

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The Ocean Biogeographic Information System (OBIS) is a distributed system that allows users to search multiple datasets simultaneously for biogeographic information on marine organisms. This distributed system integrates individual datasets on marine organisms into one large consolidated database. The European node of OBIS (EurOBIS) has been developed within the EU-FP6 Network of Excellence 'Marine Biodiversity and Ecosystem Functioning' (MarBEF). MarBEF is the largest network in Europe on marine biodiversity and integrates around 700 scientists from 92 institutes and 22 countries. Within the EurOBIS architecture, the European Register of Marine Species (ERMS) is the taxonomic backbone, the European Marine Gazetteer is the geographical reference list, and the Integrated Marine Information System (IMIS) is the inventory of relevant experts, datasets, publications and other relevant information. EurOBIS came online in June 2004. At the end of December 2007 there were over 3,500,000 distribution records for more than 15,000 validated species, coming from 49 different quality-controlled data collections. 40 % of the data providers choose to submit their data for storage on the dedicated EurOBIS servers at VLIZ, while 60 % of the data providers make use of the platform-independent DiGIR (Distributed Generic Information Retrieval) protocol. DiGIR can be installed on any computer that has PHP and a web server running. The DiGIR records are available in a standardised XML format and are transferred via HTTP. For performance reasons, we also store a local copy of all remotely-held data. Regular queries guarantee the data integrity of the system. An interactive layered map is available for comparing and visualising the biogeographic data on the web. The ultimate goal of EurOBIS is to provide the end-user with a fully searchable biogeographic database, focused on three main parameters of a distribution record: taxonomy, temporal and geographical cover. Future developments will focus on the use of EurOBIS as a platform for data quality control and the display of additional information such as distribution patterns, range extensions and possible threats posed by species (e.g. potential invasiveness). For further details see www.eurobis.org.

A sea bottom imagery database for the study of the Mediterranean tectonics off the Nile Delta, Egypt

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Bathymetry of the Egyptian Mediterranean off-shore Nile Delta area, fig.1(a), [1] is analysed and interpreted, in favour of focusing natural resources, better understanding the structural and tectonic plates models. 3rd order polynomial is applied as the best fit, [2] for regional/residual separation, fig.1 (b & c). Mass distribution of the marine sediments in terms of excess and /or deficiency [3] expresses the tectonic features affecting the subsurface basin, as well as hydrocarbon favourability, [4].

Analysis and Interpretation: Bathymetry map as a spatial function D (Lat.(y),Long.(x)), is increasing and decreasing in both NW & SE directions respectively. The Regional component of bathymetry is filtered by a least squares fitting of 3rd order polynomial: Ď= 98.3593 + 1586.849 x - 248.721y + 42.1881x2 - 31.56386x y - 374.871y2 + 1.778475x3 - 0.1399558x2 y - 8.312923xy2 + 2.552614y3, while its residual component is given by đ =D(Lat.(y), Long.(x)) - Ď. The đ component indicates continental shelf offshore the Nile Delta as being sinking down with northward migration that making a depression of a residual depth of about 600 m. and bounded by an EW fault. Another sinking plate is located at the NW, makes a depression of a residual depth of about 350 m. On the contrary, a positive plate lies between these two sinking plates of a depth range 325m to 400m. The three plates are bounded by fault zones that trending to make a synclinal feature having NW-SE axis, fig. 2(a), which affects the Nile delta region, to form a synclinal feature. Such basin might be favourable for structural offshore hydrocarbon traps. On the other hand, the increasing and / or decreasing in the shallow marine sediments, gave rise to distribution of mass excess and / or deficiency [5] as being estimated to be about 59.68112 M.T. and -122.8629 M.T respectively. Mass excess are located at N, E and W, with larger amount at the western side than the eastern one; while mass deficiency lie at the middle of the map. The belts of zero balance, those separating the areas of excess and deficiency, are considered as zones of stability, which may indicate the erosion budget should equal to that of accretion of marine sediments.

Conclusively, the eastern and western sides of the study area are uplifted whereas the middle part of the map in front of the Nile delta is sinking [6], fig. 2(b). This is due to structures that affect the upper crust by a set of tectonic fault zones interacting in upward and downward plat tectonics. This view is in acceptable agreement previously mentioned by Emery et al [7]. Moreover the rate of upward movement in the eastern side of the study area is higher than that in the western side [8] and the tectonic movement along the mid axis generates a subduction zone likes a zone of creeping. 3D model is representing the tectonic framework off Nile Delta fig. 2(c).

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Upgrading the Malta Marine Data Management System to SeaDataNet requirements

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Marine data can only be useful as much as it is locatable, easily accessible and shared with users. In 2003, following its mission as a national oceanographic data centre for the Maltese Islands, the Physical Oceanography Unit, established within the IOI-Malta Operational Centre of the University ofMalta, launched the Malta Blue Pages. This is an internet-based national directory system that provides detailed descriptions on existing ocean and coastal marine data holdings. The Malta Blue pages additionally provides an inventory on local marine-related projects, rendering such initiatives more visible as well as making derived results and findings known to a wide range of end-users. Besides the searchable databases, the Malta Blue Pages also offers a user friendly online interface for the browsing and selection of data from a 2-degree square domain around the Maltese Islands.

The metadata within the Malta Blue Pages portal is stored on a MySQL database, and all interfaces are presented as HTML pages. The management duties are per- formed over the Internet through a normal web browser.

Within the ambit of the SeaDataNet project, this portal is being updated. The Common Data Index interface is being implemented whereby the metadata records will conform to the ISO 19115 standard. The system being developed is a three-tiered structure where the MySQL database is used to store all the necessary information. On the client side the system is accessed over the HTTP protocol using a web browser. In between those two tiers, there is the server which uses CGI (Common Gateway Interface) and ODBC to perform the necessary tasks. The server updates the MySQL database regularly by communication to the SeaDataNet servers via SOAP to obtain the latest updates to the controlled vocabulary lists.

The new system will serve two types of user. There is the administrator user who adds new data to the CDI system, or edits the existing data by progressing through a series of forms. The use of the controlled vocabularies is enforced by allowing the user to select only from the controlled listings where appropriate. Once a new dataset has been entered, or an existing dataset has been updated, a script is triggered which automatically produces the XML representation of the CDI dataset. This script works very similarly to MIKADO whereby a template file is used containing SQL queries which are updated with the appropriate results.

The other type of user is the normal user who can navigate and query the existing CDI data sets. A GIS system will control the visualisation of the geographical locations relevant to the different datasets. Google Maps will be used as the basis for this GIS system. Free text searches will also be available for the user.

Safeguarding, Integrating and Disseminating Knowledge on Exploited Marine Ecosystems : The Ecoscope

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The informational resources required to set up an efficient management of environmental domain are by nature, heterogeneous, like the different elements interacting in this domain. Moreover, the studying of ecosystems under human pressure, like oceans, requires the collection of informational resources from a wide spectrum of disciplines, from human sciences (political, economical, demography...) to environmental sciences (oceanography, ecology, biology, geology...). To that purpose, the ecosystem approach to fisheries (EAF) is promoted by international organizations (Sinclair and Valdimarson 2003, FAO 2003) to set up an alternative management approach which leans towards the integration of the various information acquired on the main elements of an ecosystem (natural or anthropic elements) and on their use in a concertation framework.

The Ecoscope project (www.ecoscope.org) is based on the main idea, first formalized by Ulanowicz (1993) and taken back by Cury (2004), which aims to enable a reasoned management of knowledge related to tropical and Mediterranean ecosystems' fisheries by using an ecosystemic approach. In particular, the essential goals are to archive, articulate and facilitate access to the knowledge acquired by different past, ongoing or future projects. After a two year feasibility study, the Ecoscope project suggests the setting up of an original information system which integrates the classical issues of heterogeneous informational resources management which differ in their thematic scope (content) as well as in their formalization (languages, data format, metadata...). The use of metadata is needed but, regardless of the chosen standards, the main goal is to warranty the indexation quality for informational resources in the catalog in order to improve thereafter the searching of knowledge in the information system.

The success of the suggested informational resources management leans on the integration of both technical (standards for heterogeneous information and knowledge management: cataloging, metadata and indexation, geographic information and semantic) and thematic (setting up of ontology: description of the elements and their

interactions in the ecosystem by experts). In this paper, we will describe the approach used to solve the two complementary steps.

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Creation of E-Catalog of Oceanographic Data in Georgia

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The collection of marine data on a regular basis and scientifically based data management started in Georgia in the year of 2001, when the Georgian Designated National Agency for International Data and Information exchange (GeoDNA) was established as a unit of IOC/UNESCO International Oceanographic Data and Information Exchange (IODE) Program with scientific and educational purposes at Iv. Javakhishvili Tbilisi State University.

It's mission is to collect, acquire, process, store and disseminate marine data and metadata sampled by Georgian institutes and agencies, as well as to provide graduate level of education in marine sciences.

Its main objectives are to facilitate the access to marine information, promote development of indicators on marine science and technology, environment and socio-economics and to encourage cooperation between the National and European Institutions.

From the year of 2006 the Designated National Agency operates within the Centre of Relations with UNESCO of the Iv. Javakhishvili Tbilisi State University

In recent years, the first oceanographic E-Catalog was created as a result of financial support from different international projects.

Actually, building of the metadata base was realized within the IP SEA-SEARCH and

SEADATANET and in parallel with their achievements and thus, uses the main instruments and approaches developed in these projects.

Following the EDMED, EDMERP and ROSCOP formats elaborated within the IP SEA-SEARCH , all rescued historical and other oceanographic data existing in Georgia, were transformed into the new formats and included into the Pan-European base.

Recently all data became accessible through the GeoDNA portal.

The E-Catalog includes marine metadata (data sets, projects and cruises) of 14 Georgian data holder institutions. Most of the data introduced correspond to the shore line dynamics, geomorphology and geology. Hydro-meteorological and hydro-chemical data were mainly collected until 1992 by the National Hydrometservice. After this period all kind of observations are carried out within the IP and by private institutions and have an episodic character.

At present, the GeoDNA carries out works for collecting, compilation and metadata update for preparation the common data catalog. Preparation and submitting of CDI XML files are on the way of loading to the SeaDataNet CDI portal and, thus provide new degree of accessibility to the national oceanographic data.

The Global Sea Level Observing System (GLOSS) delayed-mode data centre

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In 2007 the Permanent Service for Mean Sea Level (PSMSL) combined its Mean Sea Level (MSL) 'delayed-mode' (DM) activities with the higher-frequency (HF, typically hourly) DM data collection from Global Sea Level Observing System (GLOSS) stations sites conducted by the British Oceanographic Data Centre.

GLOSS was originally proposed in order to improve the quantity and quality of MSL data supplied to the PSMSL, and GLOSS continues to perform that function. While MSL research is most closely related to climate change (global warming, melting of glaciers etc.), it is the changes in extremes which are of most interest to people at the coast due to the possibility of changing frequency and magnitude of flooding.

The combining of the datasets will enable a more efficient collection of data and metadata (related information such as technical details, photographs and maps) from the two DM activities and will extend the range of possible global sea level studies.

Abstract 30

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

The InforM@r Project

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The InforM@r project was born within the Portuguese Task Group for the Extension of the Continental Shelf (EMEPC), as an ocean data gathering, treatment and exploitation system.

InforM@r's is primarily intended to support the EMEPC, including the management of essential data to the elaboration of the necessary studies and documentation to justify the Portuguese Project for the Extension of the Continental Shelf, under the United Nations Convention on the Law of the Sea. A portal for metadata visualization of data gathered during the Portuguese Continental Shelf Extension Project has already been developed. However, this project not only is intended to provide for EMEPC's needs in data management, but it also aims at establishing itself as the reference for a de facto Portuguese ocean data centre.

GIS is a powerful tool for the management of large amounts of spatial data. Thus, several COTS (Commercial Off-the-Shelf) technologies are being used in this project, such as: ESRI GIS software, more specifically ArcGIS® and ArcObjects, compatible with the OpenGIS consortium specifications; object oriented spatial databases, using the Oracle® spatial concept and the ArcGIS® Marine Data Model (ESRI) as a working base; Microsoft Visual Studio. NET® for the development of specific tools; and data broadcast via web client (ESRI ArcIMS®).

The first step on the creation of this system was the adoption of ESRI's Marine Data Model as a working template, to meet up with some of its basic requirements, following an analysis of different existing models. This template was then deeply modeled (using Microsoft Visio®) to face the specific requirements of four major disciplines (Physical Oceanography, Hydrography, Geodesy and Geology), identified as essentials for the EMEPC project. The final version of the database model was then converted to an ESRI Geodatabase, implemented and tested.

Two environments are being developed for the exploitation of the data: Intranet (freely accessible in the EMEPC) and Internet (of controlled access for the public, via institutional WEB). In the Intranet environment, ArcGIS® applications such as ArcIMS® (Internet Map Server) and ArcSDE® (Spatial Data Engine) will be freely available and will work as an interface of access to the database. Additional applications have already been and are currently being developed using high-level development tools, enhancing the visualization, interpretation and analysis of specific aspects of the data.

At the present time the system has already provided the EMEPC workgroup with advanced GIS-based visualization tools for Oceanographic and Hydrographic data, as well as interpretation and analysis tools for Seismic data and Geodetic information. It is expected that, in the near future, some of these tools will be available online, in the InforM@r portal.

From its inception, InforM@r was developed as a dynamic and adaptable geographic information system to be able to hold as much thematic data and metadata as possible. Several initiatives are under way in order to receive and incorporate data from other disciplines such as Marine Biology and Biodiversity Conservation, allowing the Portuguese government to conform to European directives in this area.

It is envisaged that the system will later become a virtual data centre, containing data and metadata, according to the ISO 19100 specifications and abiding to the Inspire initiative, of other organizations working on earth and marine sciences in Portugal, such as public institutes, laboratories and universities.

Abstract 31

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Web-services for codes of marine environment and marine-related activities

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At present in the area of marine environment and marine-related activities there are many different codes (platform codes, organization codes, instrument codes, country codes etc.). There is a data base where all code standards are collected (http://data.oceaninfo.ru/meta/codes/index.jsp). This data base is frequently used at different levels of ESIMO (Unified System of Information on the State of the World Ocean). Normally most of developers copy the necessary codes from the data base in advance to use them in their applications. But the centralized code reception means that code record copies expire quite quickly in all system levels. Codes copying increases the use of network and access time to code lists greatly. This may cause various problems such as:

- Codes cannot be identified at the receiving side;
- Codes with unknown value cannot be presented;
- Values with different codes cannot be compared.

The most effective decision of these problems is the use of web-services as an add-in to the data base. In totality they will form a unified catalogue of codes and code standards.

Web-service is a program system whose public interfaces and bindings are defined and described with the Extensible Markup Language (XML). Description of this program system can be found by other program systems which can interact with it incompliance with this description using messages based on XML and transmitted with the help of Internet protocols. Web-services link data with programs, objects, data bases or with complex operations. A Web-service and application exchange XML-based documents presented as messages. Web-service standards (SOAP, UDDI, WSDL) define message formats, interface to which message is transmitted, rules that define binding of message content to an application that implements the service. Web-service standards also define web-service searching and publishing mechanisms. Any web-service user (application or individual user) can get an access to all code standards or a particular code standard.

In this process information about codes will always be up-to-date. Only codes which are necessary to the application are requested.

A Web-service implements the following functions:

- Code standard list extraction
- Code list extraction for a specified code standard
- Extraction of specified code list values for all code standards
- Extraction of specified code list values for specified code standards
- Extraction of a specified code value for a specified code standard
- Conversion of a specified code from one code standard to a specified code of another code standard

At present some web-services working with codes and metadata have been created (http://data.oceaninfo.ru/wscat/). These web-services provide complete information about sea area codes, geographical area codes, country codes, marine organization and expert codes and complete information about codes that are used in the ESIMO integration technology.

Future prospects consist in classification of tasks used in different technologies and identification of the most effective directions to be implemented on the basis of web-services.

Abstract 32

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

DAMAR: a marine data and metadata management system

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INTRODUCTION

Due to the large and diverse marine data information obtained from different sources, during SEADATANET project, a new marine data and metadata management system is being developed at the IEO. A mixed system has been design, in which some of the information is structured in a relational database, DAMAR, and some information is stored in ASCII files. DAMAR is designed to store and manage CSR and EDIOS inventories, as well as all kind of marine metadata. In this database some tables have been also design for vertical profiles and time series and underway data.

Nevertheless, in order to optimize the system, and considering storage capability and speed response, and given the ever-increasing size of the inventory files, the system is prepared to work with data stored in ASCII files (MEDATLAS) as well as data stored within the relational database. Normally, data type with a wide range of parameters but not too much data, as contaminant measurements, species, etc. will be stored within the relational database. On the other hand, data type with few parameters but a huge data volume will be stored only in binary (NetCDF) or ASCII files (MEDATLAS).

The DAMAR architecture is consistent with ISO19115 standard for easy storage, retrieval and updating.

Open Source software (MySQL, PHP) has been used where possible.

DESIGN

The database design, in its first version, was initially adapted to the nature of oceanographic data stored in Medatlas format, which is able to store metadata (ship name, cruise name, cast date, location, measured parameters, instrument, responsible institutes etc.) as well as physical and chemical parameters of seawater. The data may be originated either from water bottle series or from oceanographic profilers and underway instruments. This format is also able to store quality control flags for appropriate information, defined by an external procedure. For SeadataNet purposes, the new database has been adapted to store also information from Cruise Summary Reports (CSR) and observing systems (EDIOS), as well as common vocabularies used for all these inventories and metadata. More ahead the database will also be adapted to store information from research projects (EDMERP) and marine environmental datasets (EDMED).

The structure of the database is large and complex because of the wide variety of data types and formats that are collected and processed. All the attributes that could be accounted for or anticipated has been included. DAMAR is organized in some groups of tables related among them, which are:

- Inventary tables: includes all the tables necessaries to store data from inventories (CSR, EDIOS,...).
- Vocabulary tables: these tables store common vocabularies used in metadata to facilitate data sharing and analytical tool development.
- Metadata tables: this group includes the tables that store information pertaining to location, measured parameters, data format, cruise, profiles and time series header, files, and the physical location of the data (ASCII files or database).
- Data tables: tables containing measured data.
- MEDATLAS files (ASCII format): files containing measured data not stored within the database.

SYSTEM MANAGEMENT

The load of inventories (CSR/EDIOS) is still pending of developing because at the moment they are sent to the correspondence European databases manually.

To load data and metadata from the ASCII files in Medatlas format to the database, a PHP script has been performed, that generates the different records stored within the tables. In this process, these records also show if the data is stored only in the original files or the database, as well as the link to the original file.

The system allows making selective retrievals through a user interface developed in Visual Basic .NET. that search for the metadata records that meet the criteria introduced by the user, as geographical bounds, data responsible, cruise, platform, time periods, etc.

As the search result, the system produces a file containing the data that is stored in the database, in ODV format, and another configuration file with the information about the records that meet the criteria but that are located in their original files.

Automatically, a FORTRAN programme extracts the data from the files (profiles, time series, etc) with the information provided in the configuration file and exports them to another file in ODV format, making also a unit conversion.

With the appropriate tools, it is also possible to extract from the database the XMLs needed to integrate the system in the SeadataNet portal, i.e. Common Data Index.

A new method of Electronic At-Sea Data Collection: A Case Study from the Northeast Industry-Funded Scallop Program, New England, USA

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Introduction: Data quality and safety at sea are the two most important elements of the Northeast Fisheries Observer Program in New England, USA. While there has been increased attention and developments to improve observer and fisherman safety while at sea, there has been less attention and concentration on modernizing and enhancing data collection procedures aboard fishing vessels. We propose a simple yet under utilized system of data collection that eliminates paper logs, using specially designed software tailored for at-sea data collection conditions. We propose a pilot study for an exclusively electronic data collection and transmission environment using the Atlantic Sea Scallop (Placopecten magellanicus) Industry-Funded Observer Program.

Background: In an effort to collect more comprehensive and accurate at-sea data for the northeast scallop fishery, Amendment 13 to the Atlantic Sea Scallop Fishery Management Plan was developed by the New England Fishery Management Council, the management body for this species in New England, USA. The purpose of the Management Plan was to re-activate a past industry funded observer program through a scallop total allowable catch (TAC) and days-at-sea (DAS) set aside program. The program was designed to help fishing vessel owners defray the cost of carrying observers. Observer coverage in the scallop fishery is necessary in the region to monitor the bycatch (fish caught but not sold) of finfish, primarily yellowtail flounder (a small flatfish), skates, monkfish, cod, and other species. Monitoring of yellowtail flounder bycatch has occurred in otherwise "closed" fishing areas that are opened only to scallop vessels in the industry funded program. These closed areas are now called Scallop Access Areas to reflect the seasonal use by the scallop industry. Data collected on harvested yellowtail flounder is of particular concern because the scallop fishery is constrained by a fishery-specific total allowable catch of yellowtail flounder, a species that is considered overfished. Observer coverage is also critical in order to monitor interactions of the scallop fishery with endangered and threatened sea turtles. Data collection in this regard is of national significance as these species are listed under the Federal Endangered Species Act.

As one of two licensed Observer Service Providers for the industry-funded scallop program, East West Technical Services has placed Federal observers on over 1,100 fishing vessels over the last two years. In addition, EWTS officers have combined at sea experience of several decades, servicing vessels across the northeast and northwest USA. As data collected at sea is sent to, processed, and edited by the National Marine Fisheries Service (NMFS), there are strict collection procedures used and rigidly enforced in order for observers to maintain their certifications and for the data to be easily interpreted and integrated into fisheries science and management. However, while data quality and safety at sea rank highest in the NMFS priorities and goals, all data is surprisingly collected as it was decades ago on paper logs and hand scribed by the observer on the vessel. In an effort to help launch northeast fisheries to a new level of data quality, standardization, and efficiency, we have developed a software package and protocol that will allow electronic transcription of data at sea. The system will not only enhance data quality, but will be less logistically complex and will serve to ease the burden on data editors at the NMFS, allowing a speedy integration into the scientific process. We propose a pilot study on scallop vessels participating in the industry-funded observer program as there are features of this fishery which provide a simplified testing platform. In addition, removing reliance on paper logs and subjective transcriptions by observers and incorporating an electronic data collection process offers several advantages to all parties involved:

1. Electronic entry and transmission of data means speedier access to data editors at NMFS and thus quicker integration into fisheries science and policy.

2. Electronic data that is properly stored and backed up removes the risk of paper data packages being lost in the mail or slow delivery and pick-up times.

3. Paperless data collection is environmentally favorable, not only saving timber resources but saving government agencies money in printing and delivery costs.

4. Data quality enhancement – electronic interface removes any legibility issues, ensuring accurate transcription by NMFS.

5. Standardization – Electronic data entry will avoid any discrepancies or style issues between observers. Pre-programmed entry screens and selection options tailored to the fishery will eliminate confusion over how the data is recorded.

6. Customizing the software by enlisting advice and the expertise of observers and fishermen - The system offers a great opportunity to harness the ideas and the diverse array of experiences of fisheries participants to custom tailor the data entry interface so that it captures the goals of the NMFS and scallop observer program.

While there are many advantages to electronic data collection at sea, there are also potential problems that need to be addressed. For example, working conditions at sea are harsh and the corrosive affects of salt water on electronic equipment has been a long-standing impediment to using this method. Along this theme, maintenance time and costs for electronic devices can also be a draw-back and of concern to both observers and the Observer Providers who have purchased the equipment. Reliability of the equipment while at sea is also a concern, as observers may not have any back-up methods available to them on extended trips. This potential situation can be rectified by providing observers with paper logs to use as back-up to any electronic device failure. Given the compact nature of a portable data collection device, there may also be limited ability to include options for detailed comments and other unexpected situations that are best captured by written descriptions. While multiple choice and number selections are easily integrated into a portable device, more qualitative descriptions are difficult to summarize on electronic devices. Finally, there is often heavy resistance to change and towards any new system of doing business and the training and time costs of observers may not be trivial. There may also be skepticism and reluctance from not only the observers, but from the end users at the NMFS who must adjust data entry techniques and software to accommodate the new electronic data.

While there are certain advantages and also potential problems with electronic data collection at sea, we propose a trial experiment with specially-tailored software for the industry-funded scallop program in the Northeast, USA. Focusing only on a specific fishery and a small set of vessels and observers, we can conduct a pilot experiment to understand how best to further specialize the software for future applications. We hope that through presentation of this abstract and attendance to the IMDIS Conference, we can gather expert opinions, advice, and feedback to structure and begin the pilot project in the Northeast.

Abstract 34

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Implementation system for data management in croatian operative oceanography

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Implementation of information system is very important for successful work of any monitoring system. This fact was taken in account in the framework of the first Croatian national oceanographic monitoring program (NOP) adopted in 1998. In the framework of NOP Marine observation system (CROMOS) has been developed, which performed monitoring different types of oceanographic parameters in the Adriatic Sea. This automated system was constructed to collected data from coastal stations, buoys, vessels (scientific and voluntary) and as real or near real time data send to control centre located in the Institute of oceanography and fisheries, Split.

One of the most important task in the framework of the NOP was development and implementation system of operative oceanography with objective to perform "on-line" measurements of different oceanographic parameters by more oceanographic stations distributed in wide area of CRoatiaan part of the Adriatic Sea, data transmission to control center in real-time and their management, which includes data receiving, validation, archiving and their dissemination as row data and in graphic form to users via web service.

To achieve these needs an integrated oceanographic system has been under developing, which includes three main elements:

- Marine observation system (CROMOS) with network of automatic measuring stations and control center in IOF,
- Oceanographic information system (CROIS), which includes communication systems (GSM, GPRS, Wi-Fi and VHF), and Marine environmental database of the Adriatic Sea (MEDAS) for data management of "on-line" receiving data, and
- Numerical hydrodynamic models for reconstruction and forecast field of standard physical parameters.

Croatian marine observational system (CROMOS)

In the framework of CROMOS various oceanographic research activities have been performed by vessels and automatic-measuring systems (buoys and coastal stations).

More stations for measurement of various oceanographic parameters (physical, chemical and biological parameters) were distributed in coastal region of the Croatian part of the Adriatic Sea as a part of sea level tide gauge stations network, and network of oceanographic buoys and meteo-ocean coastal stations.

Observation system consists of more oceanographic stations and buoys, which measure standard meteo-oceanographic parameters (wind speed, gust and direction, air temperature, pressure and gust, precipitations and net radiation, directional waves, temperature, salinity, oxygen, chlorophyll and turbidity at the se surface, and currents profile in water column). For the present time there are three coastal stations and five oceanographic buoys positioned in coastal waters of the Croatian part of the Adriatic Sea. Measured data have been sent in regular time intervals to the receiving centre (from 10 minutes up to one hour depending of station). In addition, data from seven tide level station and two coastal HF radars have been transmitted "on-line" to control centre.

The most hardware and software components of the oceanographic measuring systems (including buoys, coastal stations, processing units and corresponded programs, except measuring instruments) have been developed and built in Croatia. This solution simplifies maintenance and improvement of the whole system, which has been continuously done.

Croatian oceanographic information system (CROIS)

CROIS consists more elements including Information center located at the Institute of oceanography and fisheries in Split with corresponding computers, information and communication hardware and software (MEDAS, GIS, "on-ine", web and firewall servers) and servers in other research institutes. It serves for management of oceanographic data collected in the framework of various research activities in the Institute and in Croatia generally, and to exchange data on the international level. One of the important roles of CROIS is standardization of data formats and units, collection, validation, archiving, exchange and presentation the data and aggregated information through the web of Internet.

Originally, MEDAS database was developed for management and archiving of a large volume of diverse oceanographic data measured during more than a century by research and the other ships.

To achieve requirements for management of "on-line" data in the framework of the CROMOS measurement system, MEDAS database was reconstructed and extended with new modules, which allows secure management of real-time data received from oceanographic buoys and coastal stations.

Retrieving of "on-line" data from MEDAS is similar as classical oceanographic data, and includes two steps:

- Referral information about measuring stations and parameters (what, where, when, who, etc.) can be obtained by searching the database
- Through a connection to the thematic databases to get selected data through various menus as raw and graphic version of data. Depending on permissions, the user can access, validate and update records.

As database has been developed as a fully web oriented database and all data can be reached through web interface including forms for data validation and a java applet as mapping tool. The advantage of a web-oriented database interface is that is platform-independent, and only requires a browser and access to the Internet. This capability of MEDAS database is very important because all Croatian marine institutions and various users have been involved in data submission and retrieval.

The system contains procedures for automatic checks of the first level of data validation and semi-automatic check of the second level of data validation through web server, as well as retrieve of data with detailed information about time, station position, measured parameters, responsible persons, projects, institution and "on-line" stations details. Selected number of data and information are preceded to web server for wide users, and all measured data are available through password for participants in NOP program (http://www.izor.hr/eng/online/).

Inplementation of numerical model for oceanographic simulations

The real-time part of MEDAS includes programmes for automatic upload of data from real-time meteo-ocean stations, and an automatic visualization and Internet publication. On a daily basis, numerical model results are automatically calculated and published on the Internet. Real-time data from measuring stations are used as input for circulation models. The model is initiated with hydrostatic conditions; after that, the results from any day serve as initial conditions for the following day. Visualization of model results is generated by a C++ application. The first application generates a dynamic Matlab script, which is run, to dynamically create the html pages.

Hydrodynamic numerical models with Sigma coordinate (Princeton oceanographic model - POM) were adopted for the Adriatic Sea in the Institute of oceanography and fisheries. The POM model forced with surface momentum, heat and water fluxes and discharges from local rivers. In addition, procedure for data assimilation has been under development. Model was successfully tested and fully implemented in the some coastal regions, and it is under development for application into the whole Adriatic Sea.

Spatially, there are under testing three levels of numerical model. Coastal 300 m horizontal grid model for small regions in coastal regions is nested in 1km resolution shelf model into wide area of middle part of the Adriatic, and it is nested into the whole-Adriatic model having a 5 km resolution, using a simple one-way nesting technique.

Presentation spatial fields of various oceanographic parameters (wind stress, currents, temperature and salinity) obtained by numerical model by GIS tools and their verification by measuring data makes analysis and interpretation of corresponding oceanographic parameters much easier.

Design, implementation and harmonisation of CROIS system for management of "on-line" data have been development through recent several years. For the present time the most part of information system are fully implemented for management of data collected in Croatiaan operative oceanography. As CROIS is complex system its additional development and fine-tuning needs to be continuously done in future.

Abstract 35

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

JCADM, new Directions in Antarctic & Southern Ocean Data Management

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The Joint Committee on Antarctic Data Management (JCADM) was established by the Scientific Committee on Antarctic Research (SCAR) and the Council of Managers of National Antarctic Programs (COMNAP), to assist in the fulfilment of the data management obligations imposed by the Antarctic Treaty (section III.1.c): "Scientific observations and results from Antarctica shall be exchanged and made freely available."

Antarctica includes the entire Southern Ocean South of 60 - 73 degrees S.

JCADM comprises representatives of the National Antarctic Data Centres or ..ational points of contact. Currently 31 nations around the world are represented in JCADM.

So far, JCADM has been focussing on the coordination of the Antarctic Master Directory (AMD), the internationally accessible, web-based, searchable record of Antarctic and Southern Ocean data set descriptions. The AMD is directly integrated into the international Global Change Master Directory (GCMD) to help further merge Antarctic science into global science. The AMD is a resource for scientists to advertise the data they have collected and to search for data they may need.

Currently, JCADM is in a transition phase, moving forward to provide data access.

One example is the development of a Southern Ocean Observing System Virtual Observatory. (SOOS-VO).

Existing systems and web services technology will be used as much as possible, to increase efficiency and prevent 're-inventing the wheel'.

This presentation will give an overview of this process, the current status and the expected results.

Setting up a general data collection system integrating different types of oceanographic survey data

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Oceanographic data centers are confronted with a broad diversity of datasets, going from physical and bio-chemical to biological data. There are different ways of dealing with this variety of data. One could set up a series of very specific databases, each storing data in its own particular way. One could also set up a data collection system that is sufficiently generic to integrate different data types. The IMERS data system (Integrated Marine Environmental Readings and Samples), developed at the Flanders Marine, is an example of the latter approach.

This presentation deals with the how's and why's of data integration and with the advantages and drawbacks of the development of a multidisciplinary data collection system. An important part of the IMERS data system is dedicated to data administration and meta-data administration. This makes IMERS suitable for data management of the sometimes very diverse and complex project related data. Resulting benefits of this extensive administration are easy data retrieval and identification of lacking data and prevention of duplicate data entry. On the other hand, this administration makes data entry very labor intensive, which makes fast progress hard.

Furthermore this case study shows how a growing amount of data is made accessible online and how international vocabularies are used to enhance the exchange with international data compilations (Seadatanet-CDI, Eurobis, ...).

<u>User perspective:</u>

The user that is interested in access and use of the data is presented with a web interface that allows querying the database based on certain search criteria. Search criteria that can be included are based on parameters measured and taxonomic, spatial and temporal scope. The user can visualize the resulting data in tables and can export the data to different output formats.

The standard user can only access the public part of the data. Accessing non-public data through the web interface requires an account, usually distributed only for accessing data in the framework of joint projects.

Technical details:

IMERS is an MS SQL SERVER database. However, it is most commonly accessed through a Microsoft Access front end for management purposes. For manual data input from original paper data sheets, an input application has been set up in VB.net.

For online user access to data, a web interface has been set up using PHP (Hypertext Preprocessor) and css.

Geographical querying is facilitated using MapServer that renders spatial data to the web and allows querying that spatial data. Analysis tools and geographic querying have not been the main focus of the system up to now and functionalities are as a consequence rather poor. A more advanced interface is under development.

European Alien Species Database: an overview

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Biological invasions of alien (non-native) species are among the global threats to the ecological and economic sustainability of marine, fresh water inland and terrestrial ecosystems. Global climate change also alters habitats and environmental conditions making them more vulnerable and prone to unintentional introductions. Some alien species are noxious, act as parasites or vectors for new diseases, alter ecosystem processes, change biodiversity, disrupt cultural landscapes, reduce the value of land and water for human activities and may cause other damages for man and environment. The European Alien Species Database (EAS database), the web-portal (http://www.europe-aliens.org) and exploration tools were developed as part of the Delivering Alien Invasive Species In Europe (DAISIE) project funded by the sixth framework programme of the European Commission. Over 250 datasets covering 71 terrestrial and 5 marine regions have been assembled by more than 300 experts. The EAS database contains more than 45 000 documented introduction records on 10 600 species 10% of which are marine aquatic invaders. Exploration tools enable data extraction, visualization and mapping with possibility to observe invasions dynamics over time in animated sequences of maps. Here we present details on stored information, semantic and relational model of biological invasions as well as EAS Database exploration tools programmed to work on all major computing platforms - MacOSX, MS Windows and Linux.

Abstract 38

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Biological Invasions' Early Warning System integrated with the European Alien Species Database

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An early warning system is any system of biological or technical nature deployed by an individual or group to inform of a future danger. Its purpose is to enable the deployer of the warning system to prepare for the danger and act accordingly to mitigate against or avoid it. Biological invasions of alien (non-native) species are among the global threats to the ecological and economic sustainability of marine, fresh water inland and terrestrial ecosystems. Global climate change also alters habitats and environmental conditions making them more vulnerable and prone to unintentional introductions. Some alien species are noxious, act as parasites or vectors for new diseases, alter ecosystem processes, change biodiversity, disrupt cultural landscapes, reduce the value of land and water for human activities and may cause other damages for man and environment. Therefore creation of an early warning [decision support] system capable to handle incoming reports on biological invasions from all European regions is an important step towards more efficient environmental management in Europe. Here we present an architecture and details of such a system integrated with the European Alien Species Database enabling it to analyze data patterns and efficiently present both incoming hazards and dangerous trends in European marine, inland aquatic and terrestrial environments.

PANGAEA ® - an ICSU World Data Center as a Networked Publication and Library System for Geoscientific Data

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Since 1992 PANGAEA ® serves as an archive for all types of geoscientific and environmental data. From the beginning the PANGAEA ® group started initiatives and aimed at an organisation structure, which - beyond the technical structure and operation of the system - would help to improve the quality and general availability of scientific data. Project data management is done since 1996. 2001 the ICSU World Data Center for Marine Environmental Sciences (WDC-MARE) was founded and since 2003 - together with other German WDCs - the group is working on the development of data publications as a new publication type. To achieve interoperability with other data centers and portals the system was adapted to global information standards. PANGAEA ® has implemented a number of community specific data portals. 2007 - under the coordination of the PANGAEA ® group - an initiative for networking all WDC was started. On the long range ISCU supports plans to develop the WDC system into a global network of publishers and open access libraries for scientific data.

With its long-term and secured archiving structure, the highly efficient editorial system, and the extensive interoperability with other data centres and portals, PANGAEA ® has developed into an exemplary publication and library system for scientific data. The approach for publication of scientific data developed within the German WDC consortium and realized within PANGAEA ®, is way beyond the usual interlinking of scientific publications with related data as e.g. practiced within the Human Genome Community. It allows for self-contained data publications. Each data publication is provided with a meaningful citation and a persistent identifier (DOI) und thus enables reliable references. The technique of data citation gives a strong motivation for scientists to publish their data. It is a bottom-up approach, which on the long range will improve data quality and availability.

The concept met with wide response from data producers. Nevertheless, it might take years for this new publication type to be generally accepted. First talks with ISI Thompson have indicated that data publications might be recognized for the citation index. The reference systems, developed within the German WDC, need to be extrapolated. With the networking initiative of ICSU WDC a first step is done in the direction of a global library consortium for scientific data. Such a network would be trans-disciplinary and has the advantage that all data are available without any restriction according to the open access rules. However, a sustainable framework is needed on the one hand to guarantee long-term availability of scientific data and on the other hand to foster the work in the data centres in the direction of standards for processing, archiving, and publication of data as well as interoperability of data centres. The revision of ICSU WDC will support such a framework. Nevertheless, long-term operation requires further safeguarding through national or international contracts. A memorandum of understanding could be a good starting point.

Data base of the drifter buoys for the Black Sea

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Drifting buoy experiments are carried out in the Black Sea since 1999 by:

Marine Hydrophysical Institute, Ukraine; P. P. Shirshov Institute of Oceanology, Russia; Department of Oceanography, Naval Postgraduate School; Naval Oceanographic Office; Stennis Space Center, USA.

Groups of drifters are deployed usually in the eastern or central part of the Black Sea in order to study large scale and mesoscale features of basin dynamics and circulation.

In October 2001 the pilot drifter experiment "Black Sea-2001/2003" was begun in the Black Sea. The goal of experiment was to investigate the problems for creation of a long-live drifter network in the Black Sea for the reasons of operational oceanography and hydrometeorology. The total quantity of 35 Lagrangian meteorological drifters was deployed from October 2001 to October 2002.

Four SVP-BTC60 drifters were successfully deployed in the Black Sea in late August 2004.

Modified SVP-BTC60 drifters were successfully tested in-situ near the Sevastopol bay in April 2005. The SVP-BTC60 drifter is a new project based on standard SVP-B barometer drifter. It is equipped with a digital thermoprofiling chain (nominal depth is 60m), which has 10 temperature sensors and a depth sensor at the chains bottom. Data from the depth sensor are used to determine temperature sensors locations when the chain has deflection from vertical orientation. After this testing, two buoys were deployed in the Black Sea. The buoys had a system of temperature chain packaging, updated to have the drifters automatically deployed after drop to water. According to this goal, the buoys were equipped with holders to fix the chain during transportation and avoid getting the chain entangled during self-deployment.

This deployment was the next phase to investigate spring season variability of subsurface temperature in the west part of the sea. New unique information was

obtained that, being combined with the last year data, allows to restore the dynamics of thermocline evolution during autumn 2004 and spring 2005.

Two SVP-BTC80 drifters were successfully deployed in the west part of the Black Sea in early July 2006. This is a new generation of drifters allowing to investigate heat processes within the active ocean layer.

SVP-BTC80 drifter in contrast with SVP-BTC60 drifter has the following features:

- nominal depth of profiling is 80 m;
- 16 digital temperature sensors;
- 4 depths sensors at 15, 35, 60 and 80 m;
- drogue center at 12.5 m.

Temperature measurements using SVP-BTC80 thermoprofiling drifting buoy allow to watch carefully the dynamics of the active layer thermal structure from the surface to the maximum depth of a chain with high time resolution (one hour). For example, this feature provided unique information about the cold intermediate layer variability as well as lower border of the mixed layer in the Black Sea during summer-autumn period.

Two SVP-BT-GPS drifters equipped with GPS receivers were first deployed in the Black Sea in July 2006. Three SVP-BT barometric drifters were deployed in October in the Caspian Sea. In addition to sea surface temperature sensors, all the drifters have subsurface temperature sensors at the 12m depth. These deployments resulted from international collaboration (Azerbaijan, Russia, Turkey, Ukraine, and U.S.A.) under the NATO Science for Peace Project. According to the goals of Iridium Pilot Project an experimental cluster of SVP-B and SVP-B mini drifters with Iridium data link were developed and built. All the buoys have GPS receivers which allow essential increasing of space-time resolution while study of surface and subsurface currents. Two buoys were successfully deployed in September 2007 in the Black Sea. Two other buoys have to be deployed in the North and South Atlantics in the nearest time.

The drifter's data are hold in the MHI Data bank.

The Oceanographic data bank of the Marine Hydrophysical Institute

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The Oceanographic data bank of the Maine Hydrophysical Institute contains temperature and salinity data, hydrochemical data, meteorological data, currents data, optical data and climate information. It covers the Black Sea, the Mediterranean Sea, the Azov Sea, the Atlantic Ocean, the Indian Ocean and the the Pacific Ocean.

The MHI Oceanographic Data Base includes more than 170 thousand hydrological and more than 37 thousand hydrochemical stations which were obtained in 1890-2007. In the Black Sea more than 157 thousand hydrological stations (about 4 464 thousand levels) and about 30 thousand hydrochemical stations (more than 227 thousand levels) were obtained. In the Atlantic Ocean more than 18 thousand hydrological stations (about 1 850 thousand levels) and about 2 thousand hydrochemical stations (more than 120 thousand levels) were obtained. In the Mediterranean Sea more than 12 thousand hydrological stations (about 500 thousand levels) and more than 4 thousand hydrochemical stations (about 67 levels) were obtained. In the Indian Ocean more than 2.6 thousand hydrological stations (about 385 thousand levels) and about 670 hydrochemical stations (about 9 thousand levels) were obtained. In the Azov Sea more than 430 hydrological stations (more than 1.5 thousand levels) and about 40 hydrochemical stations (more than 1 hundred levels) were obtained. In the Pacific Ocean more than 200 hydrological stations (more than 1.2 thousand levels) and about 30 hydrochemical stations (more than 6 hundred levels) were obtained.

The database of currents contains data got in cruises of "Mikhail Lomonosov" (600 buoy stations, 4357 levels) and "Akademik Vernadskyi" (418 buoy stations, 3524 levels), other research vessels of MHI and the data from the oceanographic platform in Katsiveli (about 37 thousand records). The database of drifters includes more than 13 thousand profiles of temperature (about 167 thousand levels) obtained in 2004-2007 and about 111 thousand measurements of surface temperature made in 2001-2007. The meteorological database includes more than 26 thousand stations made by the MHI's ships and the hydrometeorological service of the Black Sea Navy. The optical database includes more than 4 thousand measurements of transparency and more than 2 thousand measurements of Forel-Ule color. Climate information is represented as a climatic atlas of the Black Sea. It consists of 5 sections (temperature, salinity, density, heat storage and dynamic height) and includes 444 climatic maps.

For user convenience the database data management software was developed. It allows to import, quality check, select, visualize and export data, to support standard statistical data processing and calculation of various marine environment parameters.

The database management system provides data import and export, supporting several wide-used data formats such as ODV, CRUISE and MEDAR/MEDATLAS II. This software also includes a quality check module. It provides METADATA CONTROL and DATA CONTROL.

Data and stations selection can be accomplished directly from the map. The most common parameters of selection for all kinds of observations are:

- spatial parameters,
- organization and cruise,
- temporal parameters,
- data source description (data owner, research vessel, cruise, station, platform etc.).

Biocean :
Taxon-based System for deep-sea benthic ecological studies

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The deep-sea covers 65% of the Earth's surface and remains, for the major part, unexplored. It is characterized by a near-freezing temperature, extraordinarily high pressure and low food availability. Despite such harsh environmental conditions, the deep sea harbours very high levels of biodiversity. The Biocean database was designed to gather the extremely large volume of data collected from different deep-sea ecosystem studies conduced by Ifremer's department "Environment Profond".

Ecological studies are focused on the structure of benthic communities and their spatial and temporal variations. Our group deals with four types of ecosystems : (1) Benthic sedimentary ecosystems which depend on energetic contribution from photosynthetic production in euphotic layers. (2) Deep-sea hydrothermal ecosystems on oceanic ridges which are based on chemosynthetic bacterial production. Life in this habitat is very original, luxuriant and adapted to a toxic and unstable environment. (3) Ecosystems associated to cold seeps on continental margins which are based on chemosynthetic production around methane-rich fluids. Those ecosystems are characterized by a high biomass. (4) Deep coral reefs have been discovered on carbonate mounds on the Irish continental margin. Active mound genesis is due to intense coral growth.

Biocean was first of all a system designed for the management of successive identifications of our faunal samples collated during deep-sea cruises. As requested by the scientists, the original biological database has been extended to include associated deep-sea environmental variables in a standardized form.

The Biocean database contains data covering 30 years of French deep sea oceanographic research. Metadata for each cruise are available on the web site http://www.ifremer.fr/biocean/. They are displayed as cruise log and dive log. Biogeographic data are available through Ocean Biogeographic Information System portal (http://www.iobis.org), European Register of Marine Species portal (http://www.marbef.org/data/erms.php) ,and Global Biodiversity Information System (http://www.gbif.org/).

Abstract 43

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Data Centre for French Coastal Operational Oceanography

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This data center has been created in the frame of PREVIMER, the coastal operational system for the French marine environment.

The objectives of PREVIMER are to provide coastal observations and 48 hour forecast in the Channel, the Bay of Biscay and NW Mediterranean for the following parameters: direction and intensity of currents, temperature, salinity, sea level, waves (frequency, direction and height), concentration of particles or plankton, water quality.

PREVIMER addresses general public in recreational activities (surfing, swimming, diving, yachting...), professionals (shell farms, fisheries, maritime traffic, off-shore industry), local authorities managing the coastal environment, scientists (European and international cooperation), consultants (impact studies...).

Objectives of the Data Centre

The roles of the Coastal Oceanography Data Centre (CODC) are :

- To provide operational services to the actors and users of coastal operational oceanography who need information on currents, sea level anomaly forecasts, monitoring of sea water quality and urban contaminants discharge, or on phytoplankton blooms....
- To develop partnerships with the data producers and the data users
- To develop the operational services for data collection, quality checks, archiving and distribution.

Data collection

The data are received as much as possible in real time or near real time and the data centre deliver it to the modelling centre for several daily runs.

In order to feed the models, the data centre collects:

- *In situ* measurements,
- Meteorological data (wind, temperature, atmospheric pressure, rainfalls, radiation),
- Hydrology information (rivers outflows and nutrient fluxes),
- Limit conditions at open boundaries (Mercator, MFS, climatologies),
- Bathymetry and sea floor characteristics...

Satellites observations are also collected by the CERSAT data centre and do not come through the CODC.

Some data are available in real time, delivered by the partners (SHOM, METEO-FRANCE, DIREN, IUEM), other data come in delayed mode.

The data center automatically collects all these data that are received at different frequencies (from several times a day to once a week).

The data center also contributes to the compilation of data sets to produce climatologies or DTMs.

Data archiving

Both observed data collected for the models and model results (hindcast and nowcast analysis and forecast) are archived.

A specific server has been installed for archiving : is capacity is 18 To, each day the models produce 16 Go of data that need to be archived.

Data access

The CODC is in charge of the distribution of the data. It gives personalized access to data for partners and users.

For the actors of the PREVIMER operational system data are distributed daily, for the other users authorized access will be provided for downloading through Web interfaces.

The data are distributed under standardized specific formats : NetCDF for gridded data and ASCII for time series and in-situ data.

The results of the models are published on PREVIMER Web site (http:/www.previmer.org), where you can find information updated daily, trend maps, forecast bulletins, archive browser, commented events.

Oceanographic data and information input into recent coastal infrastructural development along the Lekki peninsular Lagos: a case study

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The Nigeria coastal and marine environment constitutes about 25 percent of the total area of Nigeria's estimated at 923,769 km2. Coastal development like petro-chemical industries, port handling facilities, road constructions and dredging especially along the newly established Lekki Peninsular Free Trade Zone in Lagos have drastically increased in the past few years. As required by the Nigerian environmental law, these infrastructures are to be subjected to Environmental impact assessment and risk analysis. The Nigerian National Oceanographic Data Center (NODC) whose human and infrastructure has been enhanced through the ODINAFRICA project has played major roles in the EIA and risk assessment of many of these new development by providing historical oceanographic and environmental data compiled by the NODC as well as advising government and developers on the results of the EIA and risk assessment. This case study presents the activities of the NODC in many of this coastal development as well as the formulation and implementation of Nigeria's plan of action for the sustainable management of the coastal zone.

Abstract 45

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Data management dedicated for assessing and modeling of the Mediterranean and Black seas ecosystem changes (SESAME integrated project)

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Information management is essential for achievement of all objectives of SESAME project (http://www.sesame-ip.eu). Assessment of changes in the Southern European Seas (SES) ecosystems over the last 50 year requires collecting relevant, historical, multidisciplinary observations and providing ready access to data in a timely manner for SESAME partners. Assessment of current status of the SES ecosystem requires the development of protocols and tools supporting fast data flow from data providers to researchers. Prediction of changes in the SES ecosystems requires the organizing and processing of huge amount of data which will be generated by mathematical models. Organization of the data management system within the first 1.5 years of the project appears to be crucial for assimilation of multidisciplinary data in order to extract essential processes and estimate significant changes in key parameters of ecosystems.

While giving the SESAME objectives first priority, data management has to satisfy existing international oceanographic standards in order to provide SESAME data to the wide scientific community.

The bulk of historical oceanographic observations in the SES has already been accumulated as a result of international efforts in oceanographic data management during the last twenty years. Part of the data is available as published CD-ROMs:

- MEDAR-MEDATLASII: http://www.ifremer.fr/medar

- MATER: http://www.ifremer.fr/sismer/program/mater.

Other part can be downloaded from databases via on-line interfaces:

- WOD05: http://www.nodc.noaa.gov/cgi-bin/OC5/SELECT/builder.pl

- CORIOLIS: http://www.coriolis.eu.org/cdc/dataSelection/cdcDataSelections.asp

- ICES: http://www.ices.dk/ocean/dotnet/HydChem/HydChem.aspx

- WDC-MARE: http://www.wdc-mare.org/data

The organization of data in the sources listed above is generally oriented at long term archiving and free distribution of oceanographic data. Nevertheless a ready access to the data in a timely manner remains a considerable problem for users who do not take part in data management professionally. Data from different sources has different formats and quality assessment, therefore unification of relevant datasets appears to be complicated and time wasting.

To improve the data access for researchers, the following data management strategy is being implemented:

1. Scan public available data sources in order to accumulate all SESAME relevant data which were digitized and archived before SESAME.

2. Provide assistance and tools to SESAME partners in order to uniform the digitizing of historical, newly observed and model generated data sets during the SESAME project.

3. Merge all SESAME relevant datasets into mobile databases with oceanographic oriented user interface.

4. Provide on-line information interface to the SESAME databases.

Based on recommendations of SEDATANET project, two widely used formats were accepted for exchange of physical and chemical cast data: MEDATLAS and ODV. The EUR-OCEANS format was accepted as a generic format for biological cast data.

Due to different principles of data acquisition and analysis, all data will be organized into three different databases: (i) physical and chemical cruise data (episodic stations);

(ii) physical and chemical data from permanent stations (time-series) and (iii) biological cruise and permanent station data (episodic stations and time-series).

Datasets generated by mathematical models in full volume are stored by modelers. For dissemination via SESAME data portal, only time-series of major ecological parameters from representative regions will be selected and loaded into the permanent stations database.

As a basic database system, the MS ACCESS system was adopted for all mobile SESAME databases. Mobile databases will support parameter definition according to SEDATANET vocabularies. An oceanographic user interface will be integrated to the mobile database to allow data visualization and quality control. Additional option is to export data to ODV generic format and use it as user interface.

For the online interface, physical and chemical mobile databases will be converted to a MS SQL Server system. Biological data will be loaded separately to the WDC-MARE database.

Abstract 46

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Capacity Building in Ocean Data and Information Management and Networking in the Indian Ocean

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This paper presents the recent activities and developments to accelerate capacity building in marine data and information management and networking in the Indian Ocean region conducted by the Intergovernmental Oceanographic Commission, IOC through the project of "Ocean Data and Information Network for the Central Indian Ocean" (ODINCINDIO). The Indian Ocean and sustainable use of its living and non-living resources is of paramount importance for the life and economy of a large part of the human population in the world. Therefore, a well understanding and knowledge of Indian Ocean characteristics is on the top priority of the world scientific community. A well capacity in marine data and information management is a key element to the success of marine research studies, ocean monitoring and ocean related economic activities. The IOC is committed to increasing the capacity of its member states to access, understand, apply and exchange marine scientific data and information that is critical to sustainable use and development of their ocean and coastal areas. In this regard, ODINCINDIO was established in the 18th session of IODE in April 2005 and its accomplishments since then have been considerable. Activities of ODINCIDNIO, whether directly or indirectly were linked to the region's capacity building in terms of marine data and information management by providing training and education and assisting in the development, operation and strengthening of National Oceanographic Data (and Information) Centers and to establish their networking in the region. Experts and scientists from the Indian Ocean region participated in several ODINCINDIO training courses or workshops. Three of these courses were specifically designed for the ODINCINDIO project and the others were held by IODE or were joint activities of IODE, in collaboration with other organizations, and a group of nominees from ODINCINDIO Member States could participate in these courses/workshops. The valuable achievements of ODINCIDNIO during the first three years of its establishment and the strong support of the Indian Ocean Member States and regional organizations, and the current IOC policy in conduction of capacity building activities through the regional projects, all indicate the substantial role of ODINCINDIO in the future capacity building activities of IOC in the Indian Ocean region.

Abstract 47

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

A new national database for Swedish marine monitoring data

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Large amounts of marine monitoring data are continuously being collected around the world. Good management of these data is crucial for their usability to assess the environmental status of the sea. In Sweden, SMHI (Swedish Meteorological and Hydrological Institute) has long hosted national physical and chemical data. On initiative by the Swedish Environmental Protection Agency, SMHI is now national data host also for marine biological monitoring data. To fulfil this role, SMHI is presently constructing a database and working out the routines for marine biological data management. In a first phase the database is constructed to (1) import data delivered by other organizations; (2) store data; (3) disseminate stored data over internet; (4) export data in formats specified by ICES (International Council for the Exploration of the Sea). The data system is built around modules for import and export in order to easily adjust to new demands. A brief presentation of the data management scheme in the new data system is presented.

D4Science: E-Infrastructures for Fisheries Resources Management

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D4Science is a project funded by the European Commission in the area of developing electronic infrastructures, which take advantage of a distributed Grid to address computation needs, and integrate and/or interoperate distributed data repositories to address data needs. The main objective of the project is to support scientific workflows and scenarios arising in several scientific communities, including those operating in the area of Fisheries Resources Management. In particular, the project aims at providing such communities with facilities for creating Virtual Research Environments (VREs) based on shared computational, storage, data, and service resources. In these environments, scientists are able to organize, retrieve, access, and analyze heterogeneous and widely distributed information in order to generate new knowledge. The resulting e-infrastructure make available data and domain-specific services that are provided by large international organizations, such as the Food and Agriculture Organization of the United Nations (FAO) and the Consultative Group on International Agriculture Research (CGIAR). Availability of these resources is expected to reinforce the impact and relevance of Europe-wide and global e-infrastructures as unique instruments for supporting science.

The D4Science project focuses on supporting the construction of VREs serving, among others, two main scenarios on Fisheries Resources Management, led by the Fisheries department of FAO: (1) Implementation of a Fisheries Country Profiles Reporting System and (2) Aquatic Species Assessment. These are both crucial multidisciplinary activities that require accessing data and knowledge resources

of different types, such as databases, repositories of full text documents, images, maps, ontologies, and thesauri, as well as application and computational resources for performing complex, computationally-demanding activities, such as data analysis, simulation, and knowledge generation processes.

(1) The Fisheries Country Profiles provide focused global information on the state of fisheries in a country-specific format to enhance decision-making and promoting

advocacy in fisheries and, in particular, in the sustainable use and conservation of fish stocks. Although the current structure of the profiles and content is standardized, the compilation of reports by country is a cumbersome task requiring the manual gathering, large processing, aggregation and editing of continuously evolving data from various heterogeneous sources that range from statistical and geospatial databases to documents and maps repositories. The complexity and cost of this task implies that nowadays these important reports are not updated and published on the web for the research community as frequently as the community requires. The goal is to put into production a system that supports the generation of environmental reports with the possibility of periodically maintaining and publishing them (through ad-hoc on-demand processing). It is worth noting that, in the long run, an easy way of exploiting a powerful and reliable Grid infrastructure together with high-level data services will allow spreading and broadening the requirements that the Fisheries Resources Management communities might raise for new applications and data handling.

(2) The Aquatic Species Assessment is another important activity that is carried out by the FAO Fisheries department and the WorldFish Center of CGIAR in collaboration with many other international research groups. This activity is performed in agreement with the guidelines established by the Ecosystem Approach to Fishery management (EAF). This approach, which requires that the problem is analyzed from different complementary perspectives, involves researchers from many disciplines, including marine biologists, oceanographers, climatologists, geographic information systems experts, socio-economists, fisheries managers, etc., who must work together to tackle the various components of such an approach. The D4Science project intends to develop a framework where key capabilities are provided to fisheries' scientists for using the data sources, tools, and computational resources available in the e-infrastructure to produce their species assessments by processing their current statistical models, based primarily on catch and biologic data, and when available, effort data.

The D4Science project takes an existing test-bed e-infrastructure (developed by the DILIGENT project [www.diligentproject.org]) and brings it into production. Management of this e-infrastructure is designed so that it may be upgraded by periodically deploying more consolidated and extended releases of the gCube software system (developed to support computational, data, and service resources [www.gcube-system.org] based on the WSRF methodology) and new user-communities' specific resources. The latter are currently provided by the D4Science partners and later by other stakeholder organisations within the relevant communities. Eventually, the computational and storage resources will be made available to the EGEE Grid infrastructure layer [www.eu-egee.org], while the data and service resources will be registered directly as D4Science sites. The data resources expected to be shared through this e-infrastructure include information objects of a great variety of different types, volumes, and complexity with rich metadata, such as repositories of textual documents, statistics database, large geographic images collections, ontologies, taxonomies, and metadata specifications. Good examples of such data sources are the FIGIS system from FAO, the FishBase and ReefBase databases of the WorldFish Center (CGIAR), and the eoPortal of the European Space Agency (ESA). The services offered correspond to progressively improved releases of existing generic data retrieval, access, and management services, as well as application-specific services adapted and ported into the D4Science e-infrastructure in the course of the project. The deployed production e-infrastructure will also be open to other pilot communities that want to exploit it by using existing resources and/or creating their own Virtual Research Environments. (The project will also provide consulting and technological support to such communities for registering their resources and using the e-infrastructure functionality.)

In addition to gCube and other core system software, additional tools are being developed for the management of the overall e-infrastructure, such as administration and monitoring tools, which will increase sustainability of the e-infrastructure. Particular emphasis is also given on quality attributes such as stability, performance, and reliability. Heterogeneity of the content exploited requires the introduction of sophisticated mechanisms for implementing transparent access to the different data sources. Moreover, availability of various types of domain specific resources, such as ontologies, gazzeteers, and taxonomies, are being introduced into and empower the content-centric services, e.g., search, retrieval, access, and visualization. Finally, an effort is made to facilitate the process of developing applications that exploit all levels of the e-infrastructure in order to better serve the target scientific environment, which continuously demands adaptation and enhancement of existing applications as well as development of new ones.

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Managing oceanographic data collated from on-line Information Systems

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The most complete existing dataset that has been widely used for statistical analysis and studies of the decadal and the long-term variability of the Mediterranean and the Black Seas is the MEDAR/MEDATLAS II with temporal extension from the begging of the century until 2000. Since 2000, a large amount of additional historical and recent data from research projects and the operational oceanography have been made available at the Web Portals of various projects and Data Centres. In order to obtain a temporal updated dataset, vertical profiles of physical and bio-chemical station data were extracted from on-line Information Systems, checked for duplicates with the reference MEDAR/MEDATLAS II dataset, converted to common formats and merged to a unique dataset for further processing.

Three Information Systems were searched out for additional data in Mediterranean and Black Seas: a) The World Ocean Database 2005 (WOD05) at http://www.nodc.noaa.gov/cgi-bin/OC5/SELECT/builder.pl, b) the Coriolis Database of the French Operational Oceanography Data Centre at http://www.coriolis.eu.org/cdc/dataSelection/cdcDataSelections.asp and c) the ICES Oceanographic Database at http://www.ices.dk/ocean/dotnet/HydChem/HydChem.aspx. The choice of the spatial and temporal criteria for the detection of duplicates was based on the past experience of the MEDAR/MEDATLAS II Project. Duplicates checks were performed between same data types. In the ICES oceanographic database, there are Bottle data that are replicates of low resolution CTD. Thus, the ICES data types were checked with all the MEDAR/MEDATLAS II, WOD05 and Coriolis data types.

The resulted data were converted to the MEDATLAS or ODV ASCII formats according to the availability of the related metadata. The Coriolis data were extracted at MEDATLAS

format without any additional conversions. In absence of delayed mode data, real mode data extracted. The ICES oceanographic data were converted to the ODV format due to the lack of many descriptive information fields that are required in the MEDATLAS descriptive format. The WOD05 data were extracted at the native ASCII format and then converted to the MEDATLAS trying to retain as much as possible of the header structured information. The quality flags of the source data were translated to the MEDATLAS flag scale. Whenever absent (like WOD05 metadata quality control flags), were constructed in conformance with the MEDAR protocol.

The data were organized in files according to their data type. Totally, seven data types were processed: CTD, BOTTLE, Expendable Bathythermographs (XBT/XCTD), Mechanical Bathythermographs (MBT), Profiling Floats (PFL), Drifting Buoys (DRB) and Gliders data. More than 110000 additional vertical profiles of hydrological and bio-chemical stations from about 5600 cruises found for the time period 1864-2007. The majority of the WOD05 data are originated from released bathythermographs collected from the navies of various countries before 2000. The source of the Profiling Floats is the international ARGO Program and the source of the WOD05 Drifting Buoys is the Global Temperature-Salinity Profile Program (GTSPP). The gliders data are collected by autonomous drifting vehicles and coming from MERSEA and MFSTEP Projects. The XBT and XCTD Coriolis data are coming from research or commercial ships.

The above described dataset will be also used to the EU FP6-IP Project SESAME in the framework of the HCMR participation (as coordinator) in the Project.

Integrated web oriented data management on Institute of oceanography and fisheries, Split

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Introduction

Data management helps to increase value of information, to prevent data loss and improve data organization. Human, manual work is crucial for data collection and interpretation, especially in oceanography. Field work, inter institutional cooperation, and data sharing are common. This means that data management must be user friendly, with good visualization and multimedia tools, accessible from various different places. We try to solve some of this increasing demands using integrated web oriented data management. Why web oriented? Because today Internet is widely present in Institutes, homes, and also ships at the sea thanks to mobile data transfer protocols (GPRS, EDGE, UMTS, HSPDA).

Web browsers are some of most used applications and all users are familiar with their use. Another big advantage is that there is no need for any special client applications, installations or upgrading on client side. Web application is also platform and operating system independent.

Technology background

Technology background is Oracle 10g relational database, and Oracle application server. Web interfaces are developed using PL/SQL stored database procedures (mod PL/SQL). Web applications written in PL/SQL are typically sets of stored procedures that interact with Web browsers through the HTTP protocol. A set of interlinked dynamic HTML pages forms the user interface of a web application. When a Web browser user visits a Web page, follows a hypertext link, or presses a Submit button on an HTML form, a URL is sent to the Web (HTTP) server, which causes the database server to run a stored procedure. Information the user provides in an HTML form is encoded in the URL. The URL also encodes information to identify which procedure, in which database, to call. The Web server passes this information along to the database as a set of parameters for the stored procedure.

The stored procedure that is invoked from a URL calls subprograms from the PL/SQL Web Toolkit. Typically, some of these subprograms, such as Htp.Print, prepare an HTML page that is displayed in the Web browser as a response to the user. This process dynamically generates Web pages. Code running inside the database server produces HTML on the fly, so the generated Web page can vary depending on the database contents and the input parameters. Additional parts for data visualization include use of Java applets and JavaScript.

Design highlights

Our web oriented data management is based on:

- Cruise summary report based data input (solution of metadata problem).
- User friendly web forms with basic data validations checks and data export possibilities.
- Multimedia support (specially for biological data)
- Visualisation tools for easy manual validation and reviewing of data.
- Dynamic SQL approach – one tool - many parameters.

Cruise summary report based data input

All data inputs needs starting point. In our case, this is web based cruise summary report. After inserting all metadata (who, when, where and what), for each parameter is possible to insert measured data. Without cruise summary report it is not possible to insert any data. In this case there is no link enabling inserting data. In this type of data inserting organisation two big problems are solved: metadata problem and multiple inserts of metadata for each parameter.

Web forms

Forms for data inserts are dynamically build web pages for data inserting, data reviewing and data exporting. All inserts are possible using only numerical keypad. Exports to widely used formats (Excel, CSV and ODV) of inserted data are possible. Basic validation checks are automatically performed (climatologically boundaries of values). Basic visualisations of inserted values, for visual manual checks are also supported. In case of digital measuring instruments that produce files that contain measured data (CTD probes, current meters) we are developing parsing subroutine for each format. For inserting CTD profile from CNV data format procedure is: first uploading data file (link are associated with station and parameter from cruise summary report) and second, starting parsing subroutine. Parsing subroutine extracts data from file and inserts data into database table in relation with all needed metadata.

Multimedia support

Some parameters, especially biological parameters include pictures of some species, or some interesting phenomena. For that reason inserting of various files into database are enabled. Pictures are shown on web forms, and other formats can be viewed with special tools or downloaded locally to disc.

Visualisation tools

Two groups of visualisations are important for users. First is mapping tool for showing location on the map. Second are visualisations of inserted values. As mapping tool are used Java applet and JavaScript with Goole maps API. For data visualisation are used Java applet. It is important to enable visualisation of data from many stations on one graph (whole cruise). With this type of visualisation it is easy to spot spike values without reviewing all stations one by one.

Dynamic SQL

Dynamic SQL is an enhanced form of Structured Query Language (SQL) that, unlike standard (or static) SQL, facilitates the automatic generation and execution of program statements. This is helpful when it is necessary to write code that can adjust to varying parameters. Dynamic SQL statements are stored as strings of characters that are entered when the program runs. They are generated by the program itself, based on rules defined in tables for each parameter, but unlike static SQL statements, they are not embedded in the source program. Also in contrast to static SQL statements, dynamic SQL statements can change from one execution to the next. With this type of organisation, there is no need to program specially customised form for inserting each type of parameter. Instead of this, we just need to build database structure and insert validation rules, and forms for inserting parameters are ready for use.

Conclusion

Over the past decade or so, the web has been embraced by millions of peoples as an inexpensive way to communicate and exchange information. All this data must be captured, stored, processed and transmitted to be used immediately or later. Web applications, in the form of submit fields, enquiry and login forms and content are those website widgets that allow this to happen. Web applications are, therefore, computer programs allowing website visitors to submit and retrieve data to/from a database over the Internet using their preferred web browser. The data is then presented to the user within their browser as information is generated dynamically (in a specific format, e.g. in HTML using CSS) by the web application through a web server.

Dealing with environmental measurements in today's growing common sense of human impact to nature, goes with some responsibilities. That because is important that all inserts and changes into database are identified by username, server time, and unique IP address. All parameters need responsible person for inserting, validation and dealing with data. Sometimes we must clear to scientists that Internet is not place where everyone get everything and insert what ever they want. Database without data makes no sense, but unfiltered raw data makes no use either.

POSEIDON Data Management and Quality Control

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POSEIDON is a marine monitoring, forecasting and information system based on a network of buoys that collect meteorological and oceanographic physical and biochemical parameters in the Aegean and Ionian seas. A specialized center receives, processes and analyzes all the data on an operational basis. These data, which are archived and utilized for forecast and research purposes need management, which means efficient storage, cleaning (pre data mining process), and availability in-source for the production of forecasts and other scientific issues and outsource (other institutes, web generally). Apart of the environmental data, the buoy network collects a variety of metadata such as data units, longitude and latitude, as well as various technical characteristics of the instruments themselves.

The operational center receives the above data on a 3-hourly basis. They are stored in text files and then are transferred - through a Perl script - to a normalized mysql database. Its design supported our demand for quick search and reliable results on the parameter values and their metadata. The table, that contains the data information, associates them with their metadata and a flag, which shows if the parameter has passed through a quality control process and serves quality checking purposes.

This quality control process is an integral and important part of the operational process. Its significance derives from the fact that ocean data measurements are sparse and often present a variety of dubious and false values. Bio-fouling, sensor failures, anchoring and transmission problems are among the common causes of corrupted data. In terms of operational activities, this analysis must be held in real-time conditions and has to be as reliable as possible.

In the POSEIDON operational center the quality control is carried out in two phases: a) upon receipt of data every 3 hours a simple range check is performed before data are uploaded to the web site and distributed to operational users such as the meteorological service and b) on a daily basis a more complete analysis is performed before data are archived and released as standard quality controlled daily products. Once the data are decoded, a date/hour confirmation check is applied to ensure no corruption has

occurred. Then, several tests and specific flags are attributed to data which fail or pass these numerical checks. These tests are based on some pre-assigned principles. Firstly, values must vary between certain bounds which are determined by the instrument measure range and the regional climatology. Furthermore, values may vary with a maximum rate of change (within a specific timeframe) and that has to do mainly with the threshold it is applied upon each measured parameter. To check the correct functioning of sensors over time, data have to pass the stationarity test that shows whether values are stuck and recur in continuant measurements. It is obvious that, in order to apply the appropriate flags to each value, a combined knowledge is needed about the physical processes, technical details such as analog to digital conversions, transmission methods etc.

During the last few months an intense effort is made to optimize these checks based on the following approaches. First of all, more research is in progress in order to enhance our current insight associated with the ongoing physical mechanisms. This will help us to assign more appropriate thresholds and ranges for each measured parameter regarding the place and time the measurement took place. Secondly, a thorough understanding of the instruments function and the way the measurements are carried out (sensors, a2d converters, sensibility, transmission etc.) is required. All previous efforts combined with a standard frequent visual inspection of the data, will lead to better and more reliable results in the near future.

A web-GIS database for the Eastern Mediterranean, within the framework of the HERMES Project

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Under the framework of the EC project HERMES a regional database for the Eastern Mediterranean has be developed by HCMR implementing a user-friendly GIS environment, based on the ESRI ARCIMS 9.1 software package. This web based GIS application includes different information levels such as raw data, processed data and interpretations. The data compilation and integration involve marine geology, biology, oceanography, social-economical and background datasets and interpretations owned by the HERMES partners, available from other sources (data banks) and newly generated within the project.

The first task was the identification of the main layer structure and the collection of the available bathymetric, geological, biological, and oceanographic datasets for the area of Eastern Mediterranean. Thus the first step was to insert all the information (site location plus the relevant information) that is related with the data (seismic profiles, samples, physical oceanography stations) collected from the HERMES cruises accomplished in the area of Eastern Mediterranean. The data have been sub-grouped either as point layers (ensembles of stations), or as line layers (ship tracks, such as seismic tracklines). The specific sub-layers have been named with the cruise name/year/ station number or other identification. The information is 'built' on a pre-designed 'canvas', which visualizes multi-layered information such as background maps of regional topography or multibeam bathymetry, areas of surveys, ship tracks, sites of experiments or location of samples, hyperlinks (figures, diagrams) on selected sites, interpretations, and much more. The Table of Contents is subdivided into main thematic sections (Geology, Biology, Oceanography) each of them is in turn subdivided into subsections, leading to a thematic "tree-structure" that facilitates over-specified queries. 'Queries', 'links', 'map-tips', and data presentation in both Tabular (Tables) and visual (charts) are some of the offered possibilities.

The next task is to maintain the database as the information is gradually advancing as new HERMES data are acquired or processed data and results are made available from each participant/scientist. Thus the EASTMED regional GIS database will be updated and completed according to the datasets received by the partners and needs of the HERMES community, bearing in mind that this general data-model can be adjust by each partner to his personal needs. A very important aspect is to adjust the process of categorisation and adaptation of standards to data management in terms of mapping, visualisation, nomenclature, keyword indexes, annotations, and metadata description of GIS data to guarantee a dynamic and long-lasting service for HERMES and beyond. A special effort is also focused to develop novel geo-visualisation techniques in order to better highlight and understand the structures, patterns, phenomena and processes reflected in this complex dataset.

To this end, among the main aims of this endeavour is the simplification of the use of GIS, fine tuning of the exchange of products, and improving the use of GIS as a WWW and Internet service. What is envisaged is that by making the data more accessible to a larger community and facilitating the broader understanding of the studied areas, this web-based application could function as the gateway between scientific partners and society in general.

Interfaces of the observation networks monitoring subsystem

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At present a huge volume of oceanographic and hydrometeorological information has been accumulated. There are more than fifteen metadata objects to analyze this information (networks, observation platforms, devices, experts, regulatory, etc). They describe characteristics of media objects of information sources. At the same time there is no complete, hierarchically ordered, consistent information model of metadata which would allow researchers to objectively estimate the processes under study, effectively plan resources, take a decisions, perform monitoring of observation networks and adjust their operation when necessary.

An observation network is a set of interconnected platforms, devices and data transmission protocols for collection, storage and cataloguing of information in the field of marine-related activities.

With this in view there is a need to create an information management superstructure which would allow various categories of users to provide a quick access to information on observations in the marine environment, including that on methods, sources and means of data acquisition.

Development of the system to monitor observation networks is aimed at creating tools for efficient planning of data collection, distribution of resources and accumulation of statistical data on the basis of rapid reception of information on data maintenance, location, production, quality and other characteristics. The following main goals of implementing such system can be identified:

- Design of metadata construction architecture on the basis of relational and multidimensional approaches;
- Development of a metadata creation and use information model describing a process beginning from a sensor and finishing at a data centre;
- Development of remote metadata description and search tools;

- Development of information-analytical functions to analyze operation of observation networks in the Russian Federation.

The monitoring system has been created under the Oracle DBMS; and the centralized metadata collection has been chosen based on the use of a content control system. Services of information visualization in a graphic form have been implemented on the basis of the Google cartographical service, Google Maps API (GMAPI) functions and JFreeChart graphic libraries

The system of observation networks monitoring (http://data.oceaninfo.ru/observation/gms/mymap2.jsp) makes an ample use of both metadata developed specially for this subsystem, and metadata functioning in the Centralized Metadata Base of the Unified System of Information on the State of the World Ocean (ESIMO, http: //data.oceaninfo.ru/meta/). The list of metadata includes observation platforms (research vessels coastal stations, satellites, buoys, voluntary observing ships); instruments and methods of measurements; regulatory and guidance documents; the list of enterprises, research institutes, agencies and departments involved in the marine environment study.

The system of marine observation networks monitoring implements the following functions:

- Updating and editing of descriptions available in the metadata base, and representation of available information in a user convenient form;

- Search of information by various parameters (by organization, geographical area, current status of an object: operational/closed);

- Receiving of analytical materials (summary tables, diagrams) to make scientific conclusions and decisions, e.g. the diagram of distribution of hydrometeorological stations by seas or the diagram of distribution of research vessels by countries.

There are several levels of analysis in the system, each of which involves a more detailed description of the objects under study. Complex analysis of the network of hydrometeorological observations in the World Ocean by all types of platforms and by countries is performed. A number of platforms by types (hydrometeorological stations, research vessels, voluntary observing ships, buoys, satellites, space vehicles, pollution laboratories) is estimated. The analysis of specific platform types for the chosen country, agency (for the Russian Federation), organization or type of observations is carried out. A specific platform of the chosen type (vessel, station, buoy, etc.) is estimated by platform nameplate data, types and parameters of observations, its internal construction, observation times, etc.

Prospects of the system development consist in developing the rules to allow automatic generation of recommendations and making of conclusions on the basis of the complex analysis of a network; expanding the list of metadata object attributes to allow better opportunities for search and more simple interface to other information systems; optimization of observation network management.

Qualitative analysis of fisheries data: harmonization of logbook, observer report, landings, and VMS

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Contributing to European fisheries science, the CEDER project (Catch, Effort, and Discard Estimates in Real time) collected data from the Vessel Monitoring System (VMS), electronic logbooks, observer reports, and landings. CEDER attempts to unify this data from various data sources, in such a way as to allow transparent data access. The objective of this paper is to present the findings of the CEDER project on the fitness of the data received.

The fisheries of which data sets are analyzed in this paper are:

- Dutch and English flatfish (ISO species code SOL, PLE) in ICES areas IV and VII,
- Scottish Anglerfish (ISO species code ANF) spread out over several ICES areas (II, IV, Vb, VI, XII, XIV, VII),
- Scottish Pelagic fisheries (ISO species code NEP, MAC, HER), in ICES area VIa,
- English Roundfish (ISO species code COD, HAD, WHG), in ICES areas IV and VII
- French Tropical Tuna (ISO species code YFT, SKJ, BET), spread out over various FAO areas (34, 47, 51, 57).

For the above fisheries, and for each of VMS, Electronic Logbook, Observer reports, and Landings data, this paper will explore the data received. First, the data that was missing will be described, together with the reason of why this data could not be collected. Second, the format of the data will be explored. Third, the data itself will be analyzed according to fitness criteria, and obvious quality issues will be highlighted. Finally, we examine if and how the VMS, Electronic Logbook, Observer reports, and Landings fit together.

Our findings can be summarized as follows: First, when data could not be collected, it was mostly due to privacy concerns. Second, data formats differed between the fisheries involved, but this was not the major issue faced. Third, data collected differed from fishery to fishery in both quantity and quality. This included number of samples, missing values, and other quality criteria. Finally, some of the data collected was at different levels of aggregation for the same fishery.

We conclude that while some of the data collected has limited uses, the data was generally quite disparate in its levels of resolution. This means that it is quite laborious to assemble this data in a unified way.

Development of multidisciplinary database in the framework of relational data model

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Multidisciplinary database for marine and coastal meteorological, hydrophysical and chemical data has been developed under Oracle DBMS in Oceanographic Data Center in RIHMI-WDC to provide on-line user access to the data being collected from different sources in operational and delayed mode. Two principal requirements were taken into account for database design - the necessity to include theoretically unlimited set of parameters and to provide a quick response on the user query.

The data model of "fully normalized" structure proposed by British Oceanographic Data Center is appropriate to meet the first requirement. The basic feature of the model is that all parameters are stored in one column and parameter dictionary is incorporated. Unfortunately, to process user query with this data model takes longer time than with regular structure. At another hand a model with balanced denormalization of data provides more quick response on user query and is widely applied in the "data warehouses".

Several tests on estimation of the rates of data processing have been carried out with different data structures. They result in data model where both approaches are combined. The data are separated in several tables accordingly with their mandatory attributes (metadata) structure, particularly due to presence or absence of horizontal and vertical coordinates. That is why for example data collected from ships and coastal stations are stored in different tables, the same is done with single level (surface) and multi level data. The fully normalized model is applied to store parameters in each table.

The mandatory attributes and metadata frequently used to search data are stored in tables in regular manner. To save other additional metadata also the fully normalized model is applied that enables to reduce the number of necessary tables.

The unification of data units and metadata is carried out before data loading. These actions and known arrangements like creation of indexes and data partitioning enable to achieve the higher rate of data processing.

Abstract 56

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Multi-decadal Oceanographic Database in Lebanese Seawaters (Levantine Basin)

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The Lebanese Basin of the Eastern Mediterranean, including the Lebanese seawaters, are highly oligotrophic water body, the less fertile in world's oceans. Seawater temperature and salinity averages are the highest in the entire Mediterranean. The opening of Suez Canal in 1869, constitute a link and hydrological barrier between the Red Sea and the Mediterranean; it enhances migration of marine organisms northward. This continuous phenomenon has been increased after the construction of Aswan High Dam which regulates the flood of the Nile. Multi-decadal oceanographic cruises in coastal and neritic Lebanese seawaters during the last four decades (1965-2005) has produced physical and bio-chemical data exploited in fisheries, climate changes and oceanographic research.

Monthly and seasonally cruises were undertaken at 46 inshore and offshore stations along the Lebanese coast (33º 42'-34º 28' N and 35º 27'-35 º 31' E). Long-time series of hydrological and plankton data, including temperature, salinity, dissolved oxygen, PH, nitrate, phosphate, chlorophyll a and zooplankton were collected and stored in our databases information to be easily used and exploited . Different entries are possible to get information either by names, locality, date, number of profiles, etc.

During the last four decades we noticed increasing trend in surface seawater temperature (∆T~0.35ºC) and salinity (∆S~0.40 ‰), and slightly decrease in nutrient concentrations and in plankton production. These changes had an impact on the ecology of the Levantine Basin ecosystem and thus on the biodiversity of marine organisms and on fisheries. We estimate to date over 500 Indo-Pacific and Eritrean marine species from pelagic, benthic and nektonic systems were introduced into the Mediterranean ; many of them have establish permanent populations in our area. Out of 400 phytoplankton species recorded in Lebanese seawaters, more than 50 are introduced migrants. Phytoplankton standing crop was slightly, but regularly decreasing. Amongst thousands of species encountered in zooplankton community, more than 100 are migrants, whereas 56 introduced fish species of Indo-Pacific and Red Sea origin inhabit in the Levantine Basin. Most of the introduced species have established stable populations in our seawaters and many of them have overcome or even replaced local and native species.

These hydro-biological changes occurred in the Levantine Basin traduced certain "Tropicalization" of the area, since the hydrological conditions of the Red Sea and Levantine Basin became close to each other . This is due probably to climate change and the global warming affecting the seas and oceans. In addition to these factors, the man made changes and anthropic activity in opening the Suez Canal and the functioning of Aswan High Dam , have contributed greatly in the decreasing fertility of the sea and thus in the total fisheries in the Levantine Basin.

Abstract 57

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Edserplo - A fast integrated oceanographic visualisation tool

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The British Oceanographic Data Centre (BODC) has created an integrated visualisation tool to meets its needs in appraising the wide variety of series data given to it by organisations in the UK and beyond. Integrated within Edserplo is the full processing functionality required to quality-control and process data from the 45 gauges of the UK's National Tide Gauge Network. Written in Java it can be operated outside the confines of BODC on any popular platform.

http://www.bodc.ac.uk/about/information_technology/software_engineering/edserplo.html

Data types: Waves, Current Meter, ADCP, Thermistor Chain, Underway, CTD, XBT, Moored Instrument, HF Radar, Drifting Buoy, Argo, Tide Gauge, etc.

Display Types: 11 graphical, including 3 with maps, 4 non-graphical

Formats: Currently 13, 4 writable. Easy to add more as plug-ins

Tidal Analysis

Suitability analysis of wetlands for human activities using GIS techniques: Case study Lake Maryuit, Egypt

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Lake Maryuit is one of the Northern lakes in Egypt, located to the southwest of Alexandria city, and has been a source of fish in addition to other ecosystem services such as supporting wildlife habitat. However, the water quality in the lake has deteriorated considerably and thus the ecosystem functions of the lake, due to considerable quantities of sewage and industrial wastewater being dumped into it on daily basis. Additionally, the area of the lake is continuously shrinking, due to land filling activities, and consequently adversely affecting water circulation in the lake.

The objective of this paper is to assess the quality of water for human uses using suitability analysis through GIS techniques, which utilizes national as well as international water quality standards. The physical and biological data on various variables of water, vegetation cover and sediments in the lake were acquired through a field work conducted in March, 2007, as part of the WADI project sponsored by the EC. These variables included for example; pH, temperature, dissolved oxygen, organic matter as well as ammonium, and nitrates and some heavy metals. The acquired data were georeferenced, which meant that every sampling point had to be referenced to specific geographic location using GPS.

Thereafter, data were tabulated in an excel file with two fields for each sampling point representing the latitude and longitude of the point. Using ArcGIS Software, the tabulated data were used to generate a point layer based on X and Y columns. The produced point layers were then converted into a feature classes i.e. incorporated into the geodatabase.

The developed GIS was used in mapping various variables of the lake and conducting suitability analysis of various parts of the lake for different human activities.

The results of the suitability analysis, which covers three basins of the lake; namely Main Basin, Aquaculture Basin and Southwest Basin, showed that those parts of the three basins that are suitable for various uses. Generally speaking some parts of the lake were

within permissible levels for most uses. Meanwhile the most serious problem was found to be in the main basin where different sections were found to be totally out of the permissible levels for any uses. Other sections of the main basin were found to be suitable for some but not all uses. The main source of the problem was El Qalla Drain with more than 350,000 m3 of raw sewage are discharged into the lake on daily basis.

Regional Ocean Data Base of the South Eastern Pacific: applications on Climate Forecast and marine ecosystems management

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Since the implementation of the ERFEN program, an important new data source for oceanographic data was implemented. In addition to the oceanographic information that comes from the oceanographic cruises conducted by each country in the context of their own national research programs, in 1998, the Member Countries of CPPS decided to carry out Regional Joint Oceanographic Research in the South East Pacific as a tribute to the international year of the oceans. The cruise produced excellent results giving a complete regional vision of the oceanographic conditions of the South East Pacific. Because of its importance, the XIV Meeting of the Coordination Scientific Research Commission- COCIC of CPPS, recommended the institutionalization of the regional cruise to be conducted on an annual basis. Such recommendation was welcomed by the VI Meeting of Foreign Affairs Ministers of the Member Countries of CPPS, held in Chile, in August 2000.

The Protocol on the Regional Research Program on the "El Niño" Phenomenon in the South East Pacific, a binding mechanism that provides the legal framework to the ERFEN Program, establishes in its Article V, the execution of integrated surveillance activities through seasonal coordinated cruises, among others. It is also valuable to highlight what Article III of the Protocol establishes, by means of which the Contracting Parts obligate themselves, among others, to carry out the necessary efforts through their specialized institutions, providing to the ERFEN Program with scientific, technical and administrative personnel, research vessels, infrastructure for research and training, as well as support to the meetings of the ERFEN Program.

So far, ten successful regional cruises have been carried out, each executed in different circumstances: "El Niño" 1997-1998; "La Niña" 1999; relative normality 2001; signs of "El Niño" 2002 in the Western and Central Tropical Pacific; conditions of normality 2003; and positive anomalies of the sea surface temperature in the Western and Central Tropical Pacific in 2004, 2005 and ENSO 2006-2007, allowing a comparative analysis in the area comprised between 6.5° N off the tropical rain forest of the Choco in Colombia and 30° S off Coquimbo in Chile.

As result of this huge and valuable oceanographic effort, a data base was prepared compiling all existing information from an number of stations per cruise which is between 350-422 along the SE Pacific until 500 m depth. Some of the parameters which have been systematically obtained in each expedition includes sea surface and subsurface temperature to standard depths, salinity, dissolved oxygen and chlorophyll "A". Most of oceanographic data was observed through CTD model SB-19 and for other parameters samples with Niskin oceanographic bottles were performed.

After a coordination meeting between CPPS Members and IODE/ODINCARSA several discussions took place in order to contribute to make this preliminary data base operational, and foster its scientific application in terms of climate, ocean dynamics and marine ecosystems understanding along the South Eastern Pacific.

With the cooperation of IOC Project Office on IODE and VLIZ, a prototype is being built to work on this data base and generate graphic products and systematize all the available information. It contains data from a total of 1343 oceanographic stations in different locations through the time. A complete set of all CTDs profile was processed and the system allows to visualize profiles, make inter comparisons, allocate stations on an interactive map with several graphic tools and retrieve metadata and data. This system will be ready to be validated by CPPS on next March 2008, and make it available through the web. Some further steps include, addition of more fields, other data products, a high resolution climatology, a marine Atlas and the development of scientific applications that will contribute for a better understanding of physical processes in the SE Pacific such as, mixing, heat budget, surface circulation, the role of the ocean in the formation of cloudiness which is also a big issue for global Circulation models among others. Since the ecosystems point of view. compiled data will contribute for a better understanding of Humboldt Current ecosystems, the temporal and spatial behavior of water masses and its role on fisheries under different ENSO or other conditions stages.

Global Transmissometer Database – now part of World Ocean Database'05

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Two major goals of the oceanography community are to develop regional and global mass balances for carbon, and to measure changes in carbon over time. In order to make more complete carbon budgets and dynamics it is necessary to know the magnitude and distribution of particulate organic carbon (POC) and dissolved organic carbon (DOC). To obtain information about POC distribution we used in-situ optical instruments (e.g. transmissometers) interfaced with a CTD to record values of beam attenuation coefficient (BAC) through the water column. The portion of the BAC due to particles is known to be linearly related to particle concentration, and in surface waters, the concentration of POC. The distribution of organic and inorganic particles can also be related to hydrographic characteristics of surface and bottom mixed layers and boundary layers in general.

The prospect of utilizing BAC data collected on basin-wide scales for global POC assessment has motivated our work on compiling the global database on BAC both as stand-alone product (in form of the Ocean Data View collection) and as part of World Ocean Database'2005 (WOD05). The majority of BAC data held in WOD05 were collected using instruments operated at 660 nm (red) wavelength. Most of the attenuation signal comes from particles less than 20 microns in diameter. BAC profiles presented in WOD05 were collected during several international and U.S. national programs between 1979-2001. The majority of data comes from the World Ocean Circulation Experiment (WOCE), Joint Global Ocean Flux Study (JGOFS), Bermuda Atlantic Time Series (BATS), Hawaiian Oceanographic Time Series (HOT), South Atlantic Ventilation Experiment (SAVE) and Northeast Gulf of Mexico (NEGOM) programs. Most of the data were processed at Texas A&M University under grants from the U.S. National Science Foundation (NSF).

To increase data coverage and to assess global changes on a decadal time scale, we have been sending our instruments on ongoing CLIVAR cruises. Data from completed cruises are being calibrated and reduced in order to merge them with the WOD05 collection. There are also BAC data collected in the Eastern Mediterranean that are about to be added into WOD05.══ The proven close relation between BAC and POC allows BAC data to be used for POC estimates on a global scale. Furthermore, using relationships between surface BAC (within first attenuation depth) and remotely sensed parameters (i.e. ocean color data) make it possible to assess seasonal, annual and longer-term variability of POC through development of algorithms that can be applied to satellite remote sensing observations.

Sea Level Rise Monitoring Along the Coast of Bangladesh

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One of the most recent concerns of global warming to the coastal areas and small islands of Bangladesh will be rise in sea level due to melting of polar ice sheets mountain caps and glaciers and thermal expansion of ocean waters. The potential consequences are inundation of low lying lands, acceleration of coastal erosion, increasing the risk of flood disaster, problems relating to drainage and irrigation system, increase of salt water intrusion into ground water, rivers, bays and agricultural lands. It can also damage port facilities, coastal structures, bird sanctuaries, etc. Hence, it would become important for any nation bordering the sea to understand the sea level processes and monitor its variations. A good knowledge of the variations of the mean sea level is required for development of long term data collection and suitable models to predict various scenarios of sea level and its impact. These models would serve as tools to support the policy and decision makers and those involved in the sustainable management of the coastal resources. A pre-requisite to carry out any analysis is the availability of reliable and long term data on tides and fine contour topographic maps of the coast. Recognising the importance of building of such a data base Bangladesh Govt. has taken a project for the coastal belt and the Bay of Bengal for collecting tidal data by the latest model acoustic and pressure electronic tide gauges. About 10 nos. acoustic tide gauges has been installed by Bangladesh Inland Water Transport Authority (BIWTA) and data collection and processing work is going on and the project is being implemented since 2005.

Abstract 62

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

The Irish Marine Data Repository (MDR) – spatial data warehouse

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The MDR provides a single centralised accessible platform for the Marine Institute to store oceanographic, environmental, and chemical data, with projects ongoing to add additional biological and geological / geophysical data. The Marine Data Repository provides the following advantages:

1. Full scientific value can be gained from various data sources as the information is now integrated through a central repository.

2. Ease of retrieval of data using a GIS interface to allow display and retrieval of data based on x,y,z, date, parameter type and parameter measurement query values.

3. Reduced risk of data loss or corruption since they are managed within a single database environment.

4. More efficient retrieval of integrated data, as they are stored in the central data source rather than the various separate operational databases located across the Marine Institute's network.

The technologies used for the Marine Data Repository include Microsoft Sql Server 2005,

ESRI ArcSDE and ArcIMS 9.1. ArcSDE is ESRI's server GIS software Spatial Database Engine of GIS gateway to relational database management systems such as Sql Server. ArcIMS is ESRI's Arc Internet Web Map Service product. The MDR data model is based on the ESRI ArcMarine data model.

The development of the MDR has been carried out over the past 3 years, with phase one now in operation internally in the Marine Institute. Future development of the MDR to include additional datasets, and to make the data also available externally via the web is currently being planned, and will form part of the National Coastal and Marine Information Service which is part of Sea Change, the national Marine Knowledge, Research & Innovation Strategy 2007-2013.

Implementation of international standards for colombian oceanographic data and information management using open source web software – case study

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At the present time, the countries in via of sustainable development have centered their efforts in the attention of the natural resources; concretely Colombia (South America), recognized by its hydric resources represented in its majority by oceanic, maritime and insular waters, it has enormous riches that include: oxygen production, fishing resources, mining resources, etc. For that reason, the access to oceanographic data and information sources takes great importance to explore the behavior of Colombian oceans, seas and coasts, to guarantee not only the suitable operation of these resources, but also to determine the impact of natural phenomena like ENSO events that mainly affect the Pacific coasts, and the meteorological conditions like hurricanes for the Caribbean. With this, the Colombian Naval Administration has been motivated to incorporate the use of Information and Communication Technologies (ICTs) to optimize the oceanographic data and information management of their principals oceanographic institutes located on the Colombian Pacific and Caribbean coast.

This paper provides an overview of a prototype model in terms Open Geospatial Consortium (OGC) specification and ISO TC 211, open source technology, responsibilities, roles and scopes for building the main node of Colombian Oceanographic Spatial Data Infrastructure (COSDI). This main node is currently being defined and set up by the National Naval Administration (DIMAR) which produces basic reference oceanographic geo-data at the national level.

For this case study, in order to give a significant impulse on the issue of establishing a pattern model for the COSDI that goes further into the idea of architecture = catalogs + metadata + web services + user applications, some open sources libraries and applications was tested and configured to support, of a part, the documentation of Colombian marine datasets implementing the marine community of practice metadata

profile of ISO 19115 defined by Australian Oceanographic Data Center (AODC), and on the order hand, to satisfy the requirement of reading and writing data from oceanographic data repository of DIMAR-GIS using Network Common Data Form (NetCDF), considering the increasing use of this last one in important oceanographic information systems.

Key words

Oceanographic data exchange, metadata, ISO 19115, NetCDF, XML, marine community profile

Results

For the administration and publication of Colombian oceanographic metadata, the marine community of practice metadata profile of ISO 19115 was implemented into Geonetwork, a standards based catalog application that includes an XML import/export tool to load/produce ISO 19115 compliant files. This web-based geographic metadata catalog system developed by Food and Agriculture Organization (FAO-UN), World Food Program (WFP-UN) and UNEP turned out to be considerably interoperable with DIMAR-GIS during installing of the Geonetwork´s Web-Archives (WARS) within the DIMAR-GIS servlet engine, configuring the SQL SERVER 2000 data bases and also configuring the XML Web services; it allowed forming obligatory and optional fields of the marine metadata profile and improving the controlled lists according to the specifications for the Colombian case study. Now, these catalog and service metadata are the backbone of the CECOLDO portal which involves distributed data sources and geoprocessing services.

The main goal of the Colombian Oceanographic Metadata Catalogue (COMC) is to improve the accessibility to a wide variety of geodata, following the recent international standards in the geographic information domain (ISO 19115 and ISO 19139 for Metadata XML Schema Implementation). COMC provides immediate search access to local and distributed geospatial catalogues, up and download data and documents; the availability of an interactive Web map Viewer; online editing for group and user management and the final users does not have to learn about a particular software package or services GIS.

Additionally, a NetCDF 3 archives module was included into the Colombian oceanographic data management system using the Java NetCDF library. In this module was implemented the architecture for the conversion of database content (XLS, CSV, ODV file types) to NetCDF 3 and NetCDF 4 files. The NetCDF and XML import/export formats let to incorporate different access methods to the oceanographic data and also potentialities integration with international initiatives like IODE/JCOMM E2EDM Pilot Project, Web Information Systems (WIS), etc. With this first approach the module makes possible the creation of two dimensional (data and time evolution) NetCDF files: from parameterized Web Services or from Colombian Oceanographic Data Center (CECOLDO) Web Page.

Conclusions

>> The free and open source applications provide solutions for users and developers interested in Colombian oceanographic data management.

>> The free and open source applications are an excellent low cost alternative for the adaptation of standards, formats and new functionalities to old oceanographic data management systems. In Colombia, CECOLDO is proving the benefits and opportunities of developing Oceanographic Spatial Data Infrastructures with open source and property technology and a prototype has been built using this approximation for the activation of this data center.

>> The open source libraries like NetCDF Java and AXIS, JAXB and another ones, allow making files in many different international standardized formats that support the data access requirements like IODE-IOC program; also they have potentialities the integration with others developing initiatives (web services).

>> Colombia is now prepare for converging oceanographic metadata created following the schemes of deprecated metadata standards, pre-standards and institutional norms towards the new international norms using open source software.

Abstract 64

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

EUR-OCEANS Data Management, Portals and Tools for meta-analysis in Ocean Science

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The EURopean network of excellence for OCean Ecosystems ANalysiS (EUR-OCEANS) gathers 160 principal investigators from 66 research institutions, located in 25 countries. The overall objective of EUR-OCEANS is to achieve lasting integration of European research institutions to model (hind cast & forecast) the impacts of climate and anthropogenic forcing on food-web dynamics in open ocean, pelagic ecosystems.

The success of EUR-OCEANS required an adaptive data management plan that involved 1) meeting ecosystem modellers to identify data required to validate and constrain models and their appropriate formats and units; 2) meeting database managers to identify existing data archives and their formats; 3) consulting field scientists to identify un-archived data collections that meet the modellers' needs.

Coordinating the flow of data from field scientists to data managers and then to modellers involved putting together 1) guidelines and templates for biological data archival; 2) funding programmes for data rescue and transformation; 3) meeting of experts to address the consistency of plankton data; 4) training courses in manual and automated plankton identification; 5) networks of relevant scientific equipment (e.g. HPLC, Flow Cytometer, Microscopy, ZooScan) to encourage a continuous flow of data; and 6) tools that enable scientists to search, retrieve and consolidate data of their interest once they are archived (http://www.eur-oceans.org/dataportal/).

The present poster (if possible assisted by online access to EUR-OCEANS data portal) will outline the data management plan and will focus on the tools required for meta-analysis of Ocean Science data.

Abstract 65

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Use of problem-oriented database for statistical analysis of hydrochemical characteristics of redox-layer of the Black Sea

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A problem-oriented database was developed for statistical analysis of hydrochemical parameters of the Black Sea. Algorithms of interpolation and location of appearance and disappearance (onset points) of hydrochemical parameters were developed using the Akima spline. The created database allowed to acquire a number of biogeochemical estimations, including: 1) constancy of vertical gradients of hydrochemical parameters on certain density levels; 2) seasonal variability of degree of intensity of phosphate in coastal waters and open sea areas; 3) interannual variability of level of disappearance of hydrogen sulphide, ammonia, total manganese and methane, as well as amount of oxygen in the cold intermediate layer (CIL) and their relation to climatic changes.

The calculated results show that the depth of disappearance of hydrogen sulfide was characterized by values σθ=16.15-16.25 kg/m3 in 1991- 1998. In 1999-2000 the shoaling of this boundary appeared, with a value about σθ=0.05-0.15 kg/m3 (corresponding to about 5-15 m). After 2000 the position of hydrogen sulfide stabilized. The same tendency was noticed for the other studied reductants - ammonia, total manganese and methane. Calculated vertical gradients of hydrogen sulfide, ammonium, manganese and methane were stable in both periods. These changes may be related to the two warm winters that occurred in 1998-1999, that could affect the balance between input of fresh water from the rivers and saline water from the Bosphorus and the winter formation of the oxygen-rich Cold Intermediate Layer (CIL). These years are remarkable for increase of the Sea surface temperature, increase of temperature in the core of CIL and shoaling of CIL in the density field. All these events can be connected with the weather condition oscillations as it follows from NAO index behavior. The decrease of intensity of CIL formation should lead as to increase of temperature in its core and decrease of oxygen content there. To check it we calculated the average concentrations of dissolved oxygen in CIL (for the layer σθ=16.15-16.25 kg/m3). These results reflect both changes of concentrations in CIL and the vertical shifts of the CIL core in the density field. In 1999-2000 when the shoaling of reductants occurred a decrease of oxygen content was marked. The minimal concentrations were found in 2001-2002. In 2003-2004 we observed the increase of oxygen content in this layer to the values typical for the beginning of 1990th.

The obtained results illustrate the mechanism of reaction of the natural system of the Black Sea on the Global Climate changes. As it follows from the analyses, changes of the sea surface temperature lead to changes of winter CIL formation process intensity and to the oxygen renovation there. The oxygen inventory in the CIL acts as a specific accumulator that support the consumption of oxygen for the organic matter decay and downward diffusive flux during all the year. The interdecadal variations of this oxygen renovation in CIL lead to changes of hydrochemical structure of suboxic layer and, in particular, of position of the anoxic boundary in the density field. Therefore, the distribution of the chemical parameters in the density field in the Black Sea is a excellent detector of the Global Climate variations.

It is necessary to stress that direct result of the anoxic boundary oscillations for 5-10 m is the change of the volume of the oxic waters for about 5-10%, where the Black Sea oxic ecosystem is situated. Such oscillations are vitally significant and should be studied.

Validation hydrophysical fields obtained by MHI near-operational Nowcasting/Forecasting system for the Black Sea

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One of the actual problems of the Black Sea region development is its state control and resources utilization. This problem solving needs for full monitoring of the Black Sea hydrophysical fields. For this purpose on MHI NASU was developed and working at present time the forecasting/nowcasting system. The Black Sea nowcasting/forecasting system permitting to monitor continuously the circulation, stratification and surface waves height and direction of the basin and it's sub regions is extended to the near-real time. The system is based on the primitive equation models of the Black Sea circulation - MHI and POM with grid step from 5 km for basin scale to 1 km for regional scales. For waves height and direction prediction the WAM model is using. External forces that needs for diagnoses and predictions are provided by NMA of Romania on the base of ALADIN family model of MeteoFrance. The MHI Black Sea circulation model assimilates the space remote sensing data including sea surface topography anomalies, provided by AVISO/Altimetry a multi-satellite data active archive center dedicated to space oceanography (France) and surface temperature (via direct reception of Advanced Very High Resolution Radiometer (AVHRR)). Regional circulation forecasting is performing by means of POM model with initial fields and boundary conditions on fluid boundaries taking from MHI basin-scale model. The wave's characteristics are predicted by means WAM model with additional coupling of the current fields from MHI basin-scale model for wave's refraction accounting. The output of the system is time series of two or three dimensional hydrophysical fields (temperature, salinity, current velocities, sea level, wave's height and direction). Products of the system are regularly presented on the WEB-site http://www.dvs.net.ua/ and FTP-server. It's allows to present the images of the Black Sea fields and transmitting modeled data to users.

An essential part of the Black Sea forecasting system is the subsystem for the validation of its products. The validation of the system products is based on utilization in situ measurements by surface drifting buoys and deep profiling floats. A special preprocessing of observations is carried out to ensure compatibility observations and mode outputs. In situ data for sea surface temperature and surface current velocities are obtained from SVP-drifters developed in Marlin-Yug firm on MOC and WMO projects on ocean surface and near surface atmosphere monitoring by automatic measuring systems with satellite communication. Profiling floats are used for validation of a weekly mean velocity and temperature and salinity profiles. PALACE Floats Profiles buous was developed on WOCE project and disposed on Black Sea by oceanographic organizations of USA, Turkey and Ukraine.

Validation process consists from 3 subsequent stages. Request to the "in situ" data base saved in NetCDF format is formed in the first stage. Request contains parameters for necessary data: drifter type, temporal interval, spatial ranges in latitude, longitude and depth, additionally spatial and temporal discrepancy of the in situ and model data. Quasi-synchronous mutual data set formed during the second stage of the processing. Statistical characteristics of the data obtained in previous step are calculated during the third stage. Validation subsystem allows to compare sea surface temperature, water salinity and temperature profiles in upper layer, and current velocities. Standard deviation, scaterrograms, histograms, graphs of the time series and profiles are calculated during the procedure of validation. Subsequent procedures of the validation subsystem described below in detail.

Robust statistical methods are used for analysis of sea surface temperature data uniformity. Anomalous situations are detected, and reasons of its occurrence are studied. Defined by specific physical features of the SST field anomalies are analyzed during the third stage. Calculations of the statistics of deviation for the both - "uniform" and "anomalous" (obtained by robust values) data sets are carried out in this step. Censured mean and mean-square deviations between model and in situ are used as main statistical characteristics for model and in situ data intercomparison.

Validation process of the temperature profiles in the upper layers of the sea is realized by the following way. The joint test array of the measurements is formed at first stage. Depth levels of the in situ measurements and levels of the model calculations do not coincide in this test array.

Before intercomparison model values were interpolated on the in situ depth levels. After that time series of the mean, mean-square errors and correlation coefficients between measured and model values of temperature are estimated. Same characteristics are calculated for temporary averaged temperatures for different depth levels. Scatterograms of the in situ and model temperatures are plotted. Its represents variable information about consistence of the model and in situ measured temperature profiles in different geographical regions of the Black Sea.

Subsystem of validation allows to analyze the variability of the model near surface current velocities. Validation of surface current velocities is based on comparison with velocities calculated on data about SVP-drifter moving. Validation is done for zonal and meridional components for instantaneous velocities and velocities averaged at the inertial cycle. Correlation coefficient, mean and root mean square of the differences between averaged model and measured by drifters velocities is analyzing.

Correlation coefficient, mean and root mean square of the differences between averaged model and measured by drifters velocities are analyzed. Amplitude and phase reproduction of the inertial oscillations are studied for model calculated velocities. Comparison is based on spectral analysis time series methods, including the model and in situ velocity coherence spectra analysis.

Current velocities validation at the depths of 200, 750 and 1500 meters is based on comparison with profiling floats – PALACE. Trajectories of deep profiling floats are given mean Lagrange velocities on the week-time interval. Comparison of these velocities with model instantaneous Euler velocities is not correct, because they can change essentially in a week. Therefore we used next comparison procedure. During model calculating we launch a fictive "model" buoy in the same point that real buoy which moving with model current. Validation subsystem calculates trajectory of the model buoy for the interval of the real buoy coordinates absence (underwater position). In this way we calculate mean, model Lagrange velocities for the same period as real buoy. These velocities are subject for comparison provided similarly to averaging surface velocities.

Developed validation subsystem was tested. Its results are using for further models improvement, increase reliability of nowcasting and forecasting fields of the Black Sea.

Abstract 67

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Channel Habitat Atlas for Marine Resource Management (CHARM project): making the results of this multidisciplinary project accessible on the Internet

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CHARM (Channel Habitat Atlas for Marine Resource Management) is a Franco-British research project currently in its second phase. With co-financing from the European Union under the Interreg IIIa scheme, French and British researchers from a number of universities and research institutes are working together to assemble, standardise, model, integrate and disseminate diverse marine physical, environmental, biological, anthropological and legal data relevant to marine living resources, particularly fisheries, in the Eastern English Channel. This area, which connects the Atlantic ocean with the North Sea, is a key economic area for numerous activities, such as leisure and tourism, international ports and maritime shipping, and the exploitation of living (e.g. fisheries) or abiotic (e.g. aggregates) marine resources. The project's first phase (which ended 2005) aimed at assessing available data, such as seabed sediment types, satellite imagery (e.g. chlorophyll a concentration), benthic invertebrate fauna, key commercial fish species, and initiating a review of the policy and legal framework regarding marine living resources and their habitats for both sides of the Channel. A high number of distribution maps (i.e. GIS layers) were produced, many using geostatistical interpolation, whilst some of the assembled data were used, in parallel, to model fish habitat suitability using GAMs and regression quantiles. The results of this multidisciplinary project were presented in a richly illustrated 200+ page atlas, available to download from the project's Web site (http://charm.canterbury.ac.uk) and constituting an up to date reference of the status of living marine resources and their habitats in the study area. The project's second and current phase aims to complete the original project's objectives, notably by considering more marine species (invertebrates and fish), integrating information on local fishing communities and further UK and French fisheries statistics, and using the data assembled and GIS layers produced during

phase 1 to develop resource management tools. A model of the ecosystem functioning using mass-balance food web models (Ecopath with Ecosim) is being built to evaluate management scenarios, whilst a conservation plan using the MARXAN spatial planning software should help identify important sites for conserving biodiversity. Furthermore, the project's results will be made available on-line and interactive on the Internet through two interlinked Information Systems: a Content Management System (or CMS, using Joomla!, www.joomla.org) and an interactive Web-mapping application (using Mapserver technology, http://mapserver.gis.umn.edu/), both Open Source and hence allowing a greater flexibility of development. The CMS site will be the first port of call for visitors and will present background information and project results in a user-friendly manner (e.g. limited descriptive text, use of illustrations, notably animations displaying time-series of annual distribution patterns, etc). Each main discipline of the project will have its own section of the CMS site, which will allow direct access to the GIS layers that are particularly relevant to the discipline considered. The GIS layers, as well as associated metadata will, in fact, be hosted by the Web atlas, and advanced-users (who have a precise idea of what data they are interested in viewing) will be able to browse the numerous maps directly within the Web atlas, where further mapping tools will be available (e.g. selection, zoom, printing, customised legend, etc). Although this approach aims at presenting project outputs in an interactive manner, the system also allows each project partner to be in charge of building and managing the contents of their section of the CMS site; this is particularly useful for large international projects where on-line (distance) collaborative work has become common. When completed (end of 2008), it is hoped that the CMS site and its associated Web atlas will help disseminating project outputs to a variety of users, from researchers to governmental environmental agencies, conservation planners and decision-makers, university students, but also to the wider public, so as to raise awareness of this fragile marine ecosystem. In the face of climatic change and anthropogenic disturbance, it is of utter importance that information on marine ecosystems such as that of the English Channel is made available through the Internet so as to allow for a sustainable management these vulnerable marine living resources.

Abstract 68

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Marine Fishery Database in Syrian Seawaters

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The Levantine Basin of the Eastern Mediterranean, including the Syrian seawaters, is highly oligotrophic with low nutrient concentrations, showing high salinity and temperature averages. The fish resources are not as high as in western Mediterranean region. However the ongoing management of fishery and the awareness on the marine biodiversity conservation create certain hope to develop the fishery industry.

Database of fishery in Syrian seawaters is underway within the frame of the new management regulations. These databases may include information on ichtyofauna with focus on the main commercial species and the most available on the fish market. In addition to this, we have available a list of most fish resources including algae, invertebrates and fish exploited in fishery. Furthermore the amount fish landing is statistically estimated along with fishing efforts and the number of fishing boats and fishermen. The most important fish resources and fish available on the fish market are also considered in these databases

224 fish species found in Syrian seawaters belong to 18 order, 75 families,155 genera. Out of them, there are 37 Lessepsian migrants of Indo-Pacific and Eritrean origin and 14 species indicators of Atlantic and western Mediterranean. All of those exotic invading species have settled stable populations, and many overcame in abundance some native species. The major fish families of economic importance are: Sparidae forming 9.82% of total landing and including 22 species; Blennidae 13 species, Gobiidae 10, Carangidae 10, Serranidae 10 with 4.45% of total fishing yield, Labridae 10, Scombridae 9, Triglidae 7, Mugilidae 7, Clupeidae 7. The most important fish encountered on the fish market belong to families: Engraulidae, Sparidae, Blastidae, Carangidae, Centracantidae, Clupeidae, Coryphaenidae, Hemiramphidae, Murlucciidae, Soleidae, Scaridae, Synodontidae, Sphyraenidae, Holocentridae, Serranidae, Labridae, Xiphidae, Scombridae, Mugilidae, Mullidae, Siganidae. The number of fishing boats actively working on the Syrian coast is about 1850 of 6-12 m. length, distributed in 6 fishing ports, including Erouad Island, and equipped with diesel engines of 15-40 hp with 12000 manpower fishermen. The annual fishing landing varies between 4000 and 5000 metric tons, whereas the freshwater aquaculture from 10 governmental fish farms,

produce about 7000 tons/year of Carp and Tilapia. In addition to this, there are several private freshwater fish farms, which produce 100-200 metric tons/year.

Unfortunately, although the marine fishery is still mostly artisanal, there is a managerial plan to develop and install marine aquaculture farms in the near future to fill the gap of fishery production.

Abstract 69

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Needs for Establishment of Caspian Sea International Data Center

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In spite of different campaign, research and industrial projects involving measurements of physical and biological species in water and border of the Caspian Sea, a comprehensive data center among all neighbor countries does not established yet. The Caspian Sea, the largest lake of the world, locates among 7 countries, Russia, Iran, Azerbaijan, Georgia, Kazakhstan, Uzbekistan and Turkmenistan. The Caspian Sea unique environments, in 21st century faces sever environment difficulties. Some of the challenges were natural, but some occurred by human activities. Entering wide variety of pollution, ballast water, biological infection from different sources is going to be a real crisis. Petroleum investigation is another problem which will effect on Caspian Sea characteristics and for preventing of its undesirable effects, it is needed to a permanent monitoring of sea quality and quantity factors by all adjacent countries. Monitoring of Sea level variation and measurements of hydrological parameters in order to construct a hydrological balance model for evaluation and sustainable programming in The Caspian Sea regarding water level variation is another requirement. All mentioned facts urges neighbor countries to contribute and act in a co-operative manner especially in performing a comprehensive monitoring and measurements program and share all data and information. In the first step gathering all measurements which have been done by national authorities in any of neighbor countries with detail information of timing, type, instruments and any other specification is recommended. Today, it is clear that any programming and management needs its own tools and for integrated management, sufficient and certain data network is necessary. In this paper tried to gather all data acquisition project especially with in the Iran and other countries and present a check list of important required data find the gaps. Also propose a framework for stepping forward.

SeaDataNet: unified access to distributed data sets

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SeaDataNet consortium

SeaDataNet is an Integrated research Infrastructure Initiative (I3) in EU FP6 to provide the data management system adapted both to the fragmented observation system and the users need for an integrated access to data, meta-data, products and services. Therefore SeaDataNet insures the long term archiving of the large number of multidisciplinary data (i.e. temperature, salinity current, sea level, chemical, physical and biological properties) collected by many different sensors installed on board of research vessels, satellite and the various platforms of the marine observing system, and SeaDataNet provides a harmonised access to the distributed databases via a central portal website.

SeaDataNet is a distributed infrastructure that provides transnational access to marine data, meta-data, products and services through 40 interconnected Trans National Data Access Platforms (TAP) from 35 countries around the Black Sea, Mediterranean, North East Atlantic, North Sea, Baltic and Arctic regions. These include:

- National Oceanographic Data Centres (NODC's)
- Satellite Data Centres.

Furthermore the SeaDataNet consortium comprises a number of expert modelling centres, SME's experts in IT, and 3 international bodies (ICES, IOC and JRC).

SeaDataNet is providing access to medatata, data, products and services through a central portal. SeaDataNet develops added value regional data products like gridded climatologies and trends, in partnership with scientific research laboratories.

Metadata catalogues

SeaDataNet maintains and provides discovery services via the following catalogues:

- CSR - Cruise Summary Reports of research vessels;

- EDIOS - Locations and details of monitoring stations and networks / programmes;
- EDMED – High level inventory of Marine Environmental Data sets collected and managed by research institutes and organisations;
- EDMERP - Marine Environmental Research Projects ;
- EDMO - Marine Organisations.

These catalogues are interrelated, where possible, to facilitate cross searching and context searching. These catalogues connect to the Common Data Index (CDI).

Common Data Index (CDI) and shopping mechanism:

The CDI gives detailed insight in available datasets at partners databases and paves the way to direct online data access or direct online requests for data access / data delivery. Currently, the CDI metadatabase contains more than 300.000 individual data entries from 30 CDI partners from 25 countries across Europe, covering a broad scope and range of data, held by these organisations. Additional data centres from the SeaDataNet network will further populate the CDI and other institutes in their countries will be encouraged to participate.

For purposes of standardisation and international exchange the ISO19115 metadata standard has been adopted. The CDI format is defined as a dedicated subset of this standard and ISO compliant. A CDI XML format supports the exchange between CDI-partners and the central CDI manager, and ensures interoperability with other systems and networks. CDI XML entries are generated by participating data centres, directly from their databases. CDI-partners can make use of dedicated SeaDataNet Tools to generate CDI XML files automatically.

The index metadatabase is in the public domain and features a geographic–alphanumeric user interface to locate interesting data sets easily. The index is based upon the ISO 19115 metadata standard and provides sufficient information to allow the user to assess the relevance of the data sets and possible related study reports to its particular interest.

The Data sets are managed by each of the SeaDataNet data centres, and have been gathered worldwide by numerous research institutes. The SeaDataNet data centres take care of extensive quality control and long term stewardship. The SeaDataNet portal provides registered users access to these distributed data sets via the CDI Directory and a shopping basket mechanism. This allows users to search and identify interesting data sets. Thereafter users can specify and submit their data requests. This requires user registration and agreement to the SeaDataNet data policy. Their requests are forwarded automatically from the portal to associated SeaDataNet data centres. This process is controlled via the Request Status Manager (RSM) software at the portal and a Download Manager (DM) manager software at each of the data centres. The RSM also enables registered users to check regularly the status of their requests and download data sets, after access has been granted. Data centres on their turn can follow all transactions for their data sets online and can handle requests which require their consent.

Interoperability:

Interoperability is the key to distributed data management system success. This is achieved in SeaDataNet via:

- Using common and controlled vocabularies, including international content governance
- Using the EDMO directory for organisations
- Using common quality control protocols and flag scale
- Adopting the ISO 19115 metadata standard for all metadata directories
- Adopting of OGC standards for mapping and viewing services
- Using SOAP Web Services in the SeaDataNet architecture
- Providing XML Validation Services to quality control the metadata maintenance
- Providing standard metadata entry modules
- Using harmonised Data Transport Formats (NetCDF and ODV ASCII) for data sets delivery

SeaDataNet Partners:

IFREMER (France), MARIS (Netherlands), HCMR/HNODC (Greece), ULg (Belgium), OGS (Italy), NERC/BODC (UK), BSH/DOD (Germany), SMHI (Sweden), IEO (Spain), RIHMI/WDC (Russia), IOC (International), ENEA (Italy), INGV (Italy), METU (Turkey), CLS (France), AWI (Germany), IMR (Norway), NERI (Denmark), ICES (International), EC-DG JRC (International), MI (Ireland), IHPT (Portugal), RIKZ (Netherlands), RBINS/MUMM (Belgium), VLIZ (Belgium), MRI (Iceland), FIMR (Finland), IMGW (Poland), MSI (Estonia), IAE/UL (Latvia), CMR (Lithuania), SIO/RAS (Russia), MHI/DMIST (Ukraine), IO/BAS (Bulgaria), NIMRD (Romania), TSU (Georgia), INRH (Morocco), IOF (Croatia), PUT (Albania), NIB (Slovenia), UoM (Malta), OC/UCY (Cyprus), IOLR (Israel), NCSR/NCMS (Lebanon), CNR-ISAC (Italy), ISMAL (Algeria), INSTM (Tunisia)

Abstract 71

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

NODCi – National Infrastructure for access to oceanographic and marine data and information in The Netherlands

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Nuis Martin, AGI, Rijkers Pleun, AGI

The poster will present the Dutch NODC-i project, the national infrastructure for access to oceanographic and marine data and information in The Netherlands.

The NODC-i project is run by the National Oceanographic Data Committee (NL-NODC) of the Netherlands. The NL-NODC is the national representative in the EU-SeaDataNet project.

The NODC-i project is a technical project which will result in the Dutch node in the SeaDataNet infrastructure. The goals of the NODC-i project are therefore very similar to the goals of the EU-SeaDataNet project, albeit aimed at a national level.

Managing oceanographic data in the frame of large multidisciplinary programmes, a Belgian experience

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Since 1970, the Belgian Science Policy administration foster the marine research through large multidisciplinary scientific programmes. In this frame, data management has always be a concern but, most of the time, for the duration of the project only. In the nineties, the need to have a permanent structure for managing the data collected by means of public finance for the benefit of all and to ensure their perenniality has become an evidence.

The "IDOD" project was launched in 1997 as part of the phase I of the "Scientific Support Plan for a Sustainable Development Policy" (SPSD). It soon transformed into the permanent "Belgian Marine Data Centre".

Through all these years, many and very diverse research were undertaken, most of them by groups of a few academic units. Since a few years "clustering projects" manage to provide an aggregated synthesis of several research. The same effort is done for data management by the BMDC.

Since its creation, its challenge has been to incorporate the various data types in a meaningful and useful way into one sole structure. Bird counts, salinity profiles, DNA chains, sediment granulometry, relations of post-mortem examinations of stranded marine mammals, .., are no more to be considered as isolated data sets, but as interdependent views of the same ecosystem.

At the dawn of the third phase of the SPSD, the presentation will describe and illustrate the data flows from the field or the labs to the data centre, the relationships with the data providers and the users, the data policy and the structure and mechanisms of the integrated information system.

Abstract 73

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

The management procedures for data in the Albanian Adriatic Sea

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Sea data management procedures in the Albanian Adriatic Sea are studied in order to assess their usefulness for assimilation in the framework of a possible forecasting.

The data team provides support in marine research and monitoring to collect and maintain sea data according to international standards. It plays the role of keeping track of sea observations made in the Albanian coast. Data collected by individual scientists, local agencies and governmental departments is primarily kept under the respective sources, and under different, often incompatible formats. The data team aims to identify these data holdings and bring the data under one database with standardized formats

Some physical oceanographic surveys conducted mainly after 1997 have served to give a first understanding of the phenomenology of the coastal oceanography in the Adriatic Coast of Albania. Analysis of these water column and subsurface current measurements indicate the presence of some interesting hydrodynamical aspects that are influenced

by processes covering a wide spectrum of time scales.

In this paper we place particular focus on the possibilities of a near real-time sea observing system and the gradual move toward oceanography as a more operational activity in Albania. For that different management procedures for sea data are tested. In several ways oceanography is following the path developed by observation and forecast systems, yet in other ways there are significant differences. However, the rich living and non-living resources of the sea, the critical importance attached to the coastal and marine environment, and the rich biodiversity of the Adriatic sea, among other things, make quantitative knowledge to be very important in its own right.

Integrated data and information management system of the marine research institution

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For the effective and productive work with data, each scientist working in the research marine institution needs first of all a full convenient access to his/her institution data obtained him/her self as well as to historical data and information ever collected in the institution including the concomitant data from different disciplines and any publications including "gray literature". To minimize time necessary to find, collect and analyze all required data and information, it is desirable to have them loaded into the integrated data and information management system (IDBIS).

A prototype of such system is being created now in the Institute of Biology of the Southern Seas (IBSS, Sevastopol, Ukraine). For the moment it includes 4 main components:

- Metadatabase of marine expeditions performed by the IBSS scientists on board of the IBSS research vessels and the vessels of other institutions
- Institutional database (DB) that includes the data ever collected by the IBSS scientists
- Electronic repository that contains all IBSS scientists' publications available in the digital form
- Black Sea marine species atlas developed based on WIKI technologies [under development]

IBSS metadatabase is the major part of the institutional DB (http://data.ibss.org.ua/). It gives the detailed information on the data collected by scientists and permits to request the similar metadata on the expeditions performed by other institutions. This possibility exists due to the integration of the institutional DB to the international system of the research cruises information (ROSCOP/CSR).

IBSS database management system (http://data.ibss.org.ua/) is being filled with all data ever collected by the IBSS scientists. It has been built on the up-to-date web technologies with a transparent and intuitively clear interface. The system provides a user with the following services:

- Selection of the multidiscipline data within the required geographical region.
- Verification of the taxonomic information.
- Integration in the international systems of the data and metadata exchange.
- Fast estimation of the state of environment according to the different criteria.
- Data visualization (vertical profiles, maps, etc.).
- Export of data in formats suitable for the further analyzes and visualization in different systems such as ODV (Ocean Data View), Surfer, Excel, DIVA GIS etc.;

The metadata is fully accessible for the entire scientific community although the data themselves are accessible after the registration. Some of them are restricted and can be obtained only directly from the originators.

IBSS electronic repository (http://repository.ibss.org.ua/dspace/) is the information system that provides a possibility to collect, store, index, search, automatic exchange of the scientific publications description and context, and free exchange of them via Internet in the international standards. At the moment the electronic repository exists as the separate system but it will be integrated in the IDBIS early next year. Recently (December 2007) IBSS electronic repository contains 394 publications and their number is growing fast. The additional role of the IBSS electronic repository is as well to make the publications of the IBSS scientists (especially from "gray literature") accessible to the entire scientific community and to make the IBSS "more visible" within the international scientific community.

IBSS IDBIS has been created by the IBSS DB management team and it is being supported and permanently updated by this team.

Specialized Biodiversity Information System to Support Monitoring of Marine Ecosystem

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Monitoring and conservation of biological diversity, analysis of its trends over various temporal scales have become a global concern. However, variety in methods and sampling techniques, small amount of observational data and lack of unified species check lists lead to controversy in estimation of the marine ecosystem evolution tendency. Moreover, in compassion with other fields of oceanography there is a lack of the specialized information or database management systems that give a possibility to upload, quality check, analyze and present trends in biodiversity and related data.

Within the frameworks of the GEF Caspian Environment Program, the specialized Caspian Sea Biodiversity Information System dedicated to solve this task has been developed. The general objectives of the information system are: biological and environmental data storage; on-line data access and input; spatial and temporal data visualization; changes and trends estimation. A distinctive feature of the system is interdisciplinary approach. It brings together biological and oceanographic data with special preference to biodiversity. The main component of the system is the searchable taxonomy tree of the Caspian Sea organisms that serves as reliable reference for all biological data records and authoritative taxonomic list of species occurring in the Caspian Sea marine environment. All necessary metadata records are included, such as methods (observing, analytical and processing), instruments, calibrations, quality control information, as well as available attendant documents. In addition to raw data the system provides on fly some calculated variables and estimates: population structure, average yearly and monthly values, biodiversity indices, and species age/size distribution. Data queries can be presented as tables, graphs or spatial distributions and grouped by different taxonomic groups, geographic areas, time period, etc.

The system is web-based with user-friendly interface including embedded basic GIS features. It gives a possibility to the scientists and data managers enter data remotely to the system and undertake joint basin wide analyses. The system was tested on the historical datasets provided by regional scientists and organizations and it will be used to collect and analyze data obtained during future Caspian Sea ecosystem monitoring programs. Some examples of data analyzes results undertaken based on the historical Caspian Sea datasets are presented.

The system is flexible and can be used in any other regions of the World Ocean after the region specific species check list is created and the map file is replaced.

First version of the system is available at http://www.caspianenvironment.org/CaspBIS/ and the final version will be available at the CEP website.

Cruise Meta-database

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Institute of Marine Research in Norway has developed a database system that contains meta-data relevant to the data collected on cruises undertaken by the institute. The database is a rework of an existing database that contained meta-data focusing on CTD measurements. In the new version of the database the main focus has been to integrate more meta-data on other types of measurements and to minimize work when delivering meta-data to the EU project SeaDataNet e.g. Cruise Summary Reports. At the same time the database system exports information relevant for POGO.

The database has its primary objective in giving an overview of the quality insurance process of collected cruise data. It started out as a database where CTD relevant meta-data was registered, but has grown to contain information about acoustic meta-data and trawl meta-data, and it's planed to contain meta-data relevant to plankton in the near future. For the time being only cruises undertaken by IMR is registered in the database, but for the following years the national cruise plan will be entered into the database. The main purpose of registering the national cruise plan is making the reporting to POGO easier as the program contains automatic generation of Excel forms reporting relevant data. The database also implements automatic generation of CSR's in the new SeaDataNet V1 xml format. For the time being no automatic transmissions of these CSR's have been implemented as the infrastructure at the receiving end is still under development. It will be implemented as soon as SeaDataNet launches V1.

As the delivery of CSR does require some of the data fields to follow certain standards these have been implemented into the system. These standards include the SeaDataNet Ship and Platform Codes, EDMO codes and (C161) International Hydrographic Bureau (1953) sea areas.

The meta-database is a relational database implemented in PostgreSQL. It has a user interface implemented in Java.

Abstract 77

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

GIS Spatial database for coastline classification – Bulgarian case study

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The coastline changes are in response to natural and/or anthropogenic factors furthermore these changes are not constant in time and space and often are reversible in sign, for instance sand accumulation to erosion and vice versa. In addition the rapidly growing population in coastal areas requires reliable information regarding the current state of the coast, threatened by storm impacts, erosion, landslides and technogenous overcharging in terms of human structures. In this context the coastline classification, utilizes geomorphological features and manmade modifications of the coast is essential for better hazard assessment and relevant Integrated Coastal Zone Management strategy. Numerous studies have addressed the significance of appropriate spatial information and coherently organized coastal databases as a primary foundation in decision making. Due to exceptionally dynamic nature of coastal areas representing the coastline with all complex variables has always faced some constraints associated with a wide range of information sources, dimensions and time scales. This imposes the necessity of using modern and powerful tools for storage, processing, analyzing and interpretation of coastal data.

Nowadays the priority is given to the increased application of Geographic Information Systems (GIS) giving the ability to handle large databases, to integrate data from various type sources, as well to develop standards for coastal data definition. In thus way GIS with its integration capacity allow exploring the complexity of coastline system in a comprehensive manner and promote synergies between different types of data that contribute to generation of initial open-end database.

This work presents one example of developed GIS methodology applied to detailed segmentation of Bulgarian Black Sea coastline, both in natural and technogenous compartments, as a part of geospatial database, which have been established in the Bulgarian Oceanographic Data Center, IO-BAS. In order to demonstrate the GIS application one case study was considered in a coastal section, located at the North Bulgarian Black Sea coast between cape Ekrene on the north and cape Galata on the

south, as the coastline has a length of 31494 m and ESE exposure. The presence of vast sandy beaches and the big city of Varna, makes this part of Bulgarian coast especially attractive both for settlement and various human activities, including tourist industry development. At the same time the attempts to control the natural erosion-landslide problems have been implemented by construction of large number of solid groins, dams, sea walls, meanwhile augmented of ports and dredging activities, which have lead to technogenous overcharging of the coastline.

Two types of data sources were used for mapping and classifying the natural landforms and human structures: maps data and GPS survey data. Topographical maps in scale 1:5000, published in 1983 and nautical maps in scale 1:10000, published in 1994 were scanned, georeferenced and digitised. Since most of the coastal protection structures were built during the two last decades of the past century, they are not presented on the published topographical maps. That is why in May 2007 the detailed field measurements and research in the coastal section between capes of Ekrene and Galata were carried out. During the expedition the coastline in direction North-South, as well as all built hydraulic structures were surveyed with GPS "Garmin 12" methods. To visualize and support each of identified segments more than of 400 digital photographs were taken as the most representative are included in the coastline database.

Data proceeding, mapping of natural landforms and human structures, and analysis of technogenous impact on the studied area were methodologically performed with tools of GIS ArcInfo 9.2. In result the segmentation of the coastline between two capes was implemented. On the base of accepted hierarchy coastal classification system the attribute fields for each of the segments were filled. Along the study area 117 various segments with total length of 42245 m were identified and mapped. Using different criteria the next type of natural and technogenous segments were found:

- by geomorphologic criteria: i) narrow flooded beaches; ii) wide beaches; iii) low overgrown cliff, with rubble and shingle mounds; iiii) high erosion-landslide cliff
- by engineering criteria: i) groins; ii) dikes; iii)seawalls; iiii)ports, marinas and navigation canals.

The collected and produced information for coastal section between capes of Ekrene and Galata with advantages of GIS capacity allows creating of initial open-end database, which can be easily and constantly upgraded with other types of investigations and information. The ability to add a new data sets (such as aerial, satellite, DGPS etc.) allows enlarging of coastal database for entire Bulgarian Black Sea shoreline, in thus a way that various natural landforms and technogenous occupations could be spatially analyzed into GIS and the most hazard coastal zones to be identified.

The results obtained from the performed coastline segmentation will improve the capacity for more accurate assessment of contemporary state of the coastal zone, which is essential for well planned ICZM practice.

Abstract 78

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

The Global Temperature and Salinity Profile Program

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The Global Temperature Salinity Profile Program (GTSPP) is a joint World Meteorological Organization (WMO) and Intergovernmental Oceanographic Commission (IOC) program. Functionally, GTSPP reports to the Joint Commission on Oceanography and Marine Meteorology (JCOMM), a body sponsored by WMO and IOC and to the IOC's International Oceanographic Data and Information Exchange committee (IODE). GTSPP is also an accepted part of the Global Ocean Observing System and a participant in CLIVAR (Climate Variability and Predictability).

The implementation of the GTSPP has two primary priorities: (1) to establish a data flow monitoring and reporting for the real-time data flow to prevent data losses and (2) to implement an agreed, extensive and uniform system of quality control (QC), including duplicates management resulting in the creation of the global temperature and salinity data set, known as the GTSPP Continuously Managed Database (CMD).

The US National Oceanographic Data Center leads the program and maintains the GTSPP CMD in a relational data base. The Canadian Integrated Science Data Management quality controls real-time data, checks the data for several types of errors, removes duplicate copies of the same observation before passing the data on to the NODC. The NODC replaces near real-time records with higher quality delayed-mode records as they are received and populates the GTSPP data on-line through the GTSPP Web site at http://www.nodc.noaa.gov/GTSPP.

Processing and Quality Checks of Shipboard ADCP Data

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Since 2001, ADCP (Acoustic Doppler Current Profiler) shipboard data are collected underway along the track of three IFREMER ships: ATALANTE, SUROIT and THALASSA. Since 2004 and 2006, two new French Hydrographic Service ships have been equipped with ADCP: POURQUOI PAS? and BEAUTEMPS-BEAUPRE. Collected during valorized transits or deep ocean cruises, the ADCP data are transmitted to and managed by the National Oceanographic Data Centre for France (SISMER, IFREMER) from the processing to the quality control, the archiving and the data dissemination.

Data transmission

The raw data from the IFREMER vessels are transmitted to SISMER at the end of a cruise, whereas those from the French Hydrographic Service vessels are transmitted to SISMER each day in real time.

Data processing and quality checks

Once the data are received by SISMER, they are processed using a software named CASCADE (collection of Matlab routines), developed at IFREMER by the Laboratory of Physical Oceanography. The different steps of the data processing are:

- Reformatting of the raw binary data files into NetCDF files,
- Generation of processed files (attitude and time corrections, calculation of terrestrial coordinates, filtering, means),
- Automatic and visual quality checks of the data.

Data archiving and access

Currently, the data of about 200 cruises carried out between 2001 and 2007 are archived and are directly downloadable on the SISMER portal.

For each cruise, different files are available:

- NetCDF files – Raw data and processed data (Date/time, Latitude, Longitude, Depth, N/S, E/W, Vertical current speed, Echo intensity)
- UNIX tar file containing figures (section map, images and vector plots of the sections)
- Report which contains information about the data collection, the quality checks, the processing procedures applied to the data and the problems encountered with the data.

These data are used more and more by the scientific community, especially for modelling. That is why a standardized manaement of the ADCP data becomes a critical issue.

In situ *acquisition, storage and on line data availability for marine radioactivity*

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The development of an in situ autonomous measuring system for radioactivity in the marine environment is today of important scientific priority for the marine sciences and especially for the Operational Oceanography. This work will concentrate on the improvement of an existing NaI-based gamma ray underwater spectrometer for continuous measurements of radioactivity in the aquatic environment. The detector signal is connected with a photomultiplier tube and its output to a preamplifier. The pre-amplifier output is connected to a shaping amplifier and its output is connected to a multichannel analyser (MCA). The MCA device comprises of an Analogue to Digital Converter for digitising the signal, a peak detector for measuring the voltage amplitude the special memory and microcontroller for the data storage. Special hardware and software is also developed for connecting the system to floating measuring systems for providing real-time and long term data for pollution monitoring/prevention, rainfall - groundwater tracing and submarine fault studies.

The operation of the system in the Aegean Sea provides the monitoring efficiency at 1461 keV by intercalibration with an appropriate salinity sensor mounted close to the NaI-detector. The gross counting rate was constant within the statistical uncertainty, when there was no rainfall. The artificial radioactivity (137Cs) in the North Aegean Sea was increased up to seven times higher after strong rainfall, compared to the mean radiation level as given in literature. This increment remains only for a short period of time (< 2 days), due to strong advection processes of the water masses in the specific region.

Abstract 81

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

Assessment of quality and statistical analysis of oceanographic temperature and salinity data for the Western Black Sea region

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Data quality control is an essential part of marine data management, which primary objective is to ensure timely, efficient and open access to the best possible data, metadata and associated products, for use and re-use throughout their life-cycle and to prevent loss of data and associated information. There are several aspects of ocean data validation among which most important are primary quality control of data and scientific/expert quality control. Data subject of quality control procedures are derived through the CTD casts during the RV "Akademik" cruises in the Western Black Sea carried out in 1995-2006 within the monitoring program of the Institute of Oceanology. The raw data are acquired with the CTD Sea Bird 911plus system and processed with SBE Data Processing tool. Consequently, they are submitted to standard quality control procedures.

The quality control includes automatic and visual procedures. The checks are performed on each profile separately and also on profiles grouped by cruises. The result of quality control is to add a quality flag to each numerical value, but the values of the observations are not modified. As the World Ocean Atlas edition 2005 does not include any CTD data for the Western part of the Black Sea, MEDAR/MEDATLAS regional climatology and threshold values are used for comparison.

Preliminary tests concern basically the header information (correct date, time, position), stations duplicate, increase of pressure checks and spike elimination. Profiles undergo visual inspection to identify and flag erroneous data within the profiles and erroneous profiles within the cruise. Further, broad range checks are performed after MEDAR/MEDATLAS T/S ranges. Considering the large seasonal variability of the Black Sea hydrophysical fields, narrow ranges are set considering main dynamical features such as vertical water exchange, water mass formation and circulation. Ranges vary with the depth of standard levels.

Data satisfying this test are statistically processed by averaging within 0.25-degree latitude-longitude squares at specific for the Black Sea standard levels. This gridding is

in agreement with the sampling network density and is particularly relevant for the coastal areas distinguished for higher variability of sea water parameters. Records of number of observations, mean and standard deviation are produced. Statistics are computed on seasonal basis. While averaging, data are being verified for outliers using values within 3 standard deviations of the mean. Small number of outliers is detected. Computed standard deviations are compared against the MEDAR/MEDATLAS envelops for temperature and salinity. In terms of the data statistical assessment, seasonal mean profiles are established for each square that are than compared to the corresponding climatologic ones.

Results show that high quality data were collated during the studied period 1995-2006 that can comfortably be included in the database of the Bulgarian ODC. Available regional climatology is in good agreement with the data obtained. However, there is need to be further expanded to provide tools for more reliable scientific assessment of the data quality in the Western Black Sea.

Abstract 82

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

OGS NODC Metadata standardization, discovery and reporting from a relational database

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The Oceanographic database managed by the OGS National Oceanographic Data Centre archives measurements of physical and biogeochemical parameters, of current and wave motion, of sea level and meteorological data described by correlated metadata. These information are validated and continuously updated into a relational database. The access to all the metadata is public while the access to data is submitted to a Data Policy defined at dataset level in agreement with the data providers guidelines.

The Oceanographic metadata saved in the database includes also the information related to CSR -Cruise Summary Reports-, EDMED -European Directory of Marine Data Base-, EDMERP -European Directory of Environmental Research Projects-, initially imported from other databases used in the past to exchange these metadata between the Data Centres involved at European level.

Standardization

According to the SeaDataNet project, OGS NODC is developing a standardization of the metadata. This standardization uses now the XML standard ISO19115 and centralized vocabularies accessed through the Web Services technology, to exchange and harmonize the information with the other partners.

Discovery

The OGS NODC portal supplies dedicated web pages for the different metadata European Directories that let the users to search metadata by prefixed research criteria like time period, institute, datatheme or datatype. The result of the research is a list of records which satisfies the criteria previously selected.

Reporting

The OGS NODC web portal gives in output different formats of metadata, like HTML or XML.

The information are extracted from the relational database (using SQL query via jdbc connection) and from online Web Services (using SOAP calls) as an XML document. An XML framework like Apache Cocoon is used to generate, to combine and to transform all in a single output document with the requested format using a variable number of XSLT transformations.

Technical details

The Oceanographic database is implemented using Oracle 11g Database on a Debian GNU/Linux installation. It contains 61 tables; 16 of them are needed to save the measurements and the metadata included in MEDAR/MEDATLAS data format, while 45 have been added to address the needs coming from SeaDataNet standardization.

The database now archives 120 millions of in situ measurements, taking almost 75 Gbyte of disk space also used for datawarehousing needs.

Abstract 83

Session: 1 - Marine environmental data bases: infrastructures, metadata and data systems

In situ *data acquisition, storage and online data availability assurance system*

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Marine services demand for high quality and uninterruptible data stream. Data being acquired from the in situ measurements need to be transmited to the data center as soon as possible and made available via different communication channels. Proposed system use database system in the middle of the data transmission process, depending on the connection quality and bandwith against the data stream parameters and infrastructure available at the measurement side. To gain flexibility, different technologies have been used. Either data is beeing uploaded directly to the database at the data center or is stored in local database and replicated to the center if connection is available. At the center side data is processed and presented to fulfill the user requirements. The components of the system can be plugged in and configured to gain the maximum efficiency of the data delivery process.

The data model of the seamounts geomorphic information system

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The volume of the geological and geophysical data about the numerous seamounts augment constantly. For the mast complete use of this data in the seamounts geomorphic recherches the organization of the information system is necessary. The data extracted from bathymetry and altimetry, from reports of the scientific voyages and of deep-sea drilling, from the literature about the geological and geophysical researches on seamounts.

The data base include: A. Number; B. Title (russian); C. Title international; D. Forme of relief (peak, guyot, atoll, island); E. Latitude; F. Longitude; G. Depth of summit (in meters); H. Depth of foot (in meters); I. Morphostructure (archipelagos, ridges and rises, or abyssal hollows); J. Rocks; K. Age (in millions years); L. Method of the age definition (based on the analysis of the rocks - Ar/Ar, K/Ar, based on the analysis of the sediments - palaeontologic, based on the magnetic anomalies identifications - geomagnetic); N. Minerals; O. Age of the lithosphere (in millions years); O. Enumeration of the carry out studies of seamount (in summary this point include multibeam bathymetry, satellite altimetry, sidescanning, single-beam sounding, long geophysical records, magnetometry, gravimetry, geothermy, deep-sea drilling, dredged, bathyscaphes, photographs and video films etc.); P. Bibliography.

The suggest data base model is justify in the statistic analysis of the morphometry and morphology of seamounts.

Abstract 85

Session: 2 - Standards and interoperability

Results of the IODE-JCOMM Standards Forum

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In January 2008, a Standards Forum will be held at the IODE Project Office in Oostende, Belgium. The meeting is purposely limited to a manageable number of invited experts with a list of topics to consider that is expected to be longer than can be accommodated at the meeting. Since this is the first attempt to convene such a meeting, organizers have decided to structure the meeting this way. This talk will provide an overview of the topics discussed and for which initial agreement was reached as well as those for which agreement was not attainable. Equally important, the meeting will decide on a process to engage the wider community to validate the agreements reached at the meeting and to build the broad community support needed to establish a standard. It is hoped that participants at IMDIS will provide their views on both the results and the standards process proposed from the meeting.

Putting Meaning into SeaDataNet

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SeaDataNet is built upon a foundation of metadata that tells the software what to do with the data. For this to happen, the metadata has to carry information in a form that machines can understand. The metadata formats developed and populated during SeaSearch were based on plain language fields, which are virtually useless for this. Something had to be done.

The solution developed for SeaDataNet is based on technology known as the Semantic Web (Berners-Lee et al., 2001)1. The metadata fields are populated using encoded strings known as a Universal Resource Names (URNs). Each URN may be resolved through simple string manipulation (eventually to be provided by a SeaDataNet resolution service) into a Universal Resource Locator (URL) that points to a location on the internet holding semantic information.

Each SeaDataNet URL points to the Vocabulary Server developed by BODC as part of the NERC DataGrid project and delivers an XML document containing semantic descriptions of the resource in human-readable form. More importantly, it also contains a list of URLs to other semantically related resources together with a standardised description of the relationship between each pair. In other words a subject URL, a predicate and an object URL that form the components of a Resources Description Framework (RDF) triple: the fundamental building block of the Semantic Web.

The resulting semantic framework may be used to underpin automated data synthesis, semantic cross-walking or semantic discovery. For example, if a user enters 'pigments' into a search engine it gets matched by a Vocabulary Server search method to a node in the semantic infrastructure. This is realised as an XML document containing the URLs to related broader terms such as 'chlorophyll pigments'. These in turn are realised as documents representing even broader terms such as 'chloropyll-a' and 'chlorophyll-b'. If the broader terms found walking the chain are added to the target list, datasets labelled 'chlorophyll-a' may be located by a search for 'pigments'.

Operationally, the Vocabulary Server used by SeaDataNet contains over 100,000 terms in 100 lists linked by a store of almost 40,000 RDF triples. This provides significant semantic functionality that will be considerably enhanced as work currently underway to double the size of the RDF store by encoding additional mappings is completed.

http://www-personal.si.umich.edu/~rfrost/courses/SI110/readings/In_Out_and_Beyond/Semantic_Web.pdf

Delayed Mode Quality Control on ARGO floats at the Coriolis Data Center

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Recalibrations of ARGO floats cannot be easily performed. A remote calibration method is required to correct salinity sensor drifts by using hydrographic reference database. For some years, the Argo Science Team has been working on defining salinity delayed-mode procedures designed to specifically check artificial drifts and offsets. At the Coriolis data center, the OW method has been applied to the floats of Atlantic environment to produce the delayed mode dataset for some French projects. The objective mapping scheme OW is an amalgamation of studies by Bohme & Send (2005) and Wong et al. (2003). Each float is scrutinized for the delayed mode QC following the steps defined by Argo; a large coordination has taken place between the PI and the data center to study the results of the method.

Since this application has been done on some floats older than three years, it appears that some of them show offsets or drifts, at least for the latest cycles. Most of them can be easily corrected from the DMQC method, but for the floats showing an irregular behavior, specially when a significant drift appears, break points are calculated to apply specific procedures. Complementary diagnostic plots have been developed by PIs and providing to the Coriolis Data Center to compare DMQC results with CTD, neighboring profiles, temperature and salinity residuals, and fields of climatology.

Most of Coriolis floats have been processed in delayed mode. The spool of calibrated salinity dataset is regularly updated. The delayed mode data and statistical uncertainties have been integrated into the database and can be downloaded from the Coriolis Data Center.

To be able to properly apply the OW method, a major point is to have a relevant reference dataset, which should be supplied by the CTD carried out during the float deployment. This is the base of the ARGO Regional Dac.

Abstract 88

Session: 2 - Standards and interoperability

S-100 – The New Hydrographic Geospatial Standard for Marine Data and Information

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Hydrographic and bathymetic data usually forms a fundamental backdrop to all activities associated with the seas and oceans - ranging from navigation through scientific resaerch, protection of the marine environment and exploitation and management of marine resources and ecosystems.

The International Hydrographic Organization (IHO) is the intergovernmental consultative and

technical organization established in 1921 that coordinates global hydrographic and charting standards. The IHO is a technical contributor to ongoing developments in global ocean mapping programmes including the GEBCO digital Atlas. The IHO is recognized by the UN as the competent authority on hydrography and associated maritime geospatial subjects.

IHO Special Publication 57 (IHO S-57) is the IHO Transfer Standard for Digital Hydrographic Data, which encompasses bathymetry and all of the other features, objects and information depicted on nautical charts and included in supporting nautical publications such as tidal predictions. S-57 was published in 1992 to enable the transfer of all forms of hydrographic data in a consistent and uniform manner. However, to date, S-57 Edition 3.0/3.1 has been used almost exclusively for encoding Electronic Navigational Charts (ENCs) for use in Electronic Chart Display and Information Systems (ECDIS).

A contemporary ISO-compatible standard, to be known as S-100 is now being developed to better meet the requirements of a much wider range of potential users of hydrographic data, not solely mariners. In particular, S-100 is being modelled on and aligned with the International Organisation for Standardisation (ISO) 19100 series of geographic information standards. This will mean that hydrographic, bathymetric and associated marine geospatial data can be collected, maintained, distributed and used in a common and widely accepted format.

Abstract 89

Session: 2 - Standards and interoperability

Multi-standards metadata cataloguing tools for ocean observatories

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This paper presents the goals and first results of an ongoing data management project at MBARI (Monterey Bay Aquarium Research Institute).

According to institutes and projects, informational resources are produced in heterogeneous ways but are needed for different studies related to the marine domain. Currently, in order to easily describe and retrieve informational resources, users should implement reference metadata standards. These standards aim to support the interoperability with similar systems located around the world (usually by using Web Services) and thus facilitate data locating in a more exhaustive way. Moreover, since management of spatial dimension is a crucial component of informational resources in the environmental domain, the relevant metadata standards have to deal with the ability to manage spatial information. These standards are mainly related to the common work of ISO TC 211 and OGC.

In the case of marine domain, this problem is particularly emerging in the set up of Ocean Observatories in order to improve information sharing between the different stakeholders.

Nevertheless, as these OGC standards are recent as well as complex, institutes are still using either previous standards which are rapidly becoming obsolete (like FGDC whose scope is similar to the new OGC/ISO 19139 standard) or more specific standards (like Thredds metadata element set to describe the content of files managed with the Netcdf data format) or "home made" Metadata elements sets created to manage locale needs. Most of the time these different metadata elements sets are managed with different tools and information systems based on different architectures specifically adapted to the content of the standard they manage.

The matching between metadata element sets is of course an issue to archive previous metadata and manage the related informational resources. However the real challenge to improve data management consists in the creation of an information system which manages several (previous or coming) Metadata elements sets in consistent and generic ways with friendly GUIs.

This work aims to support any kind of user (software engineer as well as thematic expert) to reach these goals by relying on a single and generic architecture which facilitates the complex implementation of several metadata standards and by considering no a priori knowledge of their contents.

By managing a metadata standard we first provide the ability for a neophyte to set up profiles in order to adapt a new standard for specific domains and specific kinds of informational resources. Thereafter, according to the profiles set up, we aim to make editing and search of metadata sheets as efficient and easy as possible for the users. In particular, we propose the use of tools like Web Map Services and Controlled vocabularies whose content is adapted to their specific context of implementation. Finally the system will be compliant with a standard implementation by generating exports of standards instances (usually XML files) to share data descriptions between information systems and thus support their interoperability across the Web.

In this presentation, we will detail the benefit of this generic approach used to manage different standard Metadata element sets in a single information system. The generic approach is formalized in conceptual models by using UML language. The presented models allow the management of Metadata standards and a semantic referential to manage the values related to thematic and spatial descriptions, we will present the particular interest of this approach for users to improve their data retrieval based on spatial and semantic queries (use cases). These UML models could be implemented with any kind of languages, however we have chosen SQL as some RDBMS with spatial extension (implementing OGC/SFS) enable a better management of spatial information and the use of friendly GUIs (especially Web Mapping Tool like MapServer). Moreover, as XML schema is the emerging standard used to deliver OGC and several other Metadata standards, we are developing a script to automate the import of XSD files into the physical model of our database which implement these generic approach. We will finally present and discuss the current results according to the standards used (Thredds, SSDS, ISO 19139, SensorML).

Semantics for the Sea of Data

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Abstract

Integration of data from different data bases that are maintained by different organizations and for different purposes is a general problem that appears in a lot of domains and communities. In this paper we will discuss the data integration problem and how a semantics-based approach can help mitigating most problems. We will present the notion of ontologies and a tool suite which among other things supports lifting databases on an onto-logical level to simplify the data integration problem. Instead of integrating data structures, like RDBMS tables or XML files, a mapping process between conceptual models leverages the potential of semantic models for the data integration problem.

the semantic web

The vision of the Semantic Web goes back to the inventor of the World Wide Web Tim Berners-Lee [Berners-Lee 99]. The original W3C Semantic Web Activity Statement said that "the Semantic Web is a vision: the idea of hav-ing data on the Web defined and linked in a way that it can be used by machines not just for display purposes, but for automation, integration and reuse of data across vari-ous applications." Thus, the integration issue is at the core of the Semantic Web. Usually the Semantic Web community is perceived as a couple of geeks that define hard-to-understand standards, which can easily be real-ized with plain XML means . A substantive portion of the Semantic Web community has a background and his-tory in Artificial Intelligence and Knowledge Representa-tion. These areas, traditionally, cope with machines try-ing to understand data. Only by choosing some represen-tation language that is capable to represent a conceptual model rather than a data structure machines can truly become interoperable. The W3C Semantic Web Activity Statement continues „In order to make this vision a real-ity for the Web, supporting standards, technologies and policies must be designed to enable machines to make more sense of the Web, with the result of making the Web more useful for humans."

The general idea of the Semantic Web in one paragraph goes like this: (i) everything you want to refer to is called a resource and gets a unique identifier (a URI), (ii) con-ceptual models, called ontologies, provide schema-level knowledge for these resources, (iii) resources and ontolo-gies are represented in a well-defined and commonly agreed language that machines can process.

W3C has developed a couple of recommendations to standardize the languages for the Semantic Web and re-search institutes, universities and companies have adopted these standards to create products that extract Semantic Web data, that can store and retrieve it effi-ciently, that can do reasoning and query answering with it, and that can map and translate between different models.

Though, an intrinsic aspect of the Semantic Web is its web character, most of the developed languages, algo-rithms and tools can be (and actually are) applied on a smaller, more controlled scale, e.g. within a company, or an intranet, or for a set of loosely coupled databases.

The data integration problem

After presenting the Semantic Web idea, we can apply the notions introduced there to the data integration prob-lem. Integrating few, stable databases can be achieved with a limited amount of work. But this assumes that the semantics of the database structure and its contents is well understood. Though, often the database structure can be accessed this is not true for the conceptual model behind it (e.g. the original entity-relationship model that once led to the tables with their columns, key and for-eign-key relationships). When integrating different data-bases this conceptual model would be an ideal starting point. It represents the idea behind the data base and is not influenced by artificial design decisions, which ac-count for performance issues, or are attributable to modi-fications of the data base schema over time.

With the methods provided by the Semantic Web world we can represent the conceptual models for each database in the form of ontologies. They can be seen as wrappers for the DBs according to Wiederhold's mediator architec-ture [Wiederhold, Genesereth 97]. Assuming a concep-tual model in the form of an ontology for each database, a conceptual mapping or alignment can be achieved much easier, because the conceptual layer abstracts from the details of the so called "symbol level".

In the figure we see n databases with automatically gen-erated ontologies that are manually mapped into an inte-gration-ontology. This integration-ontology provides a vocabulary that subsumes the other databases (or parts of them, depending on the mappings). This vocabulary can be used for query answering and direct access to the source databases.

Within the NeOn project ontoprise provides tool imple-mentations that exactly support the above means for in-formation integration on a conceptual level. The NeOn Toolkit provides plug-ins to:

(i) automatically derive ontologies for relational databases (mysql, MS SQL Server, Oracle),

(ii) create user-defined (integration) ontologies,

(iii) align multiple ontologies (cf. 2nd figure), and

(iv) ask queries against the now integrated model. Query answering is achieved by translating the automatic schema mappings as well as the user-defined mappings into logical rules which fi-nally access the data sources. Queries are formu-lated in terms of the integration ontology. Thus, the location of the original information is trans-parent to the user and it is possible to seamlessly combine information from multiple sources in the reasoning for a single query. As underlying knowledge representation language we use FLogic [Angele, Lausen 2003]. Ontoprise's in-ference engine OntoBroker is responsible for query answering and the database access.

Within the NeOn project the Fisheries Department of the FAO leads one use-case workpackage. The goal of this workpackage is to combine the multitude of data sources, of vocabularies and other types of information that are collected by FAO and its partners worldwide into a single Fish Stock Depletion Assessment System (FSDAS). Ac-cording to [Jaques 2007] the use of ontologies represents an "institutional trend" at FAO in the "movement to cen-tralize and standardize classifications and thesauri" and thus establishes the foundation for semantics-based ap-plications, such as FSDAS.

Conclusion

In this extended abstract we have presented an overview of how semantic web technology can solve the data inte-gration problem by lifting data sources onto an ontologi-cal level to associate them conceptually. We briefly intro-duced the NeOn Toolkit that provided computational means to create the needed models and to establish the ontology mappings that are required to provide integrated views on a multitude of data sources.

Abstract 91

Session: 2 - Standards and interoperability

Oceanographic Information in INFORM@R: Data Interoperability through XML

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and the EMEPC Team

The correct management of marine environment information must engage the efficient execution of several tasks, such as: data acquisition, archive, quality control, cataloguing, exploration and dissemination.

InforM@r (a Marine Environment Information System for Portugal) aims at taking action on issues associated with marine and coastal environment data management contributing, therefore, to the advance of Marine Sciences.

Physical Oceanography is one of the thematic areas of InforM@r. The variety of the measuring devices and acquisition techniques in this area promotes a wide diversity of data formats. Both at national and international levels, the data formats and structure vary from institution to institution, with devices and researcher among several other features (Wright, D. J. et al, 2007).

The data loading mechanisms used by three oceanographic data centres (DC) providing online data were considered. They include decades of information and observations of several marine domains acquired with a diversity of devices provided by many national and international institutions within multinational projects. Relevant items were considered for each DC, such as: data type and origin, submission methods, file formats and data processing sequences for migration, dissemination and associated costs. Each one of the DC takes on different approaches for a common goal: integration and availability of oceanographic data.

This work considers a solution for data loading of different types of data files provided by several ocean data holders. A comparative study was made to take into consideration different data loading mechanisms. The procedure adopted being the one that is considered to better accomplish data integration requirements - is XML (eXtensible Markup Language).

XML

XML is a language developed since 1990 by the World Wide Web Consortium (W3C). It works as an open format for information exchange and independent of the platform on witch is used.

XML was the method used in InforM@r for data exchange and data migration. This solution was adopted as an attempt to minimize the efforts required for all the participants in the data exchange process promoting the interoperability between various systems and applications.

In order to take advantage from ocean data, data holders must publish their metadata and therefore instigate scientific and universities interests. Taking this into account, XSD (eXtensible Schema Definition) and XML files were developed for metadata tables in order to allow its migration into InforM@r's database. Interested metadata providers receive auxiliary documents on how to proceed with the XML and XSD files and only have to map their data into this specific structure. Various software can be used to open the supplied XML. This fact facilitates the process of data loading. The XML files are then sent back to the InforM@r team which is responsible for conformity verification. The structure of these files is then transformed using XSLT (eXtensible Stylesheet Language Transformations) files that allow automatic metadata loading into the corresponding tables of the database. In a final stage, these metadata are published using Internet services.

Conclusions and future work

The main concerns throughout the InforM@r project development were system's interoperability and adaptability to various structures and data types in order make its use as broad as possible, and the efficient management of several data types as well as granting the correct privileges in the information access.

XML came out as the selected method for data and metadata loading, once it doesn't require any kind of specific knowledge or data modification to the user. Using XML, InforM@r has no restrictions in terms of data formats; on the contrary the system is open to any type of file.

Along with the InforM@r project other initiatives have already taken place concerning the use of XML as a mean for promoting data interoperability, such as, MarineXML. MarineXML is a standard for marine data exchange. As future work MarineXML initiative will be further investigated and possibly adopted as the InforM@r standard for data exchange.

Abstract 92

Session: 2 - Standards and interoperability

CDI/THREDDS Interoperability in SeaDataNet

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Introduction

SeaDataNet is a standardized distributed system for managing the large and diverse data sets collected by the oceanographic fleets and the new automatic observation systems. By use of standards for communication and new developments in information technology, the 40 in-situ and satellite marine data platforms of the partnership are providing metadata, data and products as a unique virtual data centre. The core of the SeaDataNet infrastructure is represented by some discovery services (e.g. EDMED, EDMERP, EDMO, CSR, EDIOS) and the Common Data Index, an XML document allowing the access to data in a distributed system.

The tradition of creating formal data centers to house and distribute ocean data and products has long been shadowed by the parallel existence of direct data downloads from research groups (usually via HTML page-links and/or FTP servers). Historically, at least half the data available to researchers has been available outside the IODE/World Data Center System facilities. During the last decades efforts have been dedicated to create a new system of internet communication (e.g. the Data Access Protocol [DAP]) that would allow users to access distributed datafiles directly, using a family of "software engines" that overlay datafile caches, allowing retrieval of files in desired formats, no matter what the storage format might be.

SeaDataNet infrastructure is building some infrastructure blocks allowing to manage some legacy problems related to different information systems. In particular, it is constructing a 'bridge' between the SeaDataNet CDI and the THREDDS middleware services.

Distributed Catalog Services

According to the general definition, geospatial data catalogs are discovery and access systems that use metadata as the target for query on geospatial information. Indexed and searchable metadata provide a disciplined vocabulary against which intelligent geospatial search can be performed within or among communities [D. Nebert, The SDI Cookbook, ver. 2.0, 25/01/2004].

Due to the existence of many disciplinary application profiles, cross-domain a catalog service must be able to address heterogeneity as well as distribution. This implies the implementation of catalog components for query distribution and virtual resource aggregation by applying mediation approaches. These catalogs may be referred to as fully distributed catalogs. In fact, these solutions must implement distributed discovery functionalities in a fully heterogeneous environment, which requires metadata profiles harmonization as well as protocol adaptation and mediation. Catalog clearinghouse component should realize fully distributed catalog services. Indeed, the development of catalog clearinghouse solutions is a near-term challenge for cross-domain spatial data infrastructures, such as: INSPIRE, NSDI and GEOSS.

Catalog clearinghouse component adopts a federated architecture to federate data & metadata services, distributing client queries. Some important benefits are: usability (i.e. one-stop-shop server) and performance -where caching and/or parallelism is enabled. On the other hand, there are some issues to be addressed; important ones are: cyclic queries, data identity, heterogeneous resources mediation.

Standard Specifications

Abstract model for distributed catalog service is formalized by OGC CS-W which complies with the ISO 19119 (Geographic information — Services) requirements. CS-W functionalities includes discovery as mandatory capability (i.e. Metadata Query & Presentation) and a couple of optional capabilities: session (i.e. initialize, close, status) and management (i.e. harvest, transaction).

In our opinion, the distribution aspects should be further specified, becoming another optional capability. Besides, distribution cannot be fully addressed without considering mediation capabilities. In fact, catalog services heterogeneity (e.g. the different CS-W application profiles) is present and it is going to stay. Therefore, we proposed an extended functional model for implementing fully distributed catalog services.

GI-cat

Based on the proposed extended model, we developed a fully distributed catalog solution, called GI-cat. GI-cat implements a framework to federate well-accepted catalog, inventory and access standard services. As for International standards, GI-cat supports the OGC: CS-W, WCS and WMS. As far as Community standards are considered, GI-cat federates the following services: UNIDATA THREDDS catalog service, the CDI (Common Data Index) and the GBIF (Global Biodiversity Information Facility) catalog service.

The solution is especially conceived for Imagery, Gridded and Coverage Data (IGCD). It supports distributed queries over a hierarchical data model, supporting incremental queries (i.e. query over collections, to be subsequently refined. It supports translucent and opaque service chaining. GI-cat is a framework consisting of several modular components which implement the different capabilities of the extended distributed catalog model.

In the framework of the SeaDataNet project, GI-cat is used to mediate between resources made available through federated THREDDS and CDI services, exposing them through a unique and standard CS-W interface.

Platform code governance, how it works and how we can improve it

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1.1 Summary

ICES has been co-ordinating the creation and assignment of platform codes for a long period of years. However with the increasing complexity of the demands of the research community and political changes in countries using the system, the co-ordinating role of ICES in the 1990's was weakened. One of the aims of the SeaDataNet project is to co-ordinate many of the marine standards used internationally, including platform codes. ICES joined the SeaDataNet project in April 2006 with the aim of re-establishing its role in the co-ordination of standards, and specifically platform codes.

To date, user requirements have been written and agreed between main partners for the Platform code list. An existing database has been expanded and the common definitions and attributes agreed in the user requirements have been introduced. Interfaces have been developed and technical/content governance of the Platform code list has been established. Version tracking has been incorporated and the Platform code list is now available to the public on the web. The harmonizing of the coding of vessels between organisations is an ongoing process. This paper explains the basics of platforms and their value to the marine research community and how we can strive to manage them more effectively.

1.2 What is a Platform and why do we need a coding system?

Historically, ICES has maintained a list of ship codes, which contained information about research vessels and ships of opportunity. As part of the SeaDataNet project, this definition has been broadened and we now refer to platforms:

"A vehicle, structure or organism capable of bearing scientific instrumentation or tools for the collection of physical, chemical or biological samples."

However, as this could potentially become a very extensive list, in practice we narrow our context to the marine research environment. It is important to note there are other complementary lists maintained by other organisations, including satellites and aircraft.

There are several reasons why this information is important for anyone working with marine data. First and foremost, it provides context. We need to know how data was gathered, and that goes beyond the actual recording device, as two identical devices on a commercial ship and a research vessel may be placed differently, maintained and calibrated in a different manner. In a similar way, compatibility is also important when dealing with data – knowing the different limitations of particular research vessels aids the researcher when they are compiling datasets from across a region. Last of all, using platform coding allows data centres to exchange data in a consistent manner that can be followed over time, a key aim of SeaDataNet and its partners.

1.3 Features of a Platform code

The ICES/SeaDataNet platform code list contains over 8600 records. By historical convention, the code itself comprises of a 2 character country code combined with a 2 character platform identity – we should note that this code can be extended beyond 4 characters and it will be necessary to do this in the future. A code can have a number of attributes, related information that helps identify the platform and track it over time i.e. Call sign, Commissioned date. At the January 2008 meeting of IODE/JCOMM it was agreed that the platform list would incorporate mapping to ISO 3166 country codes as an attribute. Attributes are extensible, if a new attribute is deemed necessary by the platform governance group it can be added. The platform list is version controlled and downloadable, which allows data centres to exchange data with the confidence they are referring to identical platform information. A new feature that is now available is a web service which allows anyone to link their web application directly to the 'live' list of platforms and their attributes.

There are two historical anomalies in the platform list, because the list has been in existence and in continual use for a long period, it would take a major effort to change the information at data source. The way ICES/SeaDataNet deals with this is described below.

1.3.1 Existing platform code split into multiple codes

A major effort has been made by contributors to weed out codes that have been used for more than one ship. For example, a ship could be decommissioned and a new ship with the same name and call sign may have taken the existing code in the database when a new code should have been generated. It will be up to each country which code they use in their own databases but the tracking facility will allow international linking to the correct code via the dates. An example of multiple code tracking is shown below.

1.3.2 Multiple codes, same platform

This situation has occurred in periods where the governance of the platform list has been disaggregated. A typical scenario would be where a country has split into smaller units or a ship has changed hands between countries – the result is the same ship being referenced by two distinct codes depending on which county you are viewing it against. We map and track these anomalies in the platform code list.

1.4 ICES/SeaDataNet Platform code governance

In 2006, as one of the SeaDataNet/ICES tasks, the platform governance group was established and ICES made modifications to their existing ship code system to facilitate the new framework. Below is a diagram that depicts the workflow for governing Platform codes in the ICES/SeaDataNet framework.

Starting from the top left, a request can originate from any source. The ICES Data Centre then checks for the existence of the platform in our platform list (RECO), the list maintained by the NODC in the United States and finally a check is made against the Lloyds marine register and extra information is also gathered. If the platform exists, this is simply reported back to the requester and the request is marked as completed. If it is a new platform or it is an update to an existing code, the request with supporting information is sent to the SeaDataNet platform group. The group then has a time limit, in which they should reply if they have any objections or clarifications to the proposed/amended code. The request then passes back to the ICES Data centre where it is quarantined for a week – pending any late objections or changes. After this time, the code is created in the platform list and the code becomes available for use by the community.

1.5 Governance issues and ways to improve the system

What is presented above is the system that we follow, however through experience it is clear that it is not a perfect system. Presented below are the issues that ICES/SeaDataNet face and suggested methods for dealing with them.

Issue: Sending request to entire platform group - this means there are multiple points of entry into the workflow and the platform group may react on a platform before the Data centre has determined the validity of the request.

<u>Possible solution</u>: ICES Data centre to take first contact and feeding to the platform group if the request is valid and not already in the system.

Issue: Errors in information supplied in request – this is time consuming to check and can lead to a platform being created that is erroneous, once a code is activated and potentially in use it cannot be deleted.

Possible solution: Requesters should take more care when making a request. Like all data, the closer it is inspected at its origin the easier it makes the downstream processes.

Issue: Silence as acceptance - the platform group only acts on incorrect platform codes otherwise it is assumed the platform is acceptable. In busy times or holiday periods this can be an issue.

Possible solution: An acceptance confirmation should be sent to the Data centre in all cases. However, whether this is from one individual or the group is debatable.

Issue: Corrections and amendments after the code is made live - in the workflow above the 1 week quarantine is often not long enough, in some cases the code is released and then amendments come in weeks after.

Possible solution: The waiting period should be clearly defined by the platform group and adhered to by the Data centre. All requesters and the platform group should be aware of this time sanction.

Issue: Turnaround of platform code creation can be slow - this can be because of incorrect information but other factors can be responsible.

Possible solution: Data centre has split the task to reduce bottlenecks and assigned more resources to managing the workflow as well as information services to report the status of requests.

In-situ delayed mode QC at Coriolis Data Center - Reprocessing 2002–2006

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Since end 2007 Coriolis has set up a new product dedicated to operational oceanography centres that wants to perform reanalysis. It covers the period 2002-2006 and we plan to extend it to 1992-2007 in 2008.

In addition to the near real time validation done on a daily and weekly basis for forecasting purposes, it has been decided end 2006 to create, from the Coriolis database, a "reference product" updated on a yearly basis. This product has been controlled using an objective analysis (statistical tests) method and a visual quality control (QC). This QC procedure has been developed with the main objective to improve the quality of the dataset to the level required by the climate application and the physical ocean re-analysis activities.

Each measurement is quality controlled, both in real-time and delayed mode. On each profile or underway data , individual automatic tests (peak detection, ...) and statistical tests (comparison with climatology and neighbour measurements) are processed. On doubtful data visual control by ocean physics expert is performed. As a result of these tests, quality control flags are assigned to each measurement and included in the product. Automatic tests are specifically used in real-time

The reprocessing of the 2002-2006 period is a global and annual delayed analysis of the content of the database and an additional validation of the dataset collected in real time and delayed mode during this 5 years period, which provide T and S weekly gridded fields and individual profiles both on their original level and interpolated level.

The process has been done in two steps using two different time windows, corresponding to two runs of objective analysis, with an additional visual QC inserted between. The first run was done on a window of three weeks, to capture the most doubtful profiles which were then checked visually by an operator to decide whether or not it was bad data or real oceanic phenomena. The second run was done on a weekly basis to fit the modelling needs.

To have a better understanding of the database state for the 5 years of reprocessing and the quality of the validation procedure at Coriolis and other Data Centers, additional statistics are also processed with the results of the first run of objective analysis.

Weekly gridded fields and maps for 2002-2006 as well as the profiles both on original and interpolated levels are provided. Temperature and Salinity fields are reconstituted on ½ degree grid, on more than 50 levels from the surface down to 2000m. Maps are available at different depths levels (10m, 100m, 300m, 1000m, 1600m).

This new Coriolis product is available on a ftp site, an OPeNDAP server and through Coriolis website

(http://www.coriolis.eu.org/cdc/global_dataset_release_2007.htm)

MDIP and MEDAG: Working to deliver improved access to and stewardship of UK Marine data and information

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In the United Kingdom, marine data and information are collected by a variety of UK government, non- government, academic, private sector and other research organisations for many different reasons. This disparate structure causes inefficiencies and delays in all activities which require access to marine data and information from different sources, such as marine planning , environmental assessments, marine environmental monitoring.

Impending new legislation in the UK and Europe places an increased focus on these issues. In March 2007, the UK Government launched the white paper for the Marine Bill, which will provide an integrated approach to management of our marine environment by bringing together a range of legislative functions under a Marine Management Organisation, introduce new systems for marine planning and licencing, and provide for new mechanisms for conservation of marine ecosystems and biodiversity. At the same time, the European Commission is working to implement its Marine Strategy Directive, which also plans to adopt a integrated marine ecosystem management approach.

As new questions are asked of marine science and more holistic assessments required, it is essential that a coordinated approach to the management and stewardship of marine data and information is adopted.

The Marine Data and Information Partnership (MDIP) and the Marine Environmental Data Action Group (MEDAG) are working together to address these very issues, with a shared vision to deliver improved access to and stewardship of UK marine data and information.

This paper discusses the challenges posed by new requirements on marine data, considering in particular the potential impact of new legislation. It will present new resources offered by MDIP and MEDAG, including new web based marine data search facilities. It will also describe how MDIP and MEDAG plan to work together over the

coming years to develop key common resources of benefit to the whole UK marine community.

A Pipeline Support Vector Regression Method to Thin Large Sea Data On-Line

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The ocean surface wind vector field is a key element for short term weather forecasting. Those forecasts are needed to issue timely and accurate ocean and coastal weather warnings to avoid major catastrophes. Much recent research attempts to measure and forecast ocean surface wind speed using data provided by satellites. Analyses based on these massive data sets should be done on a subset of the full retrieved data set.

In this paper we expand previously completed research that used support vector regression (SVR) to extract a data subset composed of support vectors. We develop a pipeline method based on SVR and Voronoi tessellation to handle an on-line stream of the above-mentioned massive data sets. At any specified time, the developed algorithm provides a subset that can be used to initialize numerical weather prediction models. Experiments show that the on-line initialization subsets reconstruct the wind vector field with a high degree of accuracy for the whole data set.

Abstract 97

Session: 2 - Standards and interoperability

Development of quality control procedure for the Black Sea in the Main Hydrophysical Institute

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To make data quality check for data loading into the MHI BOD the oceanographic data quality check software for the Black Sea was developed. It allows doing automatic and visual data quality control.

We have studied the experience of data quality check used in various projects such as

WOD, MEDAR/MEDATLAS II, NATO TU BLACK SEA and others. Summing up this experience we developed a scheme and software to provide jointly automatic and visual data check.

At the first step metadata are checked.

Metadata control provides:

- duplicate cruises and profiles check;
- data and chronology check;
- ship velocity check;
- location check;
- sea depth check;
- observation depth check.

Duplicate cruises check

This is one of the most difficult positions of checking. The duplicates check includes:

- check of the same ship names and cruise numbers;
- check of cruises with the same dates;

- visual check of superposed stations.

Check for duplicate profiles

- automatic check of the same station positions and dates (within 1 mile, 1 hour)
- visual check of the cruise positions on maps
- visual check and comparing on one plot.

If a user detects that two analyzed cruises are incomplete copies of the same one he can compare profiles of overlapping stations and recompose this cruise from complement parts.

Data and Chronology check

- The day must be between 1 and the number of days in a month.
- The month must be between 1 and 12
- The date and time of the profiles must be within the cruise duration.

The vessel speed between the each two subsequent stations is calculated. If the speed is higher than permissible one for the given vessel (including a period for a station accomplishing) the visual check should be done.

Quality check software includes a high-resolution array of geographic coordinates of the Black Sea shore. Location of any station is checked to be within the region based on this array. A user can also load his own coordinate file.

We prepared data sets of the Black Sea depths on 11 miles grid. Depth is given in metadata, and if it is absent the last sounding level is checked. If there are any differences the visual control and correction should be done.

After metadata checking, at the second step temperature and salinity data are checked.

Hydrographic data control includes:

- density inversion check;
- spikes check;
- climatic check.

Climatic check includes:

- three standard deviations check;
- check of density at standard depths;
- check of temperature and salinity on isopycnal surfaces.

Hydrological data are checked for detection of density inversion. Users can determine the reasonable range of density inversion. Data that have not passed this check can be checked and corrected visually.

We use the IOC check procedure and take into account the difference not only between values but also between gradients.

In general the spike test requires visual validation.

We calculated climatic characteristics (mean and Mean Standard Deviation) for different squares of the Black Sea for each month. To divide into districts we used a scheme of 4060 minutes (40•40 miles) squares accepted with Hydro-Meteorological Service of Ukraine. The scheme also accounts spatial variability of hydrological elements.

Some squares with considerable spatial variability were divided into 4 parts and climatic characteristics were calculated for each of them.

The climatic characteristics were calculated for the 19 standard depths.

Time resolution is monthly from the surface down to 300 m and annual below.

All new data are checked to be within 3 Mean Standard Deviation difference from the mean. Data that have not passed this check can be checked and corrected visually.

This is an example of climatic check of salinity. For Temperature and Salinity we used only 4 QC flags. They are: 0 - passed, 1 - not in climate, 2 - spike, 3 - corrected.

The same procedure is applied for some hydrochemical data such as hydrogen sulfide and oxygen. For other hydrochemical parameters the Range method similar to MEDAR/MEDATLAS II is used. But we use here more detailed spatial and depth ranges. In any case the expert analysis is necessary for these hydrochemical data. All the data in our database have passed this analysis.

Oceanographic data quality check software provides:

- Both automatic and visual metadata check;
- Both automatic and visual temperature and salinity check;
- Possibilities of metadata and data values correction during each step of quality check procedure.

It includes:

- High quality temperature and salinity climatic arrays for the Black Sea;
- Data sets of the Black Sea depths on 1×1 miles grid;
- High-resolution array of geographic coordinates of the Black Sea shore.

Abstract 98

Session: 2 - Standards and interoperability

The ATOLL information system: standards and data model

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ATOLL is an information system developed at CLS to present or search, discover and understand, access, visualise and analyse ocean products derived from satellite centers or ocean forecast centers.

An overview of the process to implement the ATOLL information system will be first presented. The overall objective was to create a logical data model that will describe the various critical entities of the ocean products and the relations among them, based on ISO and OGC standards.

The presentation will end with practical demonstration of the current information system, what we reached and what we will reach.

Abstract 99

Session: 2 - Standards and interoperability

The Irish Spatial Data Exchange – a distributed metadata search facility

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Marine spatial data in Ireland is created and used across a wide variety of public service and private sector organisations. This data can be used for decisions relating to the human, physical and biological environment. While data is costly to acquire, its potential for reuse is often not fully realised as potential users are unaware that the data exists. ISDE aims to allow distributed data discovery across organisations.

ISDE allows marine (and other) spatial data to be discovered across multiple organisations by users through a single search point. By allowing data to be discovered, ISDE provides a mechanism for data to be shared and reused.

The proliferation of 3rd party metadata can cause large maintenance overheads and inaccuracies. ISDE also allows each organisation to retain control over their data and metadata by querying each organisation's own data catalogues. This ensures that users are always searching the most up-to-date information.

ISDE provides partner organisations with a common mechanism for implementing their metadata requirements. ISDE also allows each organisation to integrate the search user-interface with their own website, thus providing multiple entry points to the system.

ISDE is based on standards and specifications such as the ISO 19115 standard and the OpenGIS Catalog Services Specification 2.0.2 (ISO 19115/19119 Application Profile for CS-W 2.0.2).

ISDE is currently a working prototype, with three partners' metadata catalogues connected to the system. ISDE will be rolled out in a production status in 2008.

Quality Control protocol for an autonomous underwater glider

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The present contribution presents the results of the research that has been done so far in order to accomplish the motion analysis and the design of an autonomous underwater glider.

Gliders have applications for remote sensing of physical, chemical and biological parameters, in oceanography. These vehicles are rapidly becoming important assets in ocean sampling and have strong potential for application in environmental monitoring. The design concept of underwater gliders enables their long term deployment in the sea. Being autonomous they have lower operating costs, making them ideal candidates for large scale sampling tasks. Gliders are well suited to extended missions such as collecting sensor data while traversing a chosen path or maintaining position. They are reusable (nonpolluting), can be deployed from small boats, are controlled remotely and report their measurements shortly after are made. They can also operate individually or in a group.

The underwater gliders are traveling through the sea by changing their buoyancy and moving internal mass. The basic principle of operation is simple: a rigid body immersed in a fluid sinks, floats or rises depending on whether it is negatively buoyant (heavier with respect to the surrounding fluid), neutrally buoyant (the body's mass equals the mass it displaces in the surrounding fluid) or positively buoyant (lighter with respect to the surrounding fluid). The mechanism of the underwater glider that effects the change in buoyancy is called the 'buoyancy engine'. This is usually accomplished by the existing gliders by pumping a fluid (oil or water) between an internal reservoir and an external bladder in order to change the vehicle volume, thus changing their relative density with respect to the surrounding fluid and their buoyancy. The pumping energy is typically derived from electric batteries. The underwater gliders can also adjust their attitude and flight path angle moving a battery pack or an alternative internal mass fore and aft in order to move accordingly the centre of gravity relative to the centre of buoyancy. A purely horizontal displacement may by obtained by combining a series of downward and upward straight gliding motions. While ascent and descent vertically, they can collect oceanographic data along the way.

The design of underwater glider requires at first the dynamic modeling of the vehicle considering the coupling between glider's motion and internal masses. The hydrodynamic design of the hull is made considering the forces of gravity and buoyancy, the effects of added mass and inertia due to motion in a dense fluid, hydrodynamic forces including lift, drag and moment. The solving of the glider's equations of motion in the time domain is required in order to proceed to the design of the controller. It is very important to develop control algorithms that will be using the natural dynamics of the glider in the most beneficial way so that the on – board energy consumption is minimal. Eventually the determination of the technical characteristics of the glider can be made.

So far forth the dynamic modeling of glider has been made, introducing at first the glider kinematics to track its orientation, position and motion. The inertial and body – fixed frames of reference and conversions between them are expressed. The body of the glider is considered with fixed wings and tail, ballast control and controlled internal moving mass. The three dimensional equations of motion are determined considering two internal masses: a ballast mass with fixed position of variably controlled amount and an internal moving mass whose amount is fixed. The dynamic model includes the coupling between the masses and the glider motions, taking into account forces due to buoyancy and gravity. The control on the internal moving mass is made through its acceleration and the ballast control through the ballast pumping rate. The (fluid) ballast mass is pumped in a way that its center of gravity coincides all the time with the centre of buoyancy of the vehicle. This point is also defined as the origin of the fixed body coordinate system. This reduces the complexity of the model terms while preserving the principal elements of the mathematical glider modeling.

As a further simplification, the three dimensional glider model is confined to the vertical plane in order to derive a longitudinal flight path, whose dynamics are analyzed consequently. Analysis of the longitudinal plane model is directly applicable to modern oceanographic gliders because their deployments include many path- sections which lie roughly within a vertical plane. Straight and steady velocity flights are the most common operational motions of a sea glider. Those equations of motions in the vertical plane are derived.

A longitudinal model in the vertical plane is furthermore simplified in order to examine the phugoid motion of an underwater glider. This procedure applies the assumptions that have been made by the analysis conducted by Lanchester in 1908, for the phugoid motion of an aircraft. This yields a system of four equations specifying the glider's Cartesian position, orientation and speed.

As mentioned, accurate navigation is an important ability for gliders. A model – based control design can be used to enhance navigational accuracy, but also requires the prediction of the vehicle-based hydrodynamic behavior. In order to proceed to the solution of the mentioned dynamic equations, it is necessary to determine also the hydrodynamic parameters (added mass coefficients etc.) and the hydrodynamic forces acting on the rigid glider body.

A glider shape design with hydrodynamic characteristics that lead to low energy consumption during the flight is essential. The shape of the hull is derived from a "low drag - laminar flow shape". A similar shape is already used in the "Seaglider" concept.

In the present work, a proven low - drag shape is adopted and wings are added. The shape is designed to reduce pressure drag by developing a favorable pressure gradient at the rear of the vehicle. The assembled glider geometry is inserted to "FLUENT" software, a state-of-the-art Navier-Stokes solver, for the calculation of the steady state 3-D flow around the glider, and for the prediction of the drag and lift coefficients of the body. The mesh-grid of glider's shape is generated through the "Gambit" software. Appropriate boundary conditions and velocity parameters, have been used as input, and the results are studied and evaluated considering existing theoretical and experimental results for similar gliders.

Abstract 101

Session: 2 - Standards and interoperability

The Global Geodetic Observing Systen (GGOS) – IAGs contribution to GEOSS

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Both the GGOS project and the SeaDataNet project face the same challenges concerning state-of-the-art interoperability of data, appropriate metadata as well as web-based catalog and data services. Although a variety of standards for different kind of metadata and services is available, interoperability projects on one hand side have to deal with the evaluation of the best standards and on the other hand to answer the question how to network established none standard solutions. This presentation will give an overview about the interoperability challenges of the GGOS project and will identify some solutions using ontology based methods in order to network existing geodetic data sources and services.

Abstract 102

Session: 2 - Standards and interoperability

The Aphia Taxon Match Tool, an online quality control tool for checking your biological data against the World and European Registers of Marine Species

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Aphia is the database engine behind several marine taxonomic databases, a.o. the European Register of Marine Species (ERMS, online at http://www.marbef.org/data/erms.php) and the World Register of Marine Species (WoRMS, online at http://www.marinespecies.org). Recently, a new Aphia tool has become available to the user on http://www.marbef.org/data/aphia.php?p=match

The Aphia Taxon Match Tool is a freely accessible online service that automatically matches species or higher taxon lists with ERMS and WoRMS. After matching, the tool returns the submitted file with the corresponding Aphia-IDs, the valid taxon names and information on the quality status of the names, authorities and/or the higher classification. Where available, the tool also provides the user with the corresponding ITIS tsn number. Thanks to the fuzzy matching option, the tool is able to take into account most of the commonly occurring spelling variations.

This poster aims to demonstrate the functionality of the Taxon Match Tool by applying the QC procedure to an exemplary dataset.

Abstract 103

Session: 3 - User Oriented services and products

The UNEP Shelf Programme and the ONE STOP DATA SHOP

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The UNEP Shelf Programme (USP) is the access point to a collaboration of international organisations with expertise in marine geoscience and maritime law. It was established in response to a United Nations resolution, stating that the United Nations Environment Programme (UNEP), working through the Global Resource Information Database (GRID) system, should work in conjunction with the Intergovernmental Oceanographic Commission of UNESCO (IOC) and the International Hydrographic Organisation, to assist coastal States, and in particular developing States and small island developing States (SIDS) with submissions to establish the outer limits of their continental shelf under Article 76 of the United Nations Convention on the Law of the Sea (UNCLOS).

The programme is managed by UNEP/GRID-Arendal in Norway and is designed to (i) facilitate the collection of the required geoscientific marine data to support Article 76 submissions; (ii) provide support for the processing and interpretation of the data; (iii) provide in country Article 76 task forces with access to training and workshops; (iv) support the technical and legal foundations of a submission; (v) promote the establishment of national/regional/central databanks at the completion of the project; and (vi) build long term capacity in information technology as applied to marine science data management and compliance with UNCLOS. UNEP/GRID-Arendal in Norway has devised six work phases based on the technical steps that make up the Article 76 submission process: 1) scanning phase, 2) desktop phase, 3) data acquisition, 4) data interpretation, 5) submission and 6) follow-up.

In conjunction with the Article 76 mandate, a One Stop Data Shop (OSDS) was developed to provide states preparing a submission with access to marine geoscientific data from various public institutions. Agreements with participating institutions allow for distribution of data to states on a request basis. The OSDS collects digital data (e.g. multibeam bathymetry, seismic data, borehole data) and provides a service for the

handling of analog data including seismic reflection and refraction datasets. Metadata and navigational tracklines for international marine campaigns are freely available for data availability assessments and project planning. The main technical developments which control the potential of the OSDS include the following products and solutions: i) the incorporation of the ETOPO2, world sediment thickness, GEBCO and GEODAS data bases as well as coast line and global maritime boundary information. ii) The development of new filters for formatting data so they can all be imported and exported into the relevant interpretation tool that a state chooses to use. The outputs of the OSDS are designed to be importable into any GIS and/or RDB (relational database) and are also suitable for use in article 76 packages such as GEOCAP and CARIS LOTS.

The achievement of establishing the OSDS enabled the USP team to complete a first pass scanning study of all relevant coastal states. It has thus been determined which states are likely to be interested in pursuing the submission process at least one step further (i.e. to a desktop phase).

Abstract 104

Session: 3 - User Oriented services and products

State of the art technologies for GIS Management Systems: Implementation through European Community Research Projects

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The development of new technologies for the aim of enhancing Web Applications with Dynamically data access was the starting point for Geospatial Web Applications to developed at the same as well. By the means of these technologies the Web Applications embed the capability of presenting Geographical representations of the Geo Information. The induction in nowadays, of the state of the art technologies known as Web Services, enforce the Web Applications to have interoperability among them i.e. to be able to process requests from each other via a network. With regard specifically to Geo Information, modern Geographical Information systems based on Geospatial Web Services are now developed or will be developed shortly in the near future, with capabilities of managing the information itself fully through Web Based Geographical Interfaces. At the same time the usage of many open source tolls for the development, the implementation and the integration of such applications, offers the Research Community the advantage of flexibility in issues like Research and Development opportunities and cost of development aspects. Powerful open sources tools concerning the geographical representation and management of spatial information, like UMN MapServer or GeoServer are now present and wide spread. These tools are capable to access geospatial information stored in one or more data locations and even around different networks and as well to execute complex Geospatial computations and return results in different formats. The usage of this entire technology platform (Web Services, Tools and Applications) in European's Union research projects like SeaDataNet and Huboldt enhance the outcomes of the programs producing valuable knowledge to the marine research community. The exploitation of HNODC Data Base, through a Web Based Application enhanced with Web Services by the use of open source tolls may be consider as an ideal example of such implementation.

Hellenic National Oceanographic Data Center (HNODC) as a National Public Oceanographic Data provider and at the same time a member of the International Net of Oceanographic Data Centers (IOC/IODE) owns a very big volume of data and relevant

information about the marine ecosystem. For the efficient management and exploitation of these data, a relational Data Base has been constructed with a storage of over 300.000 station data concerning, physical, chemical and biological Oceanographic information. Consequently a traditional web application was developed for the end user worldwide to be able to explore and navigate throughout these data via the use of an interface with the capability of presenting geographical representations of the Geo Information. For HNODC this approach is today considered as the fist version (V1) of an integrated web based environment for its data management and data exploitation. The target for the near future is the development of a Service Oriented Application (SOA) enhanced with the modern technologies of Geo representation, Dynamically Data Access, Data Interchange and Data transactions.

The traditional 3 Layer Web Architecture was used in version 1. The following convenient tools where intergraded for the task to be achieved:

1) An RDMBS schema for the data storage

2) Apache and Tomcat in heart of the Middle-Tier System

3) ArcIMS as the Geospatial representation Mechanism

4) And a web Interface for the end user capable for querying data and presenting Geographically the Results

Although it's geospatial capabilities this application stands only as a data representation mechanism without any data management and data processing abilities since the development based on a convenient platform (software + tools) that was not able in these days to give the advantages of Web Services. At the same time and because Web Services technology was not present yet the application lapses interoperability with other Geospatial systems.

In the new version, state of the art software components and tools replaced the old convenient modules. These are:

1) Geospatial and no Spatial Web Services mechanisms took the place in the Middle-Layer.

2) Geospatial open source tools was employed to create the Dynamic Geographical Representations.

3) Communication protocols (messaging) in all Layers is replaced in the upper levels by XML and GML together with SOAP protocol via Apache/Axis.

At the same time the application may interact with any other SOA application either in sending or receiving geospatial data through geographical layers, since it inherits the big advantage of interoperability between Web Services systems. Roughly the architecture can be denoted as follows:

1) At the back end Open Source PostgreSQL DBMS stands as the data storage mechanism with more than one Data Base Schemas cause of the separation of the Geospatial Data and the non Geospatial Data.

2) UMN Map Server and Geoserver are the mechanisms for representing Geospatial Data via Web Map Service (WMS), querying and navigating in Geospatial and Meta Data Information via Web Feature Service (WFS) and in the near future transacting and processing new or existing Geospatial Data via Web Processing Service (WPS).

3) Mapbender, a geospatial portal site management software for OGC and OWS architectures acts as the integration module between the Geospatial Mechanisms. Mapbender comes with an embedded data model capable to manage interfaces for displaying, navigating and querying OGC compliant web map and feature services (WMS and transactional WFS).

4) Apache and Tomcat stand again as the Web Service middle Layers

5) Apache Axis with its embedded implementation of the SOAP protocol ("Simple Object Access Protocol") acts as the No spatial data Mechanism of Web Services. These modules of the platform are still under development but their implementation will be fulfilled in the near future.

6) And a new Web user Interface for the end user based on enhanced and customized version of a Mapbender GUI, a powerful Web Services client.

For HNODC the interoperability of Web Services is the big advantage of the developed platform since it is capable to act in the future as provider and consumer of Web Services in both ways: either as data products provider for external SOA platforms or as consumer of data products from external SOA platforms for new applications to be developed or for existing applications to be enhanced. Further more and when the technology of Web Processing Service (WPS) will be mature enough and applicable for development, the derived data products will be able to have any kind of GIS functionality for consumers across the network. From this point of view HNODC, joins the global scientific community by providing and consuming application independent data products.

Sea Ice Information for Navigation and Science

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Our changing climate has brought unprecedented interest in the polar regions of our planet from scientists, governments, industry and the public in general. More ships, carrying more people and more cargo than ever before are venturing into the polar regions and coming into close proximity with sea ice and icebergs. It is the primary mission of the national ice services of the world, participants in the International Ice Charting Working Group (IICWG) and the JCOMM Expert Team on Sea Ice (ETSI), to provide reliable sea information for the safety of navigation in ice-frequented waters. As an adjunct, this same information is of considerable value to scientific research - particularly related to climate change.

Ice information from most of the modern ice services is provided in the form of "ice charts" - charts depicting the state of the ice in a particular region. An international standard maintained by the ETSI (Ref: Sea Ice Nomenclature of the WMO; World Meteorological Organization; WMO/DMM/BMO 259-TP-145, Secretariat of the WMO, Geneva, 1985) establishes the guidelines for these charts, including:

- how the state of the sea ice is described (total concentration, partial concentrations, stage of development and floe sizes of the various ice types present);
- graphical display of ice information, colours and symbols;
- encoding of information on the charts.

Ice charts are available from the web-sites of the individual ice services as well as by marine radio-facsimile and satellite broadcasts for ships at sea. Additionally, as an International Polar Year initiative, the ice services have established, in partnership with the Polar View project, a global IPY Ice Logistics Web Portal, where the charts from a growing list of services are collected and made available from one convenient site.

The international standards for ice charts were originally developed for paper charts distributed by facsimile or, for non-navigation uses, by mail. However, all of the modern ice services now produce their charts with Geographic Information Systems (GIS) and have adapted the chart standards to electronic versions of paper charts - such as .gif,

.jpg and .pdf formats. However, these formats severely limit the use that can be made of the charts and remove a lot of the intelligence that was in the GIS that produced them. Since many users receive their ice information into a GIS – whether it be a general purpose laboratory application or a specialized Electronic Navigation Chart system on a ship, there is a need to develop standards to govern sea ice information in digital form. Recognizing this need, the ETSI, advised by the IICWG, has set about addressing it.

In 2004, the ETSI adopted SIGRID-3, a new standard for digital sea ice charts (Ref: SIGRID-3: A Vector Archive Format for Sea Ice Charts; WMO TD No. 14; JCOMM Technical Report No. 23; 2004). The main driver for SIGRID-3 was the need of the World Data Centre for Glaciology, the National Snow and Ice Data Center, to receive and archive sea ice charts from all of the ice services. The multiplying number of digital formats was creating a logistical nightmare for the archive center and a common data format was urgently required. At the same time, it was recognized that many users could benefit from the availability digital ice charts in a common format and it was agreed that it should be based on open standards as much as possible.

SIGRID-3 specifies a standard for sea ice chart information based on "shapefiles", an open vector file format (Ref: http://www.esri.com/software/opengis/openpdf.html) together with specific sea ice attribute information and metadata that is FGDC compliant. Most commercial GIS can read shapefile and, since the format is publicly available, it is possible for custom software developers to utilize it.

An ice chart is essentially a geospatial polygon network, with each polygon representing a homogenous ice regime. While the shapefile provides the vector information ıor the boundaries of the polygons, the attribute information contained in a standard .dbf file provides the following information about each polygon:

- Total concentration
- Partial concentration of thickest ice
- Stage of development of thickest ice
- Form of thickest ice
- Partial concentration of second thickest ice
- Stage of development of second thickest Ice
- Form of second thickest ice
- Partial concentration of the third thickest ice
- Stage of development of third thickest ice
- Form of third thickest ice
- Stage of development of ice thicker than SA but with concentration less then 1/10
- Stage of development of any remaining class of ice
- Predominant and secondary forms of ice

The metadata provides information about the issuing agency, valid time, data quality, etc.

While SIGRID-3 has been especially useful for the exchange of digital ice charts with the archiving agency and for scientists needing to integrate sea ice information with other geographic information, it has been of little use for marine navigation - the most important users of sea ice charts. As early as 1995, the sea ice services discussed the idea of producing ice information that would be compatible with Electronic Chart Display and Information Systems (ECDIS) used for shipboard navigation. Most recently, on March 31, 2007, the JCOMM ETSI approved the first official version of this catalogue, the Electronic Chart Systems Ice Objects Catalogue Version 4.0, soon to be published as a JCOMM Technical Report.

The Ice Objects Catalogue Version 4.0 defines 23 ice "object classes". Each ice object class is thoroughly defined using 36 ice "attributes", which themselves have formal definitions and enumerations. The Ice Objects Catalogue Version 4.0 is consistent with SIGRID-3 as well as with the WMO Sea Ice Nomenclature.

Currently, work is proceeding to implement the Ice Objects Catalogue Version 4.0 into the International Hydrographic Bureau's Hydrographic Registry and develop an S-57 Product Specification for ice information. These will provide the essential tools that will allow national ice services to develop products specifically for Electronic Navigation Chart Systems and will allow the manufacturers of these systems to implement software to decode and display this ice information - all within the S-57 chart data exchange standard. It is expected that within several months, at least some ice services will begin offering S-57 products to the electronic chart community. Pilot projects are currently underway to demonstrate the feasibility.

This presentation will give the up-to-date status of this work as well as presenting an overview of the standards and how they can be used to obtain ice information in the most suitable format for users' applications - be they scientists or mariners.

Abstract 106

Session: 3 - User Oriented services and products

AquaRing, Accessible and Qualified Use of Available Digital Resources about Aquatic World In National Gatherings: a new semantic search engine for the web

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AquaRing is a European project to set up an innovative semantic demonstration portal for digital contents on the aquatic world. Its content is provided by European aquaria, natural history museums and science centers. The goal of this demonstration online resource, co-funded by the European Commission in the eContentPlus programme, is to allow access to a wealth of multimedia digital material and documents, with a particular focus on the sustainable use of the world's aquatic resources. The portal will make use of innovative, multilingual semantic web technology to facilitate intuitive access.

The AquaRing portal will allow access to information on the aquatic world in the form of:

- images, videos, audio files
- interactive software and e-books
- digital collections
- databases
- articles, theses, papers, documents and dissertations.

AquaRing will be available to anyone looking for information on the aquatic world. Its wide range of images, videos, articles and interactive material will make it a great resource for the general public. Parents of young children in particular will find lots of dedicated pictures, videos and activities to satisfy their youngsters' curiosity. The resource will also lead teachers and lecturers to a large amount of academic material, useful to help them planning their lessons. The media will be able to use the data for background information on aquatic environments, but also access essential contact information to get them in touch with experts on the aquatic world. AquaRing will also allow access to a host of communication tools and exhibit information of interest to managers and staff of aquaria, natural history museums and science centers.

The project will set up a global digital collection space with a number of important benefits: adding value to the individual collections by integration of distributed contents, encouraging the development of a global view of and a unified access to the European heritage in the domain; strengthening the cultural and scientific offer of European aquaria, science centers and natural history museums thanks to the networked contents and the capability of offering combined experiences to visitors; allowing visitors to explore a virtual global knowledge space according to their interests and needs, to plan and combine investigations and learning routes across the different participating centers; supporting improved education and informal learning experiences; increasing communications to and awareness of the public at large on aquatic environment conservation and sustainable management of aquatic resources.

AquaRing will breathe new life into archives of digital documents and collections. Many institutions are sitting on a wealth of valuable and fascinating digital content, which is currently not available to the general public. The portal is an opportunity to open up these resources, making them easily searchable to people from across the globe interested in the world's aquatic environments. The portal makes contributions from scientists more easily accessible to the enlightened amateur, for example, or allows aquariums, science centers and museums to reuse interactive materials initially created for temporary exhibitions.

For its multilanguage search engine, AquaRing will make use of semantic web technology, an emerging standard for the current generation of Internet users approaching a Web 2.0 paradigm. This technology puts the user's interests at the heart of the process through a conceptual search method. The digital contents (pictures, videos, documents, etc) are annotated with metadata based on the most reliable ontologies on the aquatic world. This allows the search engine to retrieve content based on conceptual associations. In other words, AquaRing will provide not only what the user is looking for, but also brings up other related content which may be of interest. As a result, contents made available through AquaRing semantic portal have a much wider potential audience.

The project initially involves 6 countries, Italy, Belgium, France, Lithuania, Spain and Netherlands, and different structures which have developed a high level know-how along with scientific dissemination and technical expertise all scientific experts and content suppliers, or specialists in electronic infrastructures. The AquaRing Consortium, thanks to the ECSITE network and the World Ocean Network is actually able to reach about 30,000,000 visitors per year.

A broader participation of external partners (including scientific institutions and international networks) and the enlargement of the actual scientific expertise are the next objective of AquaRing which will become soon part of the European Library.

Abstract 107

Session: 3 - User Oriented services and products

Integrating a Web-based GIS to a marine pollution monitoring and forecasting system

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In recent years, the increasing marine pollution has led to the development of operational systems and services for monitoring and forecasting of pollution in marine ecosystems. This work aims to integrate a Web-based Geographic Information System (GIS) to an existing system/service, developed in the framework of the MARCOAST project. The forecasting module of the system, developed by Hellenic Centre for Marine Research in the framework of the POSEIDON project, consists of a complex oil spill model, designed to use the results of three operational models (meteorological, waves and hydrodynamic) that provide every day 72-hours forecasts for the Aegean and the Eastern Mediterranean Sea. The use of accurate information on atmospheric and oceanic conditions (for the whole water column) is the main advantage of this oil-drift model, because it provides a more realistic description of the fate of oil in the sea compared to applications which use simplified approaches for air/sea conditions. The results of the oil spill model are remotely presented by means of a dedicated Web-based GIS, which allows authenticated end-users to view the simulation results in a geographical context, in the form of thematic layers overlaid on background marine electronic charts and land data. In addition to standard GIS operations like zooming and panning, the system allows the user to view an animation of the oil spill spread as well as query each hour layer for parameters like the volume of selected oil spill, its geographic position, elevation of its elements and many more. Specific applications concerning the spreading scenarios of oil spills in two selected areas of the Aegean Sea illustrate the system capabilities for visualization and mapping. Although the Web-based GIS was mainly

implemented by means of ArcIMS technology, most of its latest functionality is realized utilizing the Open Source GeoServer, which offers more capabilities and flexibility to the end-user. The added value of the presented Web-based GIS is that offers comprehensive and synthetic information through a remotely-customizable user-friendly graphical interface, to the end-user. In this context, its integration to a marine pollution monitoring and forecasting system could result in an enhanced pollution awareness and emergency management tool.

Abstract 108

Session: 3 - User Oriented services and products

A GIS interface to the French Fisheries Information System

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Developed in strong collaboration with the DPMA (Direction of fisheries and aquaculture of the French Ministry of Agriculture and Fisheries), the Fisheries Information System of Ifremer (FIS, previously called Fisheries Observatory of Ifremer) aims to build an operational and multidisciplinary monitoring network for scientific purposes, allowing a comprehensive view of fishery systems including their biological, technical, environmental and economical components.

One of the general objectives of the new FIS system consists in elaborating and providing data, indicators and products for a widespread public from the researchers, to the fishermen, administration and general public, including bio-economic diagnostics of the fisheries, and assessment of the short and long-term impacts of fisheries management scenario and measures.

To further an integrated analysis of the fishery systems, the wide range kinds of data - including acoustic surveys of water columns, biological in-situ observations, environmental observations, as well as fishing statistics (landings and efforts) or economic data - are managed in a single data management system, based on an integrated relational data base with geographical facilities.

Recent developments made at Ifremer have been dedicated to design, set up and interface a GIS to the FIS integrated database. Several data sources are combined together in the GIS, including the fisheries data of the FIS, but also complementary data such as regulation and administrative information, environmental, physical or climatology layers.

With the GIS interface, the FIS provides a tool to the stakeholders, to get a comprehensive, integrated and readable overview of the fisheries activity. This tool is also the basis used in the DPMA project "Geographic information system: fisheries and regulations", co-funded by the EC and by French organizations (IFREMER, IRD, MNHN, Agrocampus Rennes), and whose Ifremer is the master builder. This project also includes an online atlas on fisheries data.

This GIS is going to be available on-line by mid-2008 on the FIS web site (http://www.ifremer.fr/sih), by controlled access (login/password) but also in a public version (restricted data access).

Abstract 109

Session: 3 - User Oriented services and products

Enhancing information design for oceanographic applications

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Most of the oceanographic data and forecasting centers in Europe and elsewhere provide on a regular and nowadays on operational basis, information regarding the physical characteristics of the seas, such as temperature, salinity, currents, etc. This type of information is being used for a variety of applications, from environmental studies to search and rescue operations. Despite the fact that such applications have different needs and objectives, they are using the same data sets from different perspectives and by applying different data analysis techniques.

The oceanographic data sets are barely interpretable and therefore the oceanographic centers need to provide visualizations instead. The provided visualizations represent just a subset of the available data sets. In many cases, only a single type of visualization is provided – usually horizontal maps – with the assumption that it can meet most of the demands of oceanographic applications. As a result, the cognitive process required by end users to take advantage of these visualizations is maximized.

End users of oceanographic forecasting systems are called to discover alternative ways of usage for the provided visualizations in order to achieve simple goals such as to make a simple decision. For example, consider an end user- offshore fisherman- who wants to compare the temperature on surface and 30m in order to locate frontal zones. Most oceanographic forecasting systems - including CYCOFOS - do not provide a straightforward way of achieving this. As it can be derived from our experience, the end users of the oceanographic forecasting systems web sides usually open two or more windows in order to make a comparison. Such simple operations should be provided and supported by the user interface itself and not rely on users to discover them. For instance, a single window could be split in two as a way to provide two visualizations concurrently. Going one step further, we raise the question why not to subtract the two visualizations and provide a single one that demonstrates their difference.

Recent accomplishments in web map applications (Google Maps; Yahoo! Maps) as well as in rich internet applications in general (Adobe Flex; AJAX;) have triggered new opportunities for providing rich oceanographic visualizations through the web. In fact, ongoing projects (Bythos; GODIVA) research alternative approaches for on-fly generations. As a result, it is possible to provide a larger range of visualizations such as vertical profiles, vertical sections and time series. Meanwhile, numerous opportunities for interactive enhancements emerge since data is available on request. In an ideal system, a unique global user interface would be developed which could support and cover all the needs of oceanographic applications. However, the strong diversity demonstrated among applications and users does not only hinder the process of user centered design but also appears as a great barrier, especially when someone takes into consideration the poor research in the field of user interface design for oceanographic applications.

This study focuses on the field of physical oceanography with emphasis on information and user interface design and seeks not only to suggest enhancements in existing visualizations but also to examine how alternative designs support and facilitate dissimilar oceanographic applications. The latter could serve as a starting point for relevant future studies and interactive oceanographic systems. For this reason, oceanographic users, applications and existing visualizations are studied in depth aiming to identify common patterns and attributes.

In particular, it is examined how numerous factors affect the interpretation skills of end users and how several oceanographic applications take advantage of existing visualizations. Based on these findings, the application needs are categorized under three major design principles and numerous alternative designs are proposed and evaluated. In general, it is argued that the proposed designs facilitate the execution of oceanographic tasks through the provision of richer interfaces which not only support simple but complicated operations as well. In addition, users background and skills have a great impact on design preferences. Advanced users prefer plain designs that do not alter in any way the displayed data while novice users prefer simple designs that facilitate their tasks by applying mathematical formulas over the data.

To conclude, this study aims not only to provide a great theoretical understanding of oceanographic visualizations and applications but also to provide a rich set of design guidelines and preference rules for future studies in the field of oceanographic information and user interface design.

Abstract 110

Session: 3 - User Oriented services and products

Development of an information service system based on GOOGLE graphical interfaces

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An information system to access data, products, images, and general information has been developed in support to the Mediterranean Operational Oceanography Network (MOON). The following services are provided: (a) discovery services making it possible to search for spatial data sets and services; (b) view services making it possible to display, navigate, zoom in/out and to display legend information and any relevant content of metadata; (c) download services, enabling copies of spatial data sets, or parts of such sets, to be downloaded; (d) transformation services, enabling spatial data sets to be transformed; (e) services allowing spatial data services to be invoked. The services are: real time, delayed mode, on request, per application through service interface. All these services have been developed with a user friendly interface allowing a geographical, temporal, type of measure, parameter, campaign selection. The graphical selection of the area and the presentation and elaboration of data is elaborated on GOOGLE API maps. About 13,000 CTD and XBT profiles collected in the Mediterranean during the last few years are managed actually by this system. The quality of the data and the format is controlled by a software, before the inclusion in the MySQL data base. Once the data are selected, the user have access to metadata, data and graphs of each profile. He can create on the fly horizontal and vertical maps on profiles graphically selected with polylines or polygons tracked on GOOGLE maps. Data can be downloaded in different formats (spreadsheet or ascii).

The ATOLL information system: from the needs to products and services deployed

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ATOLL is an information system developed at CLS to present or search, discover and understand, access, visualise and analyse ocean products derived from satellite centers or ocean forecast centers. It has been developed 1- To ease management and coordination with interfaces: producers, data manager, services and users (see image attached), 2 - To base the system architecture on existing systems at CLS (SALP/AVISO, and MERCATOR ocean), to minimise the cost and impacts and to pull information technology standards (cf. Inspire), 3 - To benefit of achievements and conclusion reached within european projects (Mersea IP, ECOOP, Seadatanet, Humboldt, BOSS4GMES), 4 - To develop interoperability with external catalogues and 5- To enable the birth of new integrated ocean services by showing the full potential of data sets, aggregating and virtualising products and creating new product concept through the use of GIS services.

The presentation will start with a definition of the terminology used - information system, products, users, network services -, and reviewing the Inspire context. Then we will comment on the ATOLL functional needs (diversity and perimeters of products, up to date ISO reference of all products, historical and real-time, support producers and services by maintaining data specification and a registry of OGC networking services, a monitoring of the operational workflow) and functional architecture deployed with specific comments on interoperabilty and standardisation issues, and commitments to Inspire.

The presentation will go on on what we reached through practical demonstration of the current information system deployed: an overview of the products it managed, user scenarios deployed (direct or indirect access), steps to follow to discover, order and access products, as well as we will show some administrative functions.

The presentation will conclude on what we would like to reach to open a discussion: improved ergonomy, improved performance, improved data model with link with

archival catalogue and function for metadata validation, richer product portfolio (input) and product porfortlio profiled to a user needs, function of visualisation to help understand and order a product, function to group and schedule orders plus function of transformation continuity of service through the notion of back up product.

Development and implementation of a Data Integration System for Eutrophication Assessment in Coastal Waters in the framework of INSEA Project

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Coastal systems are very complex associated with highly dynamic spatial and temporal changes, requiring thus a number of different approaches for any efficient monitoring. Satellite imagery has an impressive capability of describing spatial distribution but, inevitably, short term temporal phenomena (in the range of hours) and vertical processes are impossible to track. On the other hand, local data measurement can show these short time trends but usually are unable to give a clear overview of spatial variation. Since only modelling tools are able to fill these information gaps, the combination of these three components gives the best management tool. In the framework of INSEA project a numerically robust ecological modelling system for Pagasitikos gulf was set up in order to describe biogeochemical cycling of carbon and nutrients occurring under different hydrographic and trophic regimes, and to explore the system capabilities in a forecast mode to support coastal zone management issues.

In situ data sets acquired during an extensive field program were organised into a management system both for data and information access and for subsequent model initialisation and validation. The metadata were translated by the Hellenic Oceanographic Data Centre to the Common Data Index (CDI) format using XML (eXtended Markup Language) compliant with the ISO19115 metadata standard. A total of 970 xml records describing ADCP, CTD and Bottle data were prepared and transmitted to the central CDI meta-database at MARIS. The CDI catalogue that is adopted by the FP6-I3 EU SeaDataNet Project, is available at the INSEA Web Portal: www.insea.info/cdi. The interface enables the users to get a highly detailed insight in

the availability and geographical spreading of individual measurements providing on-line access to the partner's data. Remotely sensed chlorophyll-a observations, using Globe-Colour data (merged SeaWiFS, MODIS and MERIS) at 4km resolution, were processed for model assimilation. The modelling system is comprised by a 3D complex bio-physical (POM&ERSEM) model with an appropriate data assimilation scheme using the singular evolutive extended Kalman (SEEK) filter and its ensemble-based variant, called the SEIK filter.

The modelling system together with the insitu measurements and the satellite data, form a data integration system, able to support different scale predictions, complex geometries and to efficiently incorporate different data sources to define boundary and surface conditions. Ultimately it will give to data users, in particular to local decision makers, valuable information for assessing coastal eutrophication problems.

Sextant: Online services for marine geographical information

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In order to manage, share and retreive geographical marine information to support multidisciplinary studies and decision making like coastal area integrated managment, Ifremer built and set up the Sextant portal. It allows to easily share geographically referenced thematic information by providing online facilities such as:

- a catalog application to manage spatially referenced resources
- an interactive web map viewer
- download facilities

One of the general objectives was to build an interoperable system by using standards for digital geographic information. The development of these standards are led by the International Organisation for Standardisation (ISO) technical committee on geographic information/geomatics (TC211) and the Open Geospatial Consortium (OGC). In broad terms, interoperability requires agreements on metadata schemas and formats, and service interfaces for accessing both data (visualisation and download) and discovery metadata.

Several data sources are combined together in the system, including :

- resident data
- administrative information
- shoreline ...
- multidisciplinary thematic data
- environmental
- physical or climatology layers ...

Other parts of the project include the dissemination of oceanographic data model output. One particularity with environmental science data is that they have a fundamental spatial component in the time and vertical. These datasets are four-dimensional (x-y-z-t). So, OGC services and graphical interfaces must allow selection through the time and vertical dimension.

OLFISH: Commercial electronic fishery management system: A demonstration of a unique, electronic solution for the collection, management, presentation and utilization of commercial fishing data

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Fisheries management is continually frustrated by the lack, or poor quality, of critical data on fish catches, sizes, fishing locations, and relevant environmental conditions. While quantitative methods for managing fisheries have developed considerable complexity, the quality of the available data remains an obstacle to meaningful advances in fisheries management. There are a number of aspects to the problem. The first is the absence of a flexible and comprehensive system for capturing essential data during fishing operations. A large amount of environmental data is lost simply because of the difficulty of recording this information easily in real time. This is despite the advent of a complex array of sensory equipment available in the bridge of modern fishing vessels. As a result, environmental patterns become part of skippers' experience, and seldom if ever become formally available to scientists or managers of fishing operations.

The authors has also found in their scientific work that much energy is wasted and important opportunities lost because of the uncertainty surrounding crucial historic data. For example, there are typically many factors related to catch-per-unit-effort data, a key index of trends in resource abundance, which are not recorded, and hence cannot be incorporated in statistical analyses. Frequently, these missing data are crucial to management decisions.

For scientists unreliable data leads to a poor basis for stock assessment models and management programs. For industry the lack of sound data significantly reduces its fishing efficiency, since past performance cannot be studied properly. As a result poor management decisions based on unreliable analyses are made, often with substantial cost and risk to fish resources and the fishing industry.

Although there is presently greater awareness amongst scientists and fisheries managers about the importance of collecting fishing data there is still confusion about exactly which data are needed, and how to collect and store them. It is common for skippers to record scientific data on one form, for shore managers to use another for commercial purposes, and for skippers to keep separate fishing logbooks. These data are then transferred to different computer systems, often complex spreadsheets, or sometimes are left in paper format in large inaccessible books and files. There is a degradation in the quality of data because of the multi-stage process of transcription from handwritten logbook sheets to paper forms and then to computer databases. The most logical first point of data entry, the fishing vessel skipper, should occur in digital format directly into a computer. One of the difficulties with fisheries data is the complexity of the logical linkages between the different types of data. Any reasonable approach to the problem requires the use of modern relational databases which are able to address the multidimensional complexity of the problem.

The authors developed an electronic, fishery data management system, named OLFISH.

OLFISH is a software program for capturing, storing and summarising fishing data. It can be used by skippers, managers and scientists during fishing operations and for scientific surveys. It provides a comprehensive, user-friendly means of compiling data reports. One of the most important features of OLFISH is that it virtually eliminates the need for paper logbooks. OLFISH

empowers its users (skippers/company mangers) to become an equal partner in the management of its resources by giving them a very powerful tool to collect and understand fishing data. It also transfer each vessel in the fishing fleet into a research station able to collect vast amount of valuable data with great accuracy and minimal effort.

Interactive Analysis and Visualization Tools

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Present and future ocean observation systems provide a wealth of data allowing to document and monitor the ocean's state and to detect variability and temporal trends. Assessment of temporal changes in the ocean also requires taking into account the vast amount of available historical data. The successful scientific use and exploitation of these large sets of historical and recent data depends on two critical elements: (1) efficient and comprehensive data management systems as well as (2) powerful and flexible analysis and visualization software tools. In this talk I will present examples of typical problems in modern oceanography and describe approaches and solutions provided by popular analysis and visualization tools.

Abstract 116

Session: 3 - User Oriented services and products

Integrating Real Time Data on North Sea and Baltic Waters as Web-Services for Monitoring and Risk Assessment

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An infrastructure for uniform access to environmental data within Europe is aimed for by several parties but is still not ready for operation. Especially for risk and crisis management in marine and coastal areas, environmental risk and crisis situations such as oil spills and exceptional, probably harmful algal blooms usually have an international dimension. Thus, users in several countries and organisations need access to the same data derived parameters, including data from observations. While many national monitoring services are well developed, they are customised to their specific needs and often based on non-standard solutions that hinder data exchange, with other countries.

Today, advances in the fields of sensor technology, data fusion methods, numerical modelling, ontologies and web services, provide building blocks for common European services applicable for GMES, the Global Monitoring for Environment and Security . Certainly remains the challenge to bring these building blocks together, and refine them for a continuous operation.

The European Framework6 (EU-FP6) project InterRisk aims to develop a system of services in an open system architecture, based on web-GIS standards as e.g. defined by the Open Geospatial Consortium (OGC) and integrate services for several European seas using satellite and aircraft data, in-situ observations and numerical models.

This paper/talk presents the integration of near real time satellite data, near real time data from ships of opportunity and additional data from aircraft and research vessels as an example with a regional focus on the more south-easterly North Sea and the more south western Baltic Sea.

The near real-time satellite data is gathered via European Space Agency's (ESA) facilities, near real-time data from ships of opportunity are gathered whenever these ships approach their respective harbours. Both types of data are further processed within our facilities. Data from surveillance aircrafts and from polish research vessels are provided by partners. An automatic data-link to the German Federal Maritime and

Hydrographic Agency running operational hydrodynamic models serves for a time mapping of in-situ to remotely sensed data. Here OPeNDAP-techniques are applied.

All theses data merge to several products within a web-map-service supporting authorities and other users not only in Germany. Especially the concurrent incorporation of theses web-map-services not only from the North Sea/Baltic Node but from all partners within the InterRisk consortium in ESA's Service Support Environment (SSE) allows a single portal to inform users on the status and possible risks on marine and coastal areas.

For the success of such service-systems it is a critical task to bring these services in accepted operation by fulfilling various demands: The presentation of data has to be done shortly after they were taken and has to develop mechanisms to handle actual data of different layers as well as data from longer periods spanning a year or more. Automatic ingestions of meta-data in a catalogue-service for the web (CSW) and their usage in web-map-services (WMS) , web-feature-services (WFS) and web-coverage-services (WCS) is essential for an accepted system.

A mechanism to include near real-time data in a WMS has been developed so far. But the use of a WCS seems to be more promising in the future. The reason is that a WCS layer could respond to time period queries. This gives the opportunity to confine a query to an interesting time period.

So far chlorophyll data from the MERIS instrument on Envisat, Europeans environmental monitoring satellite, and in-situ data from a FerryBox-system from 2 routes crossing the North Sea (Cuxhaven-Immingham and Cuxhaven-Chatwick-Immingham-Moss) were put as layers into a WMS which will be available through ESA's SSE (System Service Environment) as a Service called GERNOS (German Novelty Observation Service) on a near real-time base. Another service called GERPOS (German Potential Oil-Spill Service) utilises wind data from the ASAR-instrument on Envisat to show this and potential oil slicks in layers of this WMS. Whenever the oil detection algorithm finds a potential oil spill it will be marked in the layer.

The web-services will be complemented with exemplary radar data from surveillance flights and in-situ data from research vessels.

These services within the InterRisk-project show the realisation of a service design with multiple data in an environment with near real time data from remote sensing and in-situ measurements all to be used by various national parties.

Abstract 117

Session: 3 - User Oriented services and products

Data Interpolating Empirical Orthogonal Functions (DINEOF): a tool for geophysical data analyses

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Geophysical data sets, such as those obtained from satellites, often contain gaps (missing values) due to the presence of clouds, rain, or simply due to incomplete track coverage. There is a rising need, however, for complete data sets at the global, regional and local scale: several analysis methods, input for hydrodynamic models and data visualization are examples of applications where complete data sets are preferred or even necessary.

DINEOF (Data Interpolating Empirical Orthogonal Functions) is a method to reconstruct missing data in geophysical data sets (Beckers and Rixen, 2003). Based on Empirical Orthogonal Functions (EOFs), DINEOF uses an iterative procedure to calculate the values at the missing locations. DINEOF has been compared to Optimal Interpolation (OI), demonstrating that more accurate results are achieved, with up to 30 times less computational time (Alvera-Azcárate et al, 2005). Another advantage of DINEOF is that there is no need for a priori knowledge of the statistics of the reconstructed data set (such as covariance or correlation length).

DINEOF is able to reconstruct missing data in univariate data sets (e.g. sea surface temperature (SST) or chlorophyll). The multivariate application of DINEOF is also straightforward, using multivariate EOFs containing several variables with the possibility of including also different time lags (Alvera-Azcárate et al, 2007). A multivariate DINEOF takes into account the inter-relationships between related variables (such as SST and chlorophyll) to infer data at the missing locations. As more data is introduced for the reconstruction, the accuracy of the results can be larger than for the univariate application of DINEOF.

Spatial maps of the reconstruction error covariance estimation are also calculated with DINEOF. Using the EOFs as background error covariance, this approach was successfully applied to the Ligurian Sea (Beckers et al, 2006) showing that the error maps obtained reflect the initial cloud coverage and the covariances of the physical fields.

DINEOF is freely available for download at http://ocgmod2.marine.usf.edu, with compilation instructions for several Linux and UNIX platforms. Compiled binaries for

Linux and Windows are also available. The user can interact with other DINEOF users through a mailing list, where technical problems are presented and scientific discussion encouraged.

We will present the latest applications developed for DINEOF, such as the multivariate reconstruction and the calculation of error maps, with several examples at different locations and spatial scales. An overview of the technique and future developments will be also discussed.

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Abstract 118

Session: 3 - User Oriented services and products

Information system to manage whales distribution in areas with high fisheries activities and intense maritime traffic

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Fin whale distribution during this summer in northwestern Mediterranean was marked by an unusual occurence to shallow water near to the coast. At least two juveniles were died entangled in fishing gears (6.5 m-long and 8 m-long) and one adult male was died due to a probable boat collision (18 m long). As maritime traffic and fishing activities were the most important anthropogenic problems influencing whales lives, we present our free application using Google earth © to manage the distribution of these animals near to the coast. It is dedicated to inform local authorities about whales presence on coast in order to minimize risks to hit them. The interactive tool gives the geographic positions with a 2-hours delay determined by field monitoring. This application zooms automatically on the most recent positions and includes as well previous day movements. More information as diving pattern, average speed or eventual behaviour near boats are also indicated. An estimation of positions trend for next hour are also indicated referring to its velocity and its index of linearity. Every two hours, information are updated and transfered to the Coast Guards to manage the maritime traffic in this area. It is friendly-use application that can be shared easily via internet. This tool was applied successfully for three different occasions: 1) in May 2007, from the 20th to the 30th, along the Ligurian Coast, with the 10 m-long fin whale that entered few times in Genoa's ports; 2) in June 2007, the 8th along the Ligurian Coast with a group of 4 fin whales travelling at a constant speed westwards. Along their entire trajectory, pleasance boats were slow down by Coast Guards; 3) in October 2007, the 28th to November, the 9th with an ill Cuvier's beaked whale. Its presence at Genoa-Voltri lead to stop a nautical competition. This tool proved to be useful to protect cetacean where maritime traffic or fisheries activities and to limit unnatural mortality.

Internet GIS project and database on geochemistry oceanic volcanoes

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In the framework of the project of the academy of sciences of Russia "electronic Earth" we developed the database for compositions of volcanic oceanic rocks in islands and underwater seamountains - GIM (Geochemistry of Intraplate Magmatism). Into our task it entered the development of the base of data directly of that connected with the cartographic material and with GIS projects. The widely known similar on the database GEOROCK (Germany) and PETDB (USA) are built without the use GIS technology. For this very reason the structure of data in database structure includes multilevel text spatial information. For example, in the base of data GEOROCK are organized four level structure of localization of the position of the probe: LGlobal-LGroop-Local- Lat/Long. Since this information is not attached to the map or the GIS - project and is rigidly assigned by the initial content it it cannot be reformed under the specific objectives of user. Us it would be desirable to develop technology making it possible to combine simple relativistic base with GIS maps. This will make it possible to realize query to the base on the basis of different maps and different three-dimensional criteria.

During the first stage of the project we developed the database of tests given with the rigid structure of localization. Results are represented on the portal "Geology" of the Russian academy of sciences (http://Earth.jscc.ru/GIM). Then we created GIS project on the manifestations of magmatism where one of it was layer which contains the boundaries of the ranges of different volcanic centers, seamountains assembles and the chains of underwater mountains and rise. These boundaries are represented for Atlantic Ocean. In this case in the data base appeared the possibility to obtain demands both approach according to the old procedures and on the new, with the use of GIS- layers. At present work continues and it cannot be asserted that our development completely answers the presented questions. Many traditional tasks more conveniently deciding with the aid of simple SQL query; however, it is possible that we yet sufficiently did not develop set of programs for the work with the GIS- maps and did not completely master the possibility GIS of methods.

The data base is executed with the PostgreSQL, and GIS part of the project is based on UMN Mapserver 4.0 universities of Minnesota. For the visualization of data on the map is used dynamic WWW page with JAVA scripts by those making it possible to scale map to be moved on it and to obtain attributive data on the objects of map, to include and to turn off different layers.

The developed scripts make it possible to obtain data both on the point and on the polygon objects of map. As attributive the given point tests is used the records of the database GIM, and attributive information along the polygons is located in the layer GIS of project. For obtaining the generalized characteristics it is center volcanic activity (flash points, the linear networks), the technology of the automatic creation of the query and calculation of the averaged characteristics according to the borders of polygons is developed by that limited by the lines of the manifestations of intraplate magmatism

The boundaries of the centers of the intraplate magmatism in Atlantic oceans are built on the basis of new data according to bathymetry of Atlantic Ocean and the distribution of underwater mountains. The represented map is the new version of the map of intraplate magmatism in Atlantic Ocean. It is characterized by the wider boundaries of the manifestations of intraplate magmatism due to the association into the united structures of the revealed geomorphologic boundaries of raise. We used a bathymetric map of oceans GEPCA2000, separated the accumulations of underwater mountains, evaluated the proximity of the petrochemical specialization of the compositions of primary magma - the sources of the magmatism of volcanic islands and seamounts. It is seemed to us that the boundary of intraplate manifestation it is necessary to carry out somewhat more widely than the boundary of the direct activity of volcanism. The chain of the underwater volcanoes of those tracing the activity of flash point is united geological structure, but not separate centers of volcanism. Thus, carrying out boundary through the geomorphologic and geological signs by that uniting the group of volcanoes as united structure we is correctly reflected the geological sense of the region of volcanism as the result of the manifestation of the activity of long-life mantle plumes.

The technology proposed allows for us in proportion to the accumulation of data in the base to change the position of the boundaries of volcanic it is center to unite and to divide adjacent centers on the basis of the data about the composition of primary magmas.

The distribution of the types of primary magmas on the local manifestations was analyzed after the calculation of the generalized characteristics of the manifestations of intraplate magmatism. If in the previous analysis we used the generalized sample, then now we attempted to explain there do exist regularity in the inner correlation of different types of primary melts. We have explained on the basis of the accomplished work on the classification of primary magmas that the intraplate magmatism was represented by five petrochemical types of primary melting.

These types form steady associations isolation of which and it is base for the differentiation of petrochemical provinces in the ocean. The aid of the presented GIM database and intraplate GIS maps project we succeeded herself in calculating the averaged geochemical characteristics of the chosen zones and outlining the boundaries of the different petrochemical zones of Atlantic Ocean. In all are established 7 global petrochemical zones.

Abstract 120

Session: 3 - User Oriented services and products

A Palynological Database for the Study of the Black Sea Transgressions and climate Changes

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Palynological investigation of the sea and continental deposits in five areas of the Black Sea coast of Georgia showed that for the last 10 000 years there were six transgressive phases in the Black Sea development. Three of them were most important. According to radiocarbon dating, strong sea transgressions were observed within 6000-5500, 3800-2500 and 1350-800 Cal.yr BP. Rather substantial ingression of waters is also observed at the beginning of the Holocene within 9500-8000 Cal.yr BP. At the very beginning of the Holocene the sea level was 50-60 m lower than nowadays and by the beginning of the Atlantic period it was only -10-5 m.

All the above-mentioned transgressive phases took place during climatic optima. Mean annual and especially summer temperatures increased and were 4o-5o higher than today. In Western Georgia the area of chestnut and oak forests broadened, which is clearly seen in all pollen diagrams (more than 30). In Kolkhi Lowland the region of bogs and bog cenoses also expanded. In the mountains the upper forest limit ascended by 300 m compared to the present-day one and in the mountains more distant from the sea, for example, in the mountains of South Georgia the forests spread by 400-500 m higher than the present-day limit. In the high mountains, glaciers melted and ascended to higher levels. In their place alpine and sub-alpine meadows were formed which, in their turn, gave way to forest vegetation. Expansion of the forest belt was also observed in the steppe regions of Georgia. During climate optima and especially during humidification phases, replacement of steppes by forests took place. The forest belt expanded both in its lower and upper parts.

The warm and mild climate of the Holocene optima exerted strong influence on development of human society and formation of cultures. According to 14; dating, the first and the earliest agricultural Neolithic settlements in Lower Kartli belonging to 60-54 cent. B.C. appeared precisely in conditions of the mild and humid climate. This is evidenced by palynological spectra of the cultural layers the investigation of which has

already started and is in progress now. The Middle Holocene warming contributed to appearance of the Early Kurgan, Kuro-Araks and Trialety Cultures. The material of excavations of numerous kurgans and settlements of the given epochs within the altitudinal level of 1800-2300 m indicate the development not only of grain-growing, but also of viticulture in high mountains. It is known, that nowadays grapes, being a heat-loving species, cannot grow higher than 900-1000 m.

The climate warming of the Late Bronze and the Middle Ages was not as strong as in the Middle Holocene, but it was very important for development of the mountain belt of Georgia. For example, in Southern Georgia, at this time, the density of population mainly engaged in agriculture became very high. With the onset of climate cooling which replaced the climatic optima, the agriculture gave way to cattle-breeding, which is perfectly fixed in the palynological material.

Abstract 121

Session: 3 - User Oriented services and products

Overarching Marine Research Information in Europe

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The European Centre for Information on Marine Science and Technology - EurOcean-manages an Internet portal working as an electronic platform of information and communication for all actors with interest in marine science and technology in Europe. It gathers information, which is scattered, fragmented and uneasy to access, in a single Portal, maximising and enhancing Europe's marine and maritime dedicated efforts in research and technology development.

The Centre, operating as a decentralized network of institutions acts as a "mediator" between information providers and end-users which implies to establish and maintain close cooperation with both parties. The continuity of the availability and maintenance required by information management is guaranteed by EurOcean's independent status, which is financially supported by its Member Organisations and does not rely on EC funding programmes. Regarding the end users, priority has been given to fulfil the requirements of the decision makers and the scientific community through the development of information-bases (info-bases) related to marine research infrastructures and RTD projects. Simple and attractive tools have been developed to enable the direct management of information by the providers, to be then validated by the Centre.

Each info-base has been developed in cooperation with the interested users adopting the specific descriptors employed by the users in their daily work, and applying those to the development of user-friendly search tools.

EurOcean has, recently, moved a step forward in the management of the information collected. Added value is given to information by the production and dissemination of statistical analysis of the contents of the info-bases, providing on line and real time indicators, and preparing reports, available on line and in printable formats.

The four info-bases developed by EurOcean presented below illustrate the Centre's approach to information management. Three info-bases are related to marine research infrastructures in Europe. The fourth one is a compilation of marine related research projects funded at European level.

EurOcean_RV info-base gathers information for 263 research vessels: operating (232), planned and/or under construction (4) and out of service RV's (27). 87 descriptors have been developed concerning available onboard equipment, vessel technical specifications and contact details. Several search criteria are available such as RV's operating areas, main activity and vessel category. The update is done in cooperation with the operators of the research vessels at least twice a year. Real time on-line statistics on the research vessels capacities and their characteristics have been recently developed, i.e. updates to the info-base are automatically reflected in the statistical outputs.

EurOcean_UV, is an on line info-base on the underwater vehicles (UV) used in Europe for scientific research. The EurOcean_UV provides access to technical information on four categories of UVs as following: Remotely Operated Vehicles (ROV); Autonomous Underwater Vehicles (AUVs); Manned Submersibles; and others. A friendly-user interface allows the end-user to select the UVs according to: the name of vehicle, the country, the type of vehicle and the depth range. Fifteen descriptors have been associated to each underwater vehicle and this information is collected and put on line by the EurOcean Office after validation by the vehicle's operators, at least, twice a year.

Presently, EurOcean_UV has listed 67 UVs: 14 Autonomous Underwater Vehicles; 35 Remote Operated Vehicles; 17 Manned Submersibles; and 1 Open Diving Bell in the "Others" Category.

Recently, and in close cooperation with the Institute of Marine Research (IMR) of Norway, a EurOcean Member, the Centre has developed the Large Exchangeable Instruments Info-base, EurOcean_LExI. This info-base assembles information on 24 categories of instruments. EurOcean_LExI has a different updating scheme than the previous ones. The upload and update of the Instruments on the info-base is of the responsibility of the operators, via authorization provided by the info-base administrators, to the info-base administration pages. So far, 74 instruments have been uploaded and the first validation request sent to the operators.

The info-base of the European Marine Research Funded Projects, EurOcean_MAP provides information on projects funded by COST, EUREKA, EUROCORES (ESF), 6th Framework Programme (EC), INTERREG III (EC), LIFE (EC) and SMAP (EC). The information on these research projects partly or entirely related to marine science and technology can be accessed through a friendly-user interface, capable of providing the end-user with a set of efficient tools for searching, retrieving and printing information related to projects.

The information compiled for each project includes: acronym, title, contact, coordinator country, participating countries, regional areas, activity area and type of instrument (for FP6 projects), total amount of funding per project and project summary. EurOcean_MaP gathers information on 545 projects, of which 269 were funded by the 6th Framework Programme (almost 50% of the total).

EurOcean carried out a statistical overview of the FP6 projects and the results of the study include: 1) participation of the European countries; 2) number of projects per activity area and repartition of the funding by activity areas and countries; and 3) evolution of the FP budget of the EC allocated to marine research from 1987 until now. Through EurOcean's analysis, it was recognised the international approach of the 6th FP, in which the scientists of 83 countries are involved and used 3,6% of the overall budget dedicated to marine research projects.

The easy and friendly tools to access information, the well-thought architecture design and functionalities of these info-bases lead to the recognition of the EurOcean info-bases as standards and models being used by other groups of interest. For instance, MarinEra national projects database and an international Ocean Going Research Vessels Database were built using as template, respectively, EurOcean_MAP and EurOcean_RV.

EurOcean has now demonstrated the appropriateness and usefulness of its e-tools and on-line products, insuring the long-term continuity required by a focal point of information, providing coherent and permanent quality control, disseminating information through efficient tools and maintaining a dialogue with all interested stakeholders. The activities developed by EurOcean concur with the EC's Blue Book for "An Integrated Maritime Policy for the European Union", approved by the European Council on 14 December 2007, which is strongly promoting an integrated and intersectorial approach to ocean affairs in Europe, stating in particular that the access to a "comprehensive source of data and information" is necessary for integrated policymaking.

Towards an operational pan-European oceanographic real time data exchange

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SEPRISE (Sustained, Efficient Production of Required information Services) has been a Specific Support Action funded by the EC within the 6th Framework Programme to further operational oceanographic services, in line with the priorities of the members of EuroGOOS. These priorities also coincide with those of the European Commission and of the GMES/GEO initiatives. The project was finalized in May 2007.

One of the deliverables from the project was to deliver an operational demonstration with the main objectives to demonstrate the feasibility of joint pan-European data exchange, regular analysis and forecasting in an operational mode and to demonstrate the European capacity in operational oceanography.

The demonstration includes all operational steps; observation, data management, real time information, forecast and dissemination to users.

Currently 42 European oceanographic and meteorological institutes provide data to SEPRISE. Data is available in real-time from fixed stations and buoys for waves, wind, sea level, salinity, temperature and currents. In addition, model results have been obtained to provide forecasts for the same locations. The SEPRISE demonstration currently includes 380 stations producing 646 time series. Approximately 80% of these time series have corresponding model results with which they can be compared directly. Data is collected and presented once every hour. The demonstration has proven the possibility of sustained coordinated production and acts as a model for continued efforts.

On line atlas : a portal to improve access and legibility of fisheries data

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The recent growing trends in disk storage capacities and their networking allow to access to a large amount of information that are difficult to grasp. Portals and reporting tools could be a way to provide automatic synthesis from data before launching more detailed queries. Portals generally use meta-data (that qualifies the data) to target the user's request. Reporting tools use a definite report format that is supposed to correspond to the majority of requests.

An original experiment was developed in France to set up a portal in order to access the information trough an "online atlas" (defined as a volume of table, charts or plates that systematically illustrate a particular object). It aims to describe data using graphics and an expert advice. These indicators are then assembled in a thematic form in which the expert will put into perspective all proposed indicators.

This experiment is related to the fishing community that uses a large number of observatory systems. Theses systems are set up with different objectives (scientific, management, administrative, control...) and with masses of very important and heterogeneous data.

The official manager of fisheries, i.e. the DPMA (Direction of fisheries and aquaculture of the Ministry of Agriculture and Fisheries), needs to look at economics, social and stock state criteria to arbitrate a decision or to manage fisheries according to the EC directives. Data that will allow the DPMA to quantify and qualify each criterion, are available in different observatories. There is a need to make data complementary using one or more thematic forms.

Initially, the observatory systems of Ifremer (1), IRD (2), MNHN (3) and the DPMA (4), itself, will contribute to create this information network in providing information to the online atlas. The development of the atlas was entrusted to the Fisheries and Aquatic Sciences Center of Agrocampus Rennes.

This method was also adapted in other EC projects in West Africa (e.g. Istam project) to develop a prototype of fisheries information system that involves, among others, some of the stakeholders mentioned above.

This article will describe :

- the targeted public by the atlas,
- the selection process of indicators through a wide dialogue with the different actors,
- and also the ad hoc software used to create and disseminate the factsheet.

We will focus on the generic nature of method that mixes different skills of stakeholder: database manager, expert of data collection, end users of data, specialist and management staff who defines its needs. This article is an experience feedback on the way to give value to data to make them more accessible and understandable.

To illustrate this article, two posters will present some results of different applications of the online atlas develop during the two projects mentioned.

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1 - Ifremer - French Research Institute for Exploitation of the Sea - is in charge of the monitoring of fishery resources in EC waters (except tropical and austral fisheries).

2 - IRD (Institut de Recherche pour le Développement), is in charge of the monitoring of the tropical tuna fisheries.

3 - MNHN (Muséum National d'Histoire Naturelle), is in charge of the French austral and antarctic fisheries.

4 - DPMA, French department of the maritime fisheries and aquaculture - Ministry of Agriculture and Fisheries, is in charge of the monitoring and the management of all the French fisheries.

Abstract 124

Session: 3 - User Oriented services and products

A west Africa on line atlas on Fisheries

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The ISTAM project (Improve Scientific and Technical Advice for Fisheries Management) goal is to analyse what can make easier the formulation of advice on stock or fisheries. Our reflection begins with the description of all the monitoring systems of the ISTAM partners country (Morocco, Mauritania, Senegal, France, Spain and Portugal), then the way to spread the advice formulated is analysed. We also pay attention to the data management and accessibility that have to be used to produce the advice through models.

A working package of this project will develop a prototype of sub regional information system. The keywords are accessibility and description of the data. A solution can be to use an online atlas to describe data (statistics and survey data) and make them easily available.

Two sources of data are used:

- statistics from the STATBASE software that is a datawarehouse containing the aggregated data colleted during the European project named SIAP (Système d'Information et d'Analyse des Pêches),
- survey data collected during the same project.

For each of these data, we developed an online atlas. For the statistics series, the query is run once and the result is stored in the atlas tool, because the database is not updated in real time. The query itself is saved in the database to enable the user to run it again. For the survey series, data can not be stored while the SQL queries can. These queries can be run in real time again as new survey can be added at any time. The data are queried, stored or not, and then graphics are drawn and displayed in the factsheet.

This poster will present the context of the project, the use and some results of the online atlas.

This poster is in relation to an other poster submitted: "A French on line atlas on Fisheries" about describing a national project of online atlas that will help to monitor the French fisheries. It is also linked to an oral communication about online atlas.

Web link : http://www.projet-istam.org/

Abstract 125

Session: 3 - User Oriented services and products

Satellite database for the monitoring of cyanobacterial blooms in the Baltic Sea

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The summer blooms of nitrogen-fixing cyanobacteria are regular phenomena in the Baltic Sea. In the past years strong and widespread blooms have caused environmental concern due to nuisance, toxicity and the increased nitrogen input. The most abundant toxic species Nodularia spumigena, can posses a threat to small animals and children. Based on satellite sensor AVHRR (Advanced Very High Resolution Radiometer), SMHI has a compiled time series of daily observations of surface accumulations of cyanobacterial blooms during the period 1997-2007. To be able to compare different years definition of normalized extent, duration and intensity has been developed. Results suggest that the most widespread bloom occurred 1998 and the year with the longest duration were found both 2005 and 2006. The bloom 2006 was the most intense during the period.

Since the NOAA-AVHRR data is limited to a spatial resolution of 1000m there is an obvious problem to detect surface accumulations near land or in archipelagos. Therefore current work is focusing on development of methods to include high resolution satellite data such as MERIS (Medium Resolution Image Spectrometer Instrument) or MODIS (MODerate resolution Imaging Spectroradiometer) data when detecting and monitoring cyanobacterial blooms in the Baltic Sea.

Exploring marine data with Ocean Data View

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Ocean Data View (ODV) is a software package for the interactive exploration, analysis and visualization of marine and other geo-referenced profile or sequence data. ODV maintains quality flags with the data and facilitates data quality control of large data sets. The software runs on Windows, Linux, Mac OS X and various UNIX systems. The ODV data and configuration files are platform-independent and can easily be exchanged between different systems. ODV supports native ODV collections and the widely used netCDF format.

ODV is now more and more used to analyze and evaluate biogeochemical and fisheries data. Various data centers, including ICES, provide data output in ODV format. In addition, more than 5 GByte of marine and other geo-science data are available for download as ready-to-use ODV collections. These datasets currently include:

- Electronic Atlas of WOCE Data (eWOCE)
- NODC World Ocean Atlas 2001
- Reid & Mantyla collection of historical hydrographic and nutrient data
- Estimated global alkalinity and total dissolved inorganic carbon data
- Transmissometer and hydrographic data for the global ocean
- River discharge data for 1018 stations worldwide

ODV can be used free of charge for scientific and teaching purposes. For more information visit the ODV web page http://odv.awi.de.

Abstract 127

Session: 3 - User Oriented services and products

Methods and tools of maintaining the ESIMO portal

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The Unified System of Information on the State of the World Ocean (ESIMO) - http://data.oceaninfo.ru/- is being developed under the Federal Targeted Programme "The World Ocean". The System is intended to integrate information resources on the marine environment and marine-related activities and to provide integrated information services to the marine-related industry of Russia. The ESIMO portal is a set of software and hardware tools providing a permanent user access to information resources of the ESIMO. For the moment a huge amount of information has already been accumulated: over 60 thousand records for 16 metadata objects, about 50 thousand units of various information in the form of object files, several gigabytes of information stored in the DBMS. Every month more than 300 000 user visit the portal (visits of robots are not included). To maintain and update such amount of resources it is necessary to adequately response to various situations that have to be faced in operating the portal.

Therefore, when developing the portal the aim was to enhance its efficiency to the greatest possible extent. For that the following has been done:

- common interface for the whole of the portal has been developed. It is defined in the technical specifications of the portal: ftp://ftp.meteo.ru/resource/documentation/specification.rar;
- content management system has been created. It allows input and editing in every section of the portal (e.g., it allows templates, pages and users to be managed);
- information resources have been classified by data type, data presentation form, subjects;
- user personal page designer has been created;
- technological section of the portal has been prepared which includes administrative part, statistics, monitoring of hardware and software tools and other possibilities.

Technical specifications establish common standards for Web-pages, workstations, and stand-alone applications as well as for information products provided to users by the ESIMO tools. The developed specifications and implemented methods were employed for the creation of the International Polar Year portal (http://www.mpg-info.ru/)and for development of the portal section devoted to the Black Sea Scene Project (http://bss.oceaninfo.ru)..

The system of content management includes several workstations: description of information resources, description of instances and editing of individual pages of the portal. The first two workstations allows for remote input of a new resource or remote editing of an existing resource or its instance. These systems are used for the input of news, forecast-related operational information presented in a graphic form and other information. The system of editing any portal page without rebooting allows required corrections to be made rapidly.

Classification of information resources by data type (document, analysis, climate data, forecast, observations) makes it possible to search information resources by the attribute being indicated. Data presentation form (grid, profile, point) makes it possible to typify data structures. Classification by subjects (marine-related activities, marine environment, regulatory information, scientific-technical information, socio-economic information, media news) makes search of information resources simpler.

The user personal page designer makes it possible to create a specific menu for information resources customized by users and when necessary edit both the menu and content of resources.

The ESIMO portal collects statistics of how often the ESIMO applications are visited and performs monitoring of server hardware and software. The following is calculated: distribution of visits of Web-pages by years, by months in a current year, by days in a current month, by days in a current week, etc. Monitoring of server hardware and software is performed on a permanent basis. Output data are accumulated to allow for two modes of data handling: operational mode showing the current status and analytical mode making it possible to review data over the period being indicated. This monitoring allows dynamics of changes in processor, RAM and disc storage loading to be assessed.

Prospects consist in further automation of content handling: use of RSS protocol for export and import of news and other information; creation of a mailing block for both updating of information resources and informing users on the state of the World Ocean; enhanced use of GIS technologies.

Abstract 128

Session: 3 - User Oriented services and products

Preliminary results of climatological computations of the hydrological characteristics of the Mediterranean Sea using the Variational Inverse Method

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New gridded fields of temperature and salinity in the Mediterranean Sea are computed from aggregated datasets for the period 1864-2007. The sources of the datasets are: a) the MEDAR/MEDATLAS II database, b) national data of the Hellenic Oceanographic Data Centre, c) the Coriolis data of the French Operational Oceanography Data Centre and d) the World Ocean Database 2005 (WOD05). The duplicates between different data sources were identified by comparing the position and the date (and time) of the profiles and eliminated from the merged dataset. Then, the observed level data were interpolated vertically at 25 standard depths using the Reiniger & Ross interpolation, the same technique that was used for the MEDAR/MEDATLAS II climatology. The method is based on a weighted mean of two parabolic interpolations with 3 exterior and 3 interior data points. Only "good" data were used for the interpolation namely data with quality control flags equal to 1 or 2 according the MEDATLAS flag scale.

The gridded fields (monthly, seasonal and climatological) at each standard level are computed by the Variational Inverse Method and a finite element technique with the use of the geostatistical analysis tool DIVA of the University of Liege. The same method was used for the computation of the MEDAR/MEDATLAS II climatology. The present updated version of DIVA software incorporates additional capabilities that optimize the analysis. The ETOPO5 topography was used for the generation of the contour files. The contours are checked against the length scale of the analysis and used for the mesh generation. The correlation length and the signal to noise ratio are calibrated at each standard level

using the Generalized Cross Validation method. In addition, quality control is performed by a DIVA module by comparing the misfit between the data and the analysis with a theoretically derived distribution of these misfits. Elimination of the detected outliers sometimes smoothes but not always eliminates suspicious features on the visual representation of the analyzed fields. Coastal data produce low error fields and will be thus eliminated from the future error analysis.

This work is carried out for a PhD thesis within the framework of the FP6-I3 EU Project SEADATANET (EU-Research Infrastructures -RII3-026212).

Abstract 129

Session: 3 - User Oriented services and products

StatMap: A Statistical Cartographic Viewer Candidate for Statistical Fisheries Information

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The StatMap project main goal is to provide a friendly and versatile thematic cartographic tool available as Free/Libre and Open Source Software. The main characteristic of this system is to allow multiple data sources and multiple visualization types in a user friendly way.

Many cartographic viewers are developed nowadays (Arcgis, Quantum Gis...), but most of them are expensive and/or do not fit totally with the needs we identified:

- as most of the potential users are from Southern countries, the cartographic viewer must be completely free of charge and freely distributable;
- owing to the numerous operating systems and platforms, the viewer is supposed to be running under different systems (Windows, MacOS, Linux and other Unixes...);
- the application must be flexible and easily integrated into other products in order to fit users needs such as the use of fisheries statistics, or manipulation of environmental data (StatBase platform, Mauritanian monitoring statistical system for small-scale fisheries...);
- the cartographic viewer must provide the main functionalities of GIS commercial software.

StatMap is an extension of the OpenMap software. OpenMap(TM) is provided by BBN Technologies' as an Open Source JavaBeans(TM) based programmer's toolkit. It manages geographical information inside several independent layers. It features projection management, allowing easy panning and zooming. It offers specific beans for each layer. Each layer must implement the data extraction and the abstract graphic construction, while a dedicated component takes in charge the final visualization. Openmap thus provides a portable Open Source application.

OpenMap allows easy deployment as a stand-alone application or as an applet available on the Web. Unfortunately, available layers are all specific to one data source format. Therefore, specific data visualization features are available only for this given data source type. Our contribution for this software extension is of two orders: data sources abstraction and thematic map construction.

*** Use cases**

In order to construct a thematic map, the user simply starts by choosing its geographical data source. It can be either a shape file with its dbf file companion, a SQL table extraction from a PostGis database or a simple CSV file. At this point, a first raw visualization of the geometry is displayed. The user may add thematic visualizations such as: chloropleth, colored and proportional discs, pies, histograms. One can then export the map to a simple raster image (jpeg or gif) or to a vectorial image in SVG format for further editing. Thus, thematic maps are built seamlessly from multiple data sources. Maps can be easily configured with a friendly GUI interface. When a visualization type is chosen, it is possible to re-use it with a new set of data showing the same column names (for example same data set for different years).

The system can store all the construction steps of the data set and its visualization. These steps may be stored as a property file that may be later reloaded. Furthermore, these properties files can be used for batch programming.

As conventional Geographical Information Systems (GIS) viewers, our system allows geographical layers management through an intuitive graphical user interface. One can add layers dynamically, configure their visualization modes and their order of appearance.

*** Multi Data Source**

Two main data types are distinguished: alphanumeric and geometry. Geometry data can be, as defined by OpenGis, a collection of points, curves and/or surfaces. A centroid and a bounding box are also made available for each geometry. They are automatically computed if not directly available from the data source. Centroids are used to center a data representation, e.g. a pie, attached to the given geometry. Bounding boxes are used to speed up the visualization and the user's mouse selection of geographical elements.

Geometries may be specified using :

-a geometry element of a GML file;

-a geometry data type column extracted from a SQL DBMS such as PostGis;

-a shape from an Esri shape file or a MapInfo MIF/MID file.

It can also be simply specified by a latitude/longitude pair, allowing the use of simple CSV file.

The so-called DataStorage class was designed to allow data access abstraction and independence from information visualization. To the user and to the system's point of view, data is viewed as a table. It can be extracted seamlessly from different data sources of different types and formats. This data access abstraction may be used by different layers. Furthermore, tables from different sources (Dbase files, CSV files, PostGis tables) may be joined using a foreign key. Thus, the DataStorage provides a transparent multi data source system.

* Multi Type Visualization

Once a data set is available, multiple thematic visualizations may be activated. Common visualization types are available:

i) Simple raw geometry visualization and custom label rendering. Common settings for lines and fill colors are supported.

ii) Symbols visualization such as discs, regular convex polygons (triangles, squares, hexagons...) and also regular stars of a given branches numbers. The polygons sizes may be set proportionally to a given data column value.

iii) Multi data visualization with pies or histograms attached to a geometry centroid. Note that a pie can be also considered as a proportional disc enabling two simultaneous data visualization.

iv) Chloropleth and symbol colorization based on classifications. Currently available classification types are: equal intervals, equal cardinals (quantiles), standardization and nested means. The user may choose the classes breaks individually. Note that symbols themselves (e.g. discs) may have a surface proportional to a given data column value.

v) An original proportional quantities visualization is also available using a proportional number of small symbols such as squares or any regular polygons or stars.

Finally, a caption can be automatically generated. Furthermore, their placement and content can be fully customized with the GUI.

* Conclusion and Perspectives

StatMap simple interface makes it a very good candidate for statistical geo-localized data visualization such as fishery statistics, scientific surveys... As Maps can be exported to raster image or more interestingly to vectorial SVG file, web servers can use this feature to deliver maps constructed on the fly. These maps may have been previously configured interactively with the graphical interface and saved as a property file. The web server uses the property file to regenerate the maps or even more to deliver up to date maps by using up to date data sets.

In order to meet user's need, we are planning to incorporate others capabilities:

- Reading of XML files associated to geographic layers allowing the use of meta data following the ISO 19115 standard.
- Map export to GML format. This should enable the dissemination of the maps, and allow data reuse with other software. KML export is also planned in order to produce data visualization with Google maps. This can be very useful since one doesn't need to own the geographical data.
- Time series visualization either as a one image scatter graph or as multiple frames showing the evolution.

Abstract 130

Session: 3 - User Oriented services and products

The software providing the remote data access using the Web technologies

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In MHI is developed two ways of data access. One of them is the data access to BOD via LAN second one is the data access to BOD via internet. If user works with BOD via LAN, he can get any data from BOD, if user works via Internet he can get only free data. To provide access to BOD MHI we developed two applications. One of them was developed with using AJAX technology and provides access to BOD via LAN. Another was developed with using Flash and PHP and allows to access to BOD via Internet.

The main tasks of the software based on AJAX technology are selection, visualization and format conversion (export) of selected data. Asynchronous interaction with server is realized via freeware JSHTTPRequest component. It gives a possibility to launch php ¡V modules on server calling javascript functions and to receive results without reloading of the main HTML page. As a result user obtains a convenient way of data request building, map scaling and redrawing, selected data viewing with smaller traffic than in standard web-applications. This software provides access to hydrological, hydrochemical, drifter, currents and some other kinds of observations. AJAX application realizes such kinds of selections as:

- spatial selection;
- temporal selection;
- selection by kind of observation
- selection by cruises (for cruise data);
- selection of drifters (for drifter data);
- etc.

Possible variants of spatial selection are:

- selection be rectangle region;
- selection by free region (specified by map or loading from file) including selection by isobath;
- selection by square (Marsden Squares);

  selection by cross-section.

The software provides such kinds of temporal selection as

- selection by date interval;
- selection by month and year.

Visualization module realizes drawing of maps and plots. Now such elements (layers) of maps as

- regular grids in a form of isolines;
- groups of stations (cruises, drifters);
- rectangular, free, square, cross-section selections (for specification of spatial limitations forming data request by map);
- axes;
- legends

are realized.

The work on AJAX application and its testing is continuing now.

The software for access to BOD via Internet includes two modules. One of them is developed on Flash, another is developed on PHP. To work with BD we use MySQL. PHP modules is used for exchange data between Flash module and BOD. PHP script forms queries to BD and send results to Flash-script. Flash script is an interface for visual making query to BD and visualizing results.

This software allows to work with map, to make visual selection for time intervals, organizations and cruses, to export selected data to popular oceanographic formats. Results are represented in tables. Each row in table is meta data of station. For each station user can make query on salinity, tempreture and denthity. This information is view as graphics. You can access to BOD with using http://nodc.org.ua .

Abstract 131

Session: 3 - User Oriented services and products

15 years of ADCP measurements in the Gulf of Gdansk as a basis for hydrodynamic studies and models verification

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Frequent use of a vessel mounted Acoustic Doppler Current Profiler (ADCP®) in frame of research cruises of r/v Baltica within the Polish Exclusive Economical Zone of the Baltic Sea in 1993 - 2007 resulted with valuable data on both horizontal and vertical distribution of the currents. The data has been collected by means of two types of ship mounted current profilers. First one it was CI-60 FURUNO®, while RDI Instrument Broad Band ADCP® has been used since 1996. While the data sets were collected during 6 to 8 cruises a year within Polish Economical Zone of the Baltic Sea, the measurements in the Gulf of Gdansk had been carried out most frequently. During those cruises the same cruise tracks were repeated giving results adequate for further comparison and analyses.

Due to multipart structure of cruise tracks, alternately crossing in shallow and deep water areas, it is complicated to store raw binary data directly in the dedicated data base. Thus, ADCP data were processed using RDI Instruments software. The binary data from the instruments were converted to ASCII using the program Transect. Next, dedicated software was developed in order to select subsets of data for use in other application . The software consists of an algorithm for quality checking of data on the basis of ADCP's records of error velocity, percent good. If the percentage good for any bin is less the 25% in both 3 and 4 beam solutions the data are marked as bad. Also if the correlation magnitude fells below 64 for any of the 4 beams the data are marked as bad. During extraction of the subsets, the algorithm generates for each data record flag of quality control test, and then only good data are copied into a new file. The ASCII output stores the components of current vectors, speed and direction, as well as ship's velocity and heading in separate files for each depth. Each row of the ASCII files contains the time and the geographical position of measurements. Later on these data are to be incorporated into operational data base to plot them on the webpage.

These valuable data sets were successfully used to study dynamic behavior of the sea as well as for verification of the numerical hydrodynamic models of the Baltic Sea namely for the area of the gulf of Gdansk.

The paper presents some recent results of the models comparison with collected current data and discusses some issues related to the mapping of the currents. The main tool for this work was commercially available GS Surfer® which appeared to be very useful for spatially distributed hydrodynamic data interpolation, interpretation and presentation.

An overview of all collected data is presented thorough interesting results of statistical analysis of the currents distribution in the Gulf of Gdansk as well.

While this method of measurements is widely recognized, it requires verification and comparison with measurements carried out with other methods. Thanks to relative small depth of the sea, all the measurements have been carried out in bottom tracking mode. It makes result of measurements free form any errors involved by gyrocompass. However, in order to assure reliability of the ADCP ® measurements some experiments to verify ADCP had been carried out. One of the methods it is comparison of ADCP® data against current data from a buoy station. Another one, it is statistical analysis of the differences between the ship velocity and the forward measured velocities. In some case the occurrence of significant bubble contamination was reflected in a large difference between these velocities. Despite the fact the ship travels repeated cruise tracks, the results differed depending on weather and particular heading of the ship. Some results of such cross-checking of ADCP measurements are presented in the paper, also.

Abstract 132

Session: 3 - User Oriented services and products

Marine Fishery Database in Lebanese seawaters

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The Levantine Basin of the Eastern Mediterranean, including the Lebanese seawater constitute highly oligotrophic water body. Seawater temperature and salinity averages are the highest in the entire Mediterranean and the nutrients, including nitrates, phosphates and silicates are very low. Consequently the fish resources are very poor compared to other Mediterranean regions. However the biodiversity of marine organisms is very high, enhanced by Lessepsian migration of Eritrean species.

Database of Ichthyofauna and fishery include long-term dataset of bio-chemical and fish resources since the seventies. Database involve information system including the taxonomic list of ichtyofauna , the fish resources list of species of exploited plants and animals, fish landing, fishing effort and the number of fishing boats and fishermen Information of fish stock and major commercial fish species on the fish market are also provided in this database system.

Out of 354 fish species found in the Lebanese seawaters, 50 species are of doubtful identification and 50 are of commercial value. The number of exotic species was increasing since the construction of Aswan High Dam, reaching 56 species the number of Indo-Pacific origin species, forming permanent populations in the Levantine Basin. Regarding the fishing methods, they are no adequate management neither legal organization. Illegal fishing nets and gears and primitive techniques are still in use. Over-fishing and over-exploitation of fish resources may have a negative impact on decreasing fish stock. Fishing landing reach about 5000 metric tones a year exploited from a continental shelf covering about 5000 km2 of fishing ground over a narrow shelf and accidental rocky bottom along 200 km of coastal length. Fishing efforts to date show the presence of about 1000 fishing boats of 6 m average length and 20 hp power engine in Lebanon, with 4000 working fishermen .There is a lack in fish production, knowing that the annual consumption of seafood including fish in Lebanon, is estimated to 25.000 tons . The lack of production is imported from Egypt, Turkey as fresh fish, from Cyprus as aquaculture production and from France and Europe as deep freezing other seafood. However the aquaculture production of trout in the rivers at the Lebanese mountain is sufficient for local consumption.

Unfortunately the use of marine aquaculture is still under experimental stage in Lebanon although the freshwater culturing trout in the mountain is enough for local consumption .

Abstract 133

Session: 3 - User Oriented services and products

A French on line atlas on Fisheries

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The monitoring of French fisheries relies on various information systems. The data are stored in several observatories with different data collection protocols and obligations.

Data collection protocols are usually set up according to the objectives of each institution in charge of it. In France, three research institutes, namely IFREMER; IRD and the MNHN, have set up three information systems dealing with three different fisheries :

- Ifremer (French Research Institute for Exploitation of the Sea) is responsible for collecting information concerning French EEZ and EC waters (according to the EC directives).
- IRD (Institut de Recherche pour le Développement) collects information on the French tuna tropical fisheries (according to the ICCAT directives).
- MNHN (Muséum National d'Histoire Naturelle) collects information on the French austral and antarctic fisheries (ie. Legine fisheries).

Moreover, the DPMA (French department of the maritime fisheries and aquaculture - Ministry of Agriculture and Fisheries) collects administrative data, as well as all data needed for EC data collection framework.

Each organisation has his own methodologies and objectives according to his regulations and/or scientific or management thematics.

Regarding the French fisheries management, the DPMA need to have a overview of data that can be used and thus a better readability between the different information systems. We can mention here the strategic role of the information in the negotiation on management measures at national, European or international level.

In order to meet these different needs, the DPMA started in 2005 a project called "Geographic information system : fisheries and regulation". This project is co-funded by the EC and by French partners (IFREMER, IRD, MNHN, Agrocampus Rennes). The project relies on the existing observatories and aims to make them complementary.

This poster will present a part of the project that aims to design an online atlas about fisheries data (a volume of table, charts or plates that systematically illustrate a particular subject). This poster focuses on the main results of this project while a oral communication will present the methodology used to manage the project itself.

The presented tool builds on a database that contains SQL queries. This tool allows to query the different information systems and store the result of the query. It also contains the way to publish the data on the web through the atlas. The atlas is then spread through a website. The web interface developed during the project can be used by a wide public but not necessarily fisheries expert. The user can view standardized factsheets on each selected thematics. The web pages are dynamics and use consolidated data checked by one or more experts.

The online atlas of this project contains a general entry presenting an overview of the French fisheries and five thematics entries (species, stock, fisheries, fishing zone and administrative zone of the boats). Each thematic entry gives access to several indicators grouped by type of information. Each indicator and the global factsheet will be spread with a point of view concerning the data quality given by an expert.

The first part of this poster will present the context of the project and the methodology used. Then, the concept and a part of the results will be presented. The tool will be online before the end 2007.

Abstract 134

Session: 3 - User Oriented services and products

Database for the assement of the techtonic impact on the river Chorokhi and its influence on the sustainibility of the Black Sea Coastal zone in Adjara, Georgia

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The coastal zone of Adjaria (southern part of Georgian Black sea coast) and entire Kakhaberi plain - where Batumi is situated, mainly is made of the alluvium of the River Chorokhi. The role of the small rivers of Adjaria is insignificant in the formation of the seashores and does not go out beyond the limits of the local areas of their mouths. The River Chorokhi is a frontier river - it flows on the territories of Georgia and the Republic of Turkey. The area of the river basin is about 22 thousand km2, its length is 438 km, from which only 28 are within the territory of Georgia. It is evident that its hydrological regime and its solid sediments almost completely are formed in Turkey. In the natural conditions the River Chorokhi annually brought to the sea about 5 million m3 alluvium per year, amongst them 2,35 million m3 - of the beach creating fraction.

The beach creating material of the River Chorokhi, which fell in the coastal zone of the sea, made the stream of drift along the coast. This stream moved to the north because of the action of the prevailing south and southwest storms. Before the construction of Batumi port (1878) the continuous stream of the sediments reached the mouth of the River Natanebi (50 km from north Chorokhi river sea mouth) and made the integral lithodynamic system of the River Chorokhi with wide coast preserving beaches of the complete profile. Despite of the great volume of the coastal sediments, the coastal zone, adjacent to the river mouth (on the north from the mouth, a 3-4 km length part of Adlia) from the end of the 19th century was subject to a washout with permanently increasing intensity. Its area is developing northwards (towards Batumi).

At the beginning of the eighties of the 20th century the washout rate of the sea coastal zone on the north of the River Chorokhi sea mouth, in the district, adjacent to the airport, was in average 3-5 meters per year. On the beach of Makhinjauri, Chakvi and Bobokvati-Kobuleti, 10-30 km to north of River Chorokhi sea mouth, there was a severe emergency situation. In the Adjarian coastal zone in the years 1982-1990 there was realized unprecedented as by its contents, also by its large scale for that time coast restoration project. In the mouth area of the River Chorokhi there was captured the coarse material of the river with special dredgers and excavators and transported (with trucks and dump-body ships) to the emergency districts of coastal zone with a view to fill in the deficiency of the coastal sediments.

In the previous years these materials were lost in the submarine canyon, causing its slopes' erosion, and accordingly its activation. Within the scopes of the project in total there were yielded and transported about 6.3 million m3 materials. The compensation of the yielded materials in the mouth area place during every flood and high water. As of 1991, the total length of the degraded coasts in Adjaria decreased with 31 km, and the area of the artificially restored coast protected beaches was 38 ha. From the year 1992 because of the lack of funding no more measures were taken. Despite of this the increase of the coast areas continued till 1998 and made 58 ha. This happened because the volume of the artificially brought sediments was more than the annual lack of the sediment budget. Exception was the north part of the of the River Chorokhi mouth, which is a transit zone for the sediment flow along the shore and (in comparison with the other coasts of Adjaria) is notable for its high dynamics. Here, as soon as the filling stopped, the process of the wash off became active again. In the environs of the airport in the years 1990-1995 the shore retreated for 18-25 m, and only one force-six gale washed away 8-12 m wide coastal line.

The formation of the River Chorokhi sediments occurs on the territory of Turkey, were there are already constructed the water-power stations of Muratli (in 30 km-s from the sea) and Borchkha (in about 40 km-s from the sea), actually the Deriner dam is constructing (in about 70 km-s from the sea) in the upper reaches/river head of the River Chorokhi. The regulation of big rivers by means of dams, unlike the negative influence, caused by extracting of inert materials from the beaches and the riverbeds, belongs to a category of the irreversible man-made impact on the environment.

The radical regulation of the River Chorokhi negatively impacts different processes in the river bed and sea coastal zone in many aspects.

The extraction of great volumes of coarse fractions from the River Chorokhi bed on the territory of Turkey has caused the decrease of the dimensions of sediments. Afterwards construction of the Borckha and Muratly dams completely blocked the gravel and pebble material, and, partially, coarse sand too, - the main riverbed creating materials.

The comparison and analysis of the cartographic materials has made possible to precise the average rates of the coast washout on the different stages of the coastal zone development. In the years 1880-1926 it was about 5 m/year, in 1926-1980 - 2 m/year, in the years 1980-1990 - the period of realisation of the project of active coast protection measures the coasts were stable. In the years 1990-1995 the washout rate was 4-5 m/year, in 1998-2001 - about 3 m/year. In the year 2002 the River Chorokhi was moved to the canalisation canals of the Turkish water power stations. Accordingly, from this period the coarse fractional material of the river could no more get into the lower still water of the dam, i.e. in the limits of Georgia. In the years 2003-2006 in Adlia, the washout rate of the coastal zone, adjacent to the airport, was 7-9 m/year.

In occurred situation the coast azimuth will gradually turn/move by 20°-30° (counter clockwise). Forecasting of the washout process in time and space is relative, but the analysis of the international analogues, and also those, existing in Georgia and the results of mathematical modeling allows us to do this. In the opinion of Dutch experts, for year 2011 the River Chorokhi delta will be completely washed out. In case of "inaction", for year 2025, according to the sceenery of minimal washout, about 150-200 ha of dry land from river mouth to Batumi cape will be in the sea. The width of the washed out line near village Adlia will be about 400 m; and according to the maximal scenery, the territory of about 300-350 ha-s will be under the sea. The maximum of the washout will be about 1000m. Unliket to Hollande researchers, we consider, that the sea-shore will be included in the wash-out area not only in the north of the river Chorokhi sea mouth, but in its southern part as well at 3-4 km distance.

According to the prognosis of the Georgian specialists, the washout to be expected will cover about 320 ha-s. In both cases will be washed out the airport runway, the settled district of Batumi and significant part of boulevard. For Adjaria, with its small territory, the process of such a great scale will indispensably cause vitally important economical, environmental and social problems.

It is advisable to consider the prognosis of intensity of the sea coastal zone washout in the context of the permanent rising of the world ocean level. In particular, in case of the level rise by/of 0,5 m in the Batumi-Gonio coastal zone will be washed out a 50 m width extha strip, a coastal territory of 40 ha; in case of the level rise of 1m, the width will be 100 m, area - 80 ha. Of course, it is important, in which period and how intensely will rise the sea level - the existing tendency will be kept or the dramatic changes will occure. According to the existing prognosis, for the year 2025 the world ocean level will rise for 20 cm+10 cm, for 2050 - 42 cm+22cm, for 2100 - 85 cm+47cm.

Information System about the Marine Environment in the Gulf of Trieste

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Within the framework of the cross-border INTERREG IIIA Slovenia-Italy 2000-20006 projects, the 'ISMO' (Information System about the Marine Environment in the Gulf of Trieste) project commenced in June 2006. This on-going project, which will end on 31 May 2008, is designed to provide comprehensive information and data about ecological and oceanographic conditions in the Gulf of Trieste (the Gulf) to the general public and the professional community (www.ismo.mbss.org). It also adopts meteorological, oceanographic and biological information obtained through other projects which will be upgraded by model analysis. The existing state-of-the-art technology installed at sea (buoy.mbss.org) will be suitably upgraded (e.g. a new coastal buoy with underwater cameras and a microwave ethernet link with near-real time transmission of images and data). The data gathered by the Coastal Oceanographic Station Piran (COSP) from the coastal buoy are the core of the operational part of the system which is to be upgraded by inclusion of the ability to forecast circulation in the Gulf. Moreover, the information system will be also composed of a user-friendly interface for numerical simulations of circulation driven by internet users and by gathering near-real-time images from the natural protected area around Cape Madonna, Piran. The information system will also offer information about the fishery, nuisance phenomena (outbreaks of medusa, mucus aggregations), marine ecology and oceanography, which are provided by other institutions, mostly concentrated in a neighbouring Italy, which shares the Gulf with Slovenia.

The data collected by COSP include air temperature and humidity 4 m above sea-level, surface wave data, temperature and salinity at a depth of 2 m, currents in layers of thickness of 1 m and the temperature at the sea-floor at a depth of 22 m. The data are gathered from the buoy at 30 min intervals and they enter the MySQL data base system, which is composed of tables of instantaneous data as well as tables of post-processed data (half hour averages). The collected data pass through quality control according to WMO/IOC recommendations. Special attention is paid to the quality control of wind gust data. The data are extracted from the database and offered to the public in near-real time in a comprehensive graphic form, while they are at the same time exchanged with environmental agencies (OSMER-ARPA in Italy, ARSO in Slovenia).

All this calls for continuous measurements in the environment according to the standardised method, an ongoing cross-border exchange of relevant information and data, the automatic processing of observations and the continuous apprising of the public. Within the EU project SeaDataNet the ability of internet users to ask questions and receive replies is under development. This development will follow the Common Data Index (CDI) XML format and will enable internet users to collect the meta-data of data from the coastal buoy, as well as information about the data collected by different monitoring cruises.

Direct and indirect users of the information system are: the fishery, aquaculture, tourism, public utility companies, public administration, the maritime administrations in Slovenia and Italy, civil protection agencies, the maritime police, research institutions, schools and public media.

Eastern Pacific Ocean Analysis Bulletin

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CIIFEN (www.ciifen-int.org) contributes with an Information Service to the develop of the community associated with marine, coastal, and economic activities such as fishing, tourism, shipping, climate prediction, and environmental and coastal management in Central and Western South America.

The Information Service consists in a monthly Bulletin which presents processed data obtained from different global open sources. The Bulletin includes an image of sea surface temperature anomaly elaborated with data from AVHRR /NOAA NESDIS OSDPD and the climatology of Casey and Cornillon or The NCEP Reynolds Optimally Interpolated dataset posted by the Jet Propulsion Laboratory JPL. The image covers the Eastern Pacific Ocean from Mexico to Chile.

Another product is the image of subsurface ocean temperature, produced by CIIFEN with data obtained from the Argo floats distributed by the Coriolis Operational Oceanography Project, and processed with the Ocean Data View software developed by the Alfred Wegener Institute AWI. The data from the Argo floats is plotted from Mexico to Chile from surface to 100m depth in a band of 300 Km wide, approximately at a distance of 400 km offshore the coast.

The Bulletin also includes products from global information centers, such as the evolution of sea surface temperature anomaly from NESDIS and the model seasonal forecast prepared by the European Centre for Medium-Range Weather Forecasts ECMWF, for the next three months season.

All the information prepared is analyzed to estimate the evolution of the Eastern Pacific conditions for the upcoming month. The Bulletin is distributed to up to 13000 key users from diverse social, political, and economical sectors in the region.

Abstract 137

Session: 3 - User Oriented services and products

A thermohaline database for the study of the Sea of Azov climate fluctuations

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Social and economic progress depends on many factors, including weather and climate. Contemporary long-term forecast orients the mankind to the global warming. But an increased interest of the specialists in long-period and still discussable climatic trends should be balanced against serious attention towards the weather cataclysms. Their detailed study at a long-term scale can orient the society and economy to the assessment of actual natural risks more pragmatically.

The newest thermohaline mega-databases are developed and applied for analysis, forecast and modeling of the ocean climate. In the present research, developed technologies of oceanographic information systematization [3, 4] are adapted to the conditions of inner-continental southern seas. The structure of the database, the procedure of the data quality control and information analysis are developed by the specialists of MMBI KSC RAS and NOAA within the project «Global Oceanographic Data Archaeology and Rescue (GODAR)». This technology was applied and approved when developing the climatic atlases of the northern seas [5].

The Climatic Atlas of the Sea of Azov is a unique mega-base of primary data, including more than 133 thousand stations for 120 years of observations over the whole water area. The amount of marine observations exceeds 40 thousand stations.

The optimal parameters of the network area and interpolation in the Azov Atlas (2007) were selected on the basis of numeric experiments (even net with a pace of 10 for 10 km). Mean monthly values of temperature and salinity for every year were calculated in the knots of the net by the method of weighted interpolation with an impact radius equal to 30 km. Climatic mean long-term values in the knots of the network area were assessed by averaging the mean monthly values calculated for every point for not less than 3 years.

Important elements of technology are special interface for base's development, programmes of quality control and duplicates' exclusion, users' interfaces for selection, applied scientific analysis and comparison of diverse information. MMBI format has got a block structure and is composed of blocks describing the place, time, methods and conditions of data collection, as well as information itself. By their form, the blocks with data are close to standard discipline tables of information presentation.

More than 100 climatic mean monthly maps of the Sea of Azov water temperature and salinity distribution are developed in the GIS milieu for horizons of 0, 5, 10 m and a near-bottom one. Mean monthly thermohaline structure characterizes the weather and climate dynamics for more than a secular period. The maximum amount of measurements (2.3 to 2.7 ths a year) was made in 1927, 1935, and 1952. In 2005 and 2006, more than 800 measurements were made. Such a high study intensity of water body of a small area (39 ths km2) gives grounds for a series of common conclusions to be made.

Analysis of seasonal dynamics of water temperature for 100 years in three geographical points of the Sea of Azov showed regular (latitude) differences of sea weather. Warmer (+2 - +5°;) water masses are formed in the Kerch Strait from September to April. Shallow Taganrog Bay, on the contrary, is relatively warmed (up to 25–30°;) in May – August. It is rather obvious that water thermohaline qualities' variations in winter take place under the influence of both the air temperature and wind direction, and the volumes of advection of relatively warm Black sea waters into the Sea of Azov basin.

Severe weather in the winter season was reflected in the thermal rhythmical pattern of the Sea of Azov waters, for example, in 1928, 1937, 1939, 1950, 1954, 2003, and 2006. The mean winter water temperature in the Taganrog Bay, central part of the Sea of Azov, and Kerch Strait for the secular period was characterized depending on the salinity by the following values: from -0.1°; to +0.2°;; from -0.3 - -0.7°; to +0.2 - +0.4°;; from -0.5 - 0°; to + 0.5 - +1.5°;, correspondingly. In relatively warm years (1927, 1933, 1940, 1981, 1997) winter conditions of weather practically did not develop. The water temperature was of typically «autumn» character: +2.5 - +6°;, +3 - +7°;, +4 - +9°; correspondingly in the Taganrog, Azov, and Kerch areas. Not all winter months are covered by oceanographic parameters for 100 years. At the same time, there is a probability of consequent manifestation of severe and warm winters over the Sea of Azov area and its complete simultaneousness with the atmospheric temperature dynamics on the coast.

To get a complete climatic situation, mean daily air temperature for December - February of 1885 - 2006 was analyzed along the coast and mean winter values over the Sea of Azov were calculated. The following regularity of the rhythm of winters was determined: severe - with average frosts of -5 - -10°; in 1885 - 1941; mild - with mean temperatures over the sea up to +2 - 4°; in 1942 - 1984; severe - in alternation with mild ones with the air temperatures up to +2°; in 1985 - 2006. It is significant that after severe winters drifting ice lumps of dozens of metres size are registered over the water area till May.

In total, the conducted analysis and systematization let make the following preliminary conclusions. In publications, linked with the Sea of Azov temperature regime analysis, the main focus is on the presence of positive trends in the last years, which are linked with the global warming. But from the results presented it is seen that, most likely, we deal with inner-secular fluctuations of climate, with periodicity of 20–40–60 years. The Sea of Azov climate for 120 years is characterized by alternation of cold cycles with freezing and intensive ice situation of the whole water area with warm ice-free phases during the winter period. And in different historical period either warm or cold periods can be more typical and distinctly expressed. So far, there are no reasons to presume it might be different in the future.

Natural rhythmic polycyclic pattern (from interglacial periods to inter-year variability), probably, even considering the progressing impact of human activity, makes us treat the conception of global anthropogenic warming carefully.

Nowadays, to assess the length of contemporary relatively warm period, forecast anomalous climatic phenomena, it is necessary to develop and apply secular thermohaline data mega-bases. Besides, climate analysis is to be made in the context of changes taking place in Large Marine Ecosystems of the World Ocean in Holocene [15].

Translation by Mr. Roman G. Mikhalyuk

Data management, a crucial factor for reliable mapping

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After II WW an enormous evolution happened in the era of systems that were capable of monitoring sea parameters as well as measuring the changes of the seabed.

As the years past the aforementioned systems become more and more user friendly, resulted their easy adoption from the hydrographic and oceanographic community all over the world.

In nowadays there is a big variety from marine systems that provide enormous information in numerous formats. Surveyors or oceanographers often come back in office, with data that are not compatible (in format) with data collected in past. The issue is that they are obliged to use them in anyhow in mapping or populating the existing databases. Thus, the problems arising, since sometimes it is very difficult to write algorithms for data conversion or measurement transformation. However, transformations or conversions result sometimes to changes in data accuracy, or alter of information presentation.

Many Hydrographic Offices (H.O.s) have tried to create a reliable flowline for data manipulation, data checking and data management, in a common international accepted format but this done after offering large amount of manpower and euros.

The big issue that H.O.s face today is the training of their personnel not in using digital and many times complicated survey systems in field as happened at the last decade, but in manipulating huge amount of data, using modern database softwares and codes.

Although this article is not an academic one, it is according to my opinion very important to pass to your excellence some hints from the experience and lessons learnt, we obtained all these years at Hellenic Navy Hydrographic Service (H.N.H.S), trying to cope with the difficulties risen from managing GBytes of data, in the scope to create a reliable maritime database for mariners benefit.

Furthermore, I will crap the opportunity to say few words for the historical evolution in data collection, and the services or products can be delivered to the end users.

Commander Athanasios Mavraeidopoulos H.N, Deputy Director H.N.H.S.

Abstract 139

Session: 3 - User Oriented services and products

The ADRICOSM STAR GeoPortal

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From Stockholm (1972) to Rio de Janeiro (1992) and to Johannesburg (2002), environmental protection objectives are related to the principles of sustainable development. This includes the following important components: participation, information, communication, training (capacity building) and education. Better information ensure more participation from individuals, and allows citizens to take part in many different actions that can influence the policy process. Participation to political decisions need access to reliable and quality controlled information.

In order to organise any information system, it is necessary inter alia to define 'products' and 'services' on the base of the 'clients' of the information system:

- product is anything that can be offered to a client and that might satisfy a want or need
- service refers to a discretely defined set of technical functionalities.

The definition of products is the following:

Baseline observational product - The observational baseline products are the 'raw' in situ and L0 - L2 satellite data sets given on the measurement geographical and time locations.

Standard observational product - The observational standard products are of general categories: in situ qc, qc time series, gridded fields, L3-L4 satellite data,

Baseline model product - The model base-line products are the model output state variables on the model native grid

Standard model product - The model standard products are instead on a grid with simple geographical coordinates (lat, long and depth) at a fixed resolution similar to the native model grid

The Adricosm products and services have the goal to establish a measure of coordination between the users and providers of the information so that information and knowledge from different sectors can be combined. The question posed in the introduction must be finalised to a portal. In a general architecture, it is necessary make a distinction between data holders and data providers: the data holder can manage data belonging to many different data providers.

What - Describes the objective and/or the content of the GeoPortal

Why – Provides information on the projects in the framework of which data have been collected

Where - Describes where the products and services are concentrated

Who – Describe the data providers

How - Describes methodologies for data collection, how the products and services can be obtained

The main objective is: the definition and organisation of the information in the GeoPortal.

- The GeoPortal has the objective to support data exchange in Adricosm Star and the implementation of tools to facilitate the access to data and information through thematic portals, converting individual data provider systems into a federation.
- The GeoPortal must provide the necessary information to users on content of data that can be accessed in the federated systems.
- The users could be very different: scientists involved in Adricosm, scientists from the wider research community, students, public environmental authorities, general public.

The portal is organised in three modules and a catalog. The module 1 has been realized by giving information on the project and objectives, data policy, reasons to provide products and services, link to the themes. Skilled people can jump to the data/products/services provider by clicking on the geographical map. Module 2 is providing more specific information on centers providing data/products/services. Module 3 is providing a direct access to partners product. It contains a short description of the products and a link. Module 4 contain the catalog for each partner product and is based on What, Where, When and How. There could be more catalogs for each center.

The following key field have been considered for a catalog / search engine:

- Theme (Atmosphere, Oceanography, Hydrology, Urban Waters)

- Service Specification (near real time, delayed mode, historical data, climatology, reanalysis)
- Parameters Group, equivalent to SeaDataNet coarse-grained Parameters Group (P031)
- Parameters, equivalent to BODC Parameter Discovery Vocabulary, terms describing fine-grained related groups of measurement phenomena designed to be used in dataset discovery interfaces
- geographical region (C161 Vocabulary IHB)
- temporal coverage.

Utilizing the sonar data for mapping gas seeps, and estimating their spatial and temporal changes

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The work presented herein describes the application of the Parasound (Atlas Electronics) sediment echosounder used as a conventional single beam 18 kHz echosounder in mapping gas seepage in deep waters. It reviews the advantages and limitations that this existing sonar has in studying these systems. New techniques for data analysis for adapting single beam sonars to deep waters are proposed and applied to a data set acquired during two Meteor cruises: M72/3a and M72/3b (in the Batumi Seep Area, offshore Georgia, south-eastern Black Sea). The results show that backscatter from gas that rises from the seafloor through the water column can be observed during the surveys. Moreover, average gas flux can be calculated on the basis of the quantitative analysis of the backscatter intensity. The single beam sonar data can be used for several purposes in deep waters, in particular to estimate the spatial distribution of gas outlets (at the sea floor), and their temporal variations in the quantity of the produced gas during a period of one month (in which the surveys took place).

Abstract 141

Session: 3 - User Oriented services and products

The FIMR Data Portal Havaintohaavi

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A new service to view and download Finnish monitoring data is available at FIMR web site (http://www.fimr.fi/en/palvelut/bmp/bmp-data.html). By registering as a user anybody can view the most essential monitoring data from 16 monitoring stations that cover the whole Baltic Sea in years 1979-2006.

This web site, called "Havaintohaavi", enables simultaneous examination of observations as time series, seasonal variation and vertical profiles. The data can be downloaded free of charge directly from the site.

The user interface of Havaintohaavi

The idea of the user interface is to allow dynamic data viewing and quick insight on the nature of the data, for example exceptional values are easy to discover visually, identify interactively and study concurrently in the three dynamic views.

The user interface consists of a control panel and three data viewing windows: a seasonal variation window, a time series window and a vertical profiles window.

In the control panel the user can choose station(s), a parameter and a time span in years. In addition the user can choose a desired depth or depth interval, and restrict the choice to specific months.

The three data view windows interact so that if user points any observation in any window, the same observation is highlighted in the other windows. The location, time and exact value of an observation can be seen by pointing it in any window.

If the user has chosen some interval of months, the data for all other months are shown as grey points and the data from the selected months are highlighted.

The period of inspection can also be selected in the time series window, which highlights the chosen years' observations in the seasonal variation window.

The technical solution

The interface is based on innovative integration of rich Internet application (RIA) to powerful relational database technology and state of the art n-tier client-server architecture. The user interface and client side of the system is implemented with Adobe® Flex 2 cross-platform development framework enabling development of expressive, high-performance applications that run identically on all major browsers and operating systems. The data is maintained in MySQL® relational database, which has become the world's most popular open source database because of its consistent fast performance, high reliability and ease of use. The server side of the system and the overall architecture is built on Simsoft Tammi® application framework supporting dynamic generation and configuration of object/relational services to rapidly implement applications where large data stores need to be made available in various forms for alternative purposes and to different target groups.

The data

The data set on this site consists of the most essential hydrographical and nutrients data of FIMR covering the whole Baltic Sea in 1979-2006. It includes more than 1700 visits at the sixteen stations and nearly 150000 observation values for fourteen parameters.

FIMR is a testing laboratory T040 (EN ISO/IEC 17025) accredited by FINAS, the Finnish Accreditation and the data in the web database fulfill the accreditation requirements from the year of the accreditation.

These data or a part of it can be downloaded free of charge directly for own use. The user accepts the FIMR Data Policy and a "user license" that includes giving true contact information.

Abstract 142

Session: 3 - User Oriented services and products

Bilateral cooperation for promoting oceanographic data and information management of the Eastern Mediterranean and Black Seas

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Fundamental elements of the success of marine community research projects and an effective support of marine economic activities are the speed and the ease with which users can identify, locate, get access, exchange and use oceanographic and marine data and information. Furthermore, this information must carry a certain overall data quality level. Therefore, data and information management plays a vital role in achieving these goals. It assists science, it safeguards scientific data for future use by a wider community and moreover it enables the combination of these scientific data with other available oceanographic and marine data resources for a wide range of applications. Given the large and still expanding diversity of data types, organizations engaged in data acquisition, volume of data acquired, and offer of computer technologies for data processing, storing, retrieving and distribution, data and information management has become a professional discipline and service.

Oceanographic research undertaken in the Eastern Mediterranean and the Black Sea has been the subject of several projects supported by national agencies and international organizations [e.g., European Union, Intergovernmental Oceanographic Commission (IOC) of UNESCO, NATO, etc.], during which a large volume of diverse oceanographic data have been collected. However, although the Eastern Mediterranean and the Black Sea are two interconnected sub-basins greatly influencing each other the exchange of scientific information and data between the various research groups working in the regions has been somewhat limited.

The present contribution is related to recent activities aiming at promoting management of oceanographic data and information of the Eastern Mediterranean and Black Sea. These activities have been undertaken within the framework of the Protocol for bilateral Scientific and Technological Cooperation between Bulgaria and Greece for the years 2005-2007. The overall objectives of these activities, in which are involved the National Oceanographic Data Centres of Bulgaria and Greece, is the development of a database system for banking and managing of a great diversity of marine data and information, for the Eastern Mediterranean and Black Sea. More specifically the Programme aims to: further development of existing methods and standards for the processing, quality control and formatting of a great diversity of marine data and information, taking into consideration internationally accepted rules and procedures; the development of methods and automated techniques for input, storage, retrieval, dissemination and exchange of a great diversity of marine data and information; further improvement of existing marine data services activities to meet the needs of national economic activities and industry, along with scientific programmes; the establishment of scientific and technological methods for improved information services and the development of automatically available marine data directories, inventories and catalogues; the integration of modern technologies for remote access to the database using Internet.

The system will be useful for making decisions on administrative, economic, technical and political issues related to the exploration, exploitation, management and protection of the coastal and open sea waters and therefore it will provide services to a large number of potential users. It will be accessible through Internet and it is expected to be mutually beneficial not only for the economic and social development in the two cooperative countries but also for enhancing cooperation and sustainable development of the overall region.

Abstract 143

Session: 3 - User Oriented services and products

Application of the Generic Mapping Tools for automated visualisation of marine data products in the Baltic Sea

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Daily hydrodynamical forecasts have been presented by IMGW Maritime Branch since 1998.

They are based mostly on the High Resolution Operational Model for the Baltic (HIROMB),

which is a result of the international co-operation between partners from several Baltic countries.

At the first few years the Golden Software Surfer was used for automated visualisation of this product at IMGW. However, in order to secure a better performance and stability of the service, another solution was searched. Finally, it was decided to do both the processing and visualisation of data on Linux.

The data is preprocessed in the "netCDF Operators" (NCO) and "Climate Data Operators" (CDO) packages. Scripts for map image creation make use of the "Generic Mapping Tools" (GMT) software of Paul Wessel and Walter Smith, followed by conversion of the GMT-created PostScript to PNG for raster image export and display on the client browser.

GMT works with two-dimensional netCDF grid files, but it also possible to handle 3D-grids

by defining two-dimensional subsets. The free open source package offers an extensive functionality and a stable and efficient performance.

Using a similar approach, the service was lately extended with the visualisation of satellite SST images. The presentation, which attracts hundreds of users every day, is available at:

http://baltyk.imgw.gdynia.pl/hiromb/. The solution used for automated visualisation of data proved to be successful and worth to be recommended.

The Global Multi-Resolution Topography (GMRT) Synthesis

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Topographic maps provide a backdrop for research in nearly every earth science a discipline. There is particular demand for bathymetry data in the ocean basins, where existing coverage is sparse. Ships and submersibles worldwide are rapidly acquiring large volumes of new data with modern swath mapping systems. The science community is best served by a global topography compilation that is easily accessible, up-to-date, and delivers data in the highest possible (i.e. native) resolution. To meet this need, the NSF-supported Marine Geoscience Data System (MGDS; www.marine-geo.org) has partnered with the National Geophysical Data .noaa.gov) to produce the Global Multi-Resolution Topography (GMRT) synthesis – a continuously updated digital elevation model that is accessible through Open Geospatial Consortium (OGC; www.opengeospatial.org) Web services. GMRT had its genesis in 1992 with the NSF RIDGE Multibeam Synthesis (RMBS); later grew to include the Antarctic Multibeam Synthesis (AMBS); expanded again to include the NSF Ridge 2000 and MARGINS programs; and finally emerged as a global compilation in 2005 with the NSF Legacy of Ocean Exploration (LOE) project. The LOE project forged a permanent partnership between MGDS and NGDC, in which swath bathymetry data sets are routinely published and exchanged via the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH; www.openarchives.org). GMRT includes both color-shaded relief images and underlying elevation values at ten different resolutions as high as 100m. New data are edited, gridded, and tiled using tools originally developed by William Haxby at Lamont-Doherty Earth Observatory. Global and regional data sources include the NASA Shuttle Radar Topography Mission (SRTM; http://www.jpl.nasa.gov/srtm/); Smith & Sandwell Satellite Predicted Bathymetry (http://topex.ucsd.edu/marine_topo/); SCAR Subglacial Topographic Model of the Antarctic (BEDMAP; http://www.antarctica.ac.uk/bedmap/); and International Bathymetric Chart of the Arctic Ocean (IBCAO; (www.ngdc.noaa.gov/mgg/bathymetry/arctic). Local data sources include high-

resolution bathymetry swaths and grids from over 210 research cruises, submersible dives, and related compilations to date. GMRT is accessible via a OGC Web Map Service (WMS) which offers dynamic resolution and on-the-fly map re-projection A growing number of commercial and open-source clients support OGC protocols, including recent versions of Google Earth and Google Maps which now support WMS natively. GMRT is incorporated as a primary basemap in science Web portals and geobrowsers including EarthChem (www.earthchem.org) and GeoMapApp (www.geomapapp.org), which also serves the underlying elevation values. Future development work will include extension of GMRT to higher resolutions; addition of the International Bathymetric Chart of the Southern Ocean (IBCSO; www.ibcso.org) and the improved SRTM V2; and deployment of new OGC services including a Web Coverage Service (WCS) and Web Terrain Service (WTS).

GeoMapApp – A New Virtual Globe Specifically for Visualization of Marine Environmental Data

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GeoMapApp is an application designed for the discovery, visualization, manipulation and capture of marine environmental data through a map interface. The application is downloaded from http://www.geomapapp.org and runs in Unix, Linux and Windows XP/2000/Vista operating systems with Java 5 (http://www.java.com/en). New at the time of this conference is a virtual globe option in addition to traditional flat maps with Mercator and polar projections. GeoMapApp is interfaced with several external databases providing global syntheses of topography, bathymetry, gravity, seafloor age, sediment thickness, spreading rates and spreading asymmetry. It also has interfaces to view earthquake epicenters and their focal mechanisms as well as velocity vectors across plate boundaries. The application allows connection to external Web Mapping and Web Feature Services. With such connections users can link to a large number of environmental datasets from NASA and other government agencies. Tabular data is presented in scrollable spreadsheet style with automated links to map locations. Several large relational databases are now integrated into GeoMapApp including EarthChem, PetDB and JANUS that allow the exploration of the composition of ocean floor rocks and sediments obtained from decades of seabed sampling, drilling and downhole logging. Users can input their own data as grids or discrete samples. GeoMapApp accepts tables formatted with common spreadsheet files such as Mircosoft Excel or ASCII. Maps can be saved in numerous formats including kmz for visualization in Google Earth. My presentation is aimed to demonstrate GeoMapApp's usefulness in both research and education.

Abstract 146

Session: 3 - User Oriented services and products

A system for acquisition, processing, visualization and storage of satellite and field biooptical data

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The system for acquisition, processing, storage and analysis of satellite and field bio-optical data has been developed at the Laboratory of Ocean Optics of the Institute of Oceanology of the Russian Academy of Science (SIO RAS). The system is a software package for processing, displaying, and analyzing satellite and ship data received during remote and in situ measuring of environment condition parameters of sea, and for remote access to them, as well as for comparing satellite and in situ data. System includes a database and programs of region-adapted numerical models for diagnostic and forecasting estimations. Initially, the system was developed as information system of Satellite Monitoring of Caspian Sea (SMCS); however it can be used for processing and analysis of data obtained at any part of the World Ocean. SMCS is developed for Microsoft Windows.

SMCS has client-server architecture; its main functionality is realized on the client side. Database management system MySQL was selected as server software. The server can be managed by any operating system, which supports DBMS MySQL (v4.1 or above), such as Linux, FreeBSD, Sun Solaris, and Microsoft Windows.

The server contains an archive of satellite files in HDF format, and a relational database containing three types of data: in situ data in ASCII format, graphical files in GIF, JPG, BMP, or PNG format and satellite files metadata, as well as a number of auxiliary tables used for simplification of data search.

The client part of the software is comprised of the following programs: the main program smcs, FTP-client software smcsftp, the program smcscd intended for downloading required satellite files from compact disks, 6 processing programs (see below), a number of Dynamically Linked Libraries (DLLs) containing realization of processing algorithms, and database administrator program smscadmin. This program is intended for execution of operations connected with database modifications: change of structure of tables, data addition and removal. An essential part of the system is a text file globalproductlist.dat, a list of names of data products entering into the system and names of DLLs containing computer code for calculation of those products.

The system provides full support for Level-2 and Level-3 SeaWiFS and MODIS files generated by SeaDAS, ancillary files (ozone and meteorological files), and partial support (archiving and search, but not processing and visualization) for Level-1 files. The package contains data format converters for MODIS MYD021KM, MYD02HKM, and MYD02QKM files, and NOAA AVHRR L3 sea surface temperature data files.

By now, about 7000 satellite data files has been downloaded and inserted into the database. Most of them contain images of Atlantic Ocean and the seas of Russia: Barents Sea, Black Sea, White Sea, Caspian Sea, and Sea of Japan.

The programs included into the system were used for sea-truth purpose, bio-optical monitoring of Russian seas, and computations of balance of photosynthetically available radiation (PAR) in the Barents Sea.

Because of extremely large size of satellite files, they are not stored in MySQL tables; some satellite files are placed directly on server hard disk, some files are stored in CD-DVD archive. MySQL tables contain satellite, ship, and graphical files metadata, namely date, time, coordinates of data acquisition, sensor name, instrument type in the case of in situ data, etc. Graphical files and in situ data in their original form are stored in MySQL tables as BLOBs (binary large objects).

All stages of data processing are performed on the client side. To acquire data, one should form a SQL query. The user does not need to know this language; the query can be formed by a procedure, which is called query generator. This procedure allows selecting data by the following parameters: date, time, coordinates for all data types; sensor, bands, level for satellite data; cruise, instruments, etc. for ship data.

The query generator has a special capability for comparing ship and satellite data - the option

match-up in the database interface. The conditional expression of match-up type query contains an inequality of the form: "temporal interval between the satellite and ship measurements does not exceed a given value".

Execution of a query results in downloading of ship data files and graphical files to user's computer. As for satellite files, two lists of such files are formed: a list of files on server, and a list of files in CD-DVD archive. These file lists are used respectively by the programs smcsftp (downloading files from the server) and smcscd (copying files from CD). User can modify the SQL query created by the query generator.

After the download of all files is complete, three lists of downloaded files appear in operative memory of the main program smcs: the lists of satellite files, ship files, and graphical files. These file lists will be referred below as the internal database.

The main program smcs can serve both as a stand-alone interactive application and as a driver for programs for batch-mode processing. It is developed as multi-document interface (MDI) application for MS Windows using Microsoft Foundation Classes (MFC) technology. The program works with four types of documents: HDF satellite files, in situ data, graphical data, and output text documents, which contain results of queries and calculations. A document of each type can be presented in a separate window; it is possible to create several windows ("views") for a single document. All four types of documents can be opened simultaneously.

The ship data files are presented in a split window; the left side contains a graph, e.g. wavelength dependence or vertical profile, the right side of the window is a text editor displaying the data file in its original form. The format of ship data files are consistent with that adopted by the database SeaBASS.

Satellite files can be displayed in one of four geographical projection: equidistant cylindrical, Mercator, conformal conic, and Mollweide. Vector objects, such as coastlines, rivers, contours, ship trajectories, coordinates of stations can be displayed on top of a geographical map. Contours can be created manually, exported as text files and imported.

Another type of vector objects is a ship track or trajectory - a file containing coordinates and results of ship measurements along a ship trajectory.

Graphical interface of the program smcs includes such functions as determining latitude/longitude locations, calculation and displaying of product mean values inside a contour, histograms, sections, tables of data values at given points, slideshow of any type of data, export of files in ASCII and graphical formats.

Another function of the program is to serve as a driver for processing programs.

To run any of these programs, the user should put some files to the internal database, select required item in the menu processing, and use an appropriate dialog box to prepare a parameter file.

Processing is performed by the following programs:

- l2tol2 - is intended for calculation of new products.
- mascii - the same, but the output files are in ASCII format.
- l2tol3 - performs space-time binning and mapping.
- mtable - for a set of satellite files, and a region limited by a contour, calculates product averages and areas of sub-regions with product values lying within the given ranges.
- mtrack - is used for satellite monitoring of a region.
- seatrue - is intended for satellite and ship data comparison.
- imagex - converts satellite data to graphical files in BMP, GIF, PNG, or JPG format.

For achieving maximum processing flexibility, unified interface to all above-mentioned programs was developed. To run any of the processing programs, a parameter file should be prepared.

The system has set of DLLs package (now it includes 3 items). The first one is comprised of procedures realizing some bio-optical algorithms: semi-analytical algorithm for calculating chlorophyll concentration chl, yellow substance absorption coefficient ag, particle backscattering coefficient bbp, Kd(490), and a number of regionally-adopted regression algorithms, including two algorithms for calculation ag for Black Sea and Atlantic Ocean using SeaWiFS Level 2 data, algorithms for calculation bbp for Black Sea, Atlantic Ocean, Barents and White Seas using SeaWiFS and MODIS data.

The second DLL includes some functions enabling assessment of penetration of solar radiation into water body using satellite sensor data. These functions are intended for calculation of photosynthetically available radiation (PAR) and daily exposures at sea level, just beneath the surface, and at depths of 1, 2, 3, 5, 10, 15, 20, and 25 m. Also, reflected by surface, water-leaving, and upwelling PAR, and values of absorbed radiation are calculated.

The third DLL, now in development stage, is intended for solving atmospheric correction problem, i.e. calculation of water-leaving radiances using Level-1 satellite data.

The end user has no possibility to compile the package from scratch, as SeaDAS user can, but there are two easy ways to include user's products into the system. If the algorithm for the product calculation can be expressed through a single formula, this formula can be included into a parameter file, as described above. Otherwise, the user can include compiled C or Fortran modules into a Dynamically Linked Libraries (DLL), and add the names of new products and the name of the DLL to the global product list, the file globalproductlist.dat

Abstract 147

Session: 3 - User Oriented services and products

Integrated information system for the management of the Logone River Flood in Cameroon

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The case study provides information on how the reduction of the floods and the irrigation system and protection works have both contributed to affect the traditional flood management practices of the ecological systems of the flood plain. It should be noted that this is only a first draft and that additional material would be provided by the author to address in particular the issue of IFM.

In order to protect the population and the irrigated rice areas along the river, dykes were constructed between 1950 and 1970 on both margins of the Logone river so as to control the floods of the river. These activities continued until 1979, when they were completed on the Cameroon side with the construction of the Maga Storage Dam and the last 20 km of dykes. As a result of these, the hydrological system of the flood plain was profoundly altered; taking into account that these works were constructed during the period of persistent drought, these works accentuated even more the reduction of the flood volumes.

Studies undertaken in the 1990s have shown that the absence of floods recorded in the plain area are a result of the combined effects of the drought situation during the last 30 years and of the flood protection works. This has resulted in a reduction of the flooded surfaces in the order of 60%, as well as in the retention in the dam of the water highly loaded with limestone and other minerals, which plays a very important role regarding the fertility of plain soils.

All this has had a negative effect on the survival of the population in this region, where the flooded lands are very much used for the agriculture and grazing activities, while fishing depends on the duration and extension of the floods. The induced losses are in general very difficult to compensate by the advantages of the irrigation systems, where the performances are very often very mediocre.

In view of the seriousness of the situation, a number of studies were undertaken at the beginning of the 1990s to assess the possibility of re-instating the flooding process of the plain without affecting the irrigation systems.

From the institutional point of view, currently there are neither institutions nor administrative services responsible in Cameroon for the management of flood-related problems. However, there are a number of ministries in charge of issues related with the conservation of the natural environment in general and of water resources in particular.

A Permanent Secretary for the Management of Natural Disasters has been established. It is charged with the organisation of protection and mitigation activities in case of catastrophes over A National Plan for the Management of the Environment has been prepared and its application has been entrusted to the Permanent Secretary of the Environment of the Ministry of the Environment and Forests. Conceived as an organ of conception, management and control, this institution is

- The establishment of the diagnosis of the state of the environment, including the changes which affect the various ecosystems;
- The elaboration of the national policy in the field of the environment, which includes the strategies of sustainable management of the natural resources;
- The participation in prevention and management of natural catastrophes and risks;
- The sensitisation of the population and environmental education; and
- The management of the environmental information system.

preceded by an impact study and be based on a good knowledge of the mechanisms which underlie the normal functioning of the environment, the interrelations between the natural phenomena, and between the various communities with different and sometimes

Abstract 148

Session: 3 - User Oriented services and products

DINEOF univariate reconstruction of missing satellite data from the North Sea Belcolour-1 database

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The Belcolour-1 database holds more than 4 years of uniformly resampled MERIS chlorophyll (CHL), total suspended matter (TSM), MODIS-AQUA CHL, TSM and sea surface temperature (SST) over the North Sea. A first step of the RECOLOUR* project consists in the univariate reconstruction of missing data with the DINEOF method (Data Interpolating Empirical Orthogonal Functions). In particular, the DINEOF treatment of MERIS CHL and TSM images available for the year 2003 allowed an efficient synthesis of the coherent modes of variability existing at the scale of the whole North Sea. For both parameters, 4 modes were retained by general cross validation as an optimum for the reconstruction of missing data.

For CHL, the first spatial mode shows the high influence of coastal nutrients outputs (mainly continental estuaries and diffused coastal sources) and the lower concentration in the well stratified central and northern part of the North Sea compared to the southern bight and the eastern English Channel. The spatial trends described by the first mode are permanent features during the year, although slightly enhanced during the summer and reduced during winter. The second spatial mode corresponds to the main algal blooming events (spring and autumn) with increased concentrations in the southern bight of the North Sea, around the Isle of Wight and in frontal-like structure north-west of Denmark. The third Eof describes well the dynamics of an early phytoplankton bloom occurring in March along the Norwegian coast, where a strong stratification induced by an output of cold water from Baltic Sea provides good light conditions to phytoplankton.

Concerning TSM, the first spatial mode shows the dominant influence of large estuaries and of resuspension from shallow coastal sedimentary plains. The patterns suggest a general transport of sediments from south-east England up to the northern Dutch coastal waters, and a clear distinction between the stratified northern part and the well mixed and charged southern and German bights. Although these trends are permanent during the year, the range of spatial variations is slightly reduced during the summer, following the reduction of resuspension, of total sediment outputted by rivers and of advection along continental coasts. The second mode shows a clear seasonal signal. The winter influence of the second spatial mode can be understood as general sediment enrichment due to higher resuspension, but a clear influence of intense terrestrial water outflows contributing to reduce the sediment concentration in the plumes comparatively to the surrounding waters. This is clear for the Elbe river discharge, the whole natural part of the Wadden Sea and the Seine river plume. The Scheelde and Thames rather seems to be just neutralizing the seasonal TSM resuspension signal. The Rhine river discharge seems to make exception as no influence is detected in the second spatial mode. During summer, the contribution of the second EOF is reversed with a general reduction of suspended matter concentration in most part of the area but some local sediment enrichment at specific river discharges.

Original MERIS CHL and TSM images were filled and reconstructions were produced at a daily interval based on a linear interpolation of the temporal modes. From this, weekly averages could be calculated at stations such as the turbidity maximum of the Scheelde river plume, showing the onset of the spring bloom co-occurring with a period characterised both by the TSM seasonal reduction and by important TSM temporal variability.

*BELGIAN SCIENTIFIC POLICY - RESEARCH PROGRAMME FOR EARTH OBSERVATION - CONTRACT SR/00/111 – PROJECT RECOLOUR

Abstract 149

Session: 3 - User Oriented services and products

A new wind and wave atlas of the Hellenic seas

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The main motive for producing the "Wind and Wave Atlas of the Hellenic Seas" was the increasing demand for wave and wind data in coastal and offshore areas of the Hellenic Seas. Furthermore, the need for an updated description of the wind and wave climate was evident, as the only available Atlas for the Hellenic Seas was produced 16 years ago and was solely based on visual observations. The hindcast data of the new Atlas have been generated by numerical models of high spatial and temporal resolution, so that the main characteristic features of the wind and wave climate are represented as precisely as possible. The data cover a 10-year period (1995-2004) and are presented in a comprehensive form as charts of the spatial distribution of specific wind and wave parameters and in the form of frequency histograms in a seasonal and annual basis. In this Atlas systematic measured in-situ data are released for the first time and presented in a seasonal and annual basis. Based on the Atlas results, a description of the main aspects of the wind and wave climate of the Hellenic Seas is attempted. In this connection, the new Atlas could be a decision support tool for long-term operational applications.

Welfaremeter

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The depth and area of aquaculture sea cages are increasing. Cages can now be more than 50 m in diameter and 20 meters deep. It has therefore become next to impossible for fish farmers to form a complete picture of the welfare situation of the fish. Important decisions can therefore be taken on deficient grounds leading to great economical losses. It is consequently all-important to develop an automatic system for continuous assessment of fish welfare in sea cages.

One such system under development is the Welfaremeter. The Welfaremeter consists of a profiling probe, a control unit, a database, an expert software program and an internet webpage. The profiling probe is a standard CTD (model SD-204 MINI STD/CTD,) produced by SAIV AS, Norway, and measures salinity, temperature, oxygen, turbidity and fluorescence. The probe is lowered slowly downwards in the cage and up again by a winch on the control unit. When the probe returns to the surface the measurement data are sent to the control unit as a radio signal. The control unit consists of a winch and a mobile phone terminal (Siemens TC65). On receiving new data from the probe the control unit sends the data onwards as a GPRS-message to the database at the Norwegian Marine Data Centre (NMD), Institute of Marine Research. The system is in other words not in need of an internet connection on site, only mobile phone coverage. The database is located at NMD to ensure safe long term storage of the data. NMD has a solid IT-infrastructure with firewall, Uninterruptible Power Supply (UPS), SMS warning systems to IT-personnel and has historically had little downtime.

When new data enters the database it is analysed by the expert software program which gives an evaluation of the environmental conditions in the cage as either very good, good or potentially harmful for the fish. The expert software also calculates a welfare index from 0 (terrible) to 100 (perfect).The measurement data and the results from the expert system are immediately available on the internet webpage. The webpage has three main graphs and one speedometer. The speedometer gives the welfare index from 0 to 100.

The first graph on the page gives the measurements of the last profiling from top to bottom of the cage. The measurements are indicated by dots, the x-axis gives the scale of the measurement parameter and the y-axis gives the depth. The background in the graph is divided into red, yellow and green zones. If a measurement is in a red zone it means that the conditions measured at this depth may be harmful for the fish. Yellow zone indicates suboptimal conditions and green zone indicates optimal conditions. One can easily select between the different environmental parameter by clicking on a menu next to the graph. The two other graphs are based on the same principles, but show development over time.

In addition to classifying the environmental conditions the expert software also calculates metabolic and factorial scope. Metabolic scope is the difference between maximum available oxygen uptake under the current environmental conditions and the necessary metabolic oxygen uptake of the fish. Continued negative metabolic scope means that the fish are not able to obtain enough oxygen to cover their metabolism. If this is the case, the fish will accumulate lactic acid in the muscle and eventually die. Factorial scope is the ratio between maximum available oxygen uptake and necessary metabolic oxygen uptake. Factorial scope less than 1 means that the fish's oxygen uptake is too low to cover their metabolic need of oxygen. Factorial scope can be used as a measure of to what degree water quality can deteriorate or how much stress the fish can tolerate before it becomes harmful for the fish.

The goal is to develop the Welfaremeter into a standard product in aquaculture. All fish farmers should know and be able to document the welfare situation of the fish they are responsible for. Future versions of the expert software will also give possible reasons for poor environmental conditions and advice for how the farmers, if possible, can remedy the situation or at least diminish harm to the fish.

Development of on-line marine data systems in Estonia

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Increasing threats from natural and environmental hazards, the decisions concerning the sea have to be based on most advanced hind-, now- and forecasts, combining rapidly developing new observation techniques, model systems and expert knowledge. Those events emphasized the importance of operational oceanography significantly, in both media and decision-making level.

Estonian marine scientists joined the BOOS (Baltic Operative Oceanographic System) activities already at the end of 1990s. At this time, it was a science-driven initiative, since on the country level the applied issues of operational oceanography were not in the priority agenda. In January 2005, Estonian coastal areas suffered from massive storm and flooding from sea level raise during the surge, towns Pärnu and Haapsalu were flooded. One cause for major economic loss of property was non-effective forecast and information system of sea levels. Financed from governmental project, since 2005 a new on line sea level information system has been developed by Marine Systems Institute. System consists of 7 sea level stations placed along the Estonian coast, reporting sea levels every 5 minutes, specially optimized GPRS data transmission protocol is applied, allowing decrease running costs of real time data communication on very low level. Data are saved in database but also broadcasted in real time users via web based user interface. From other hand HIROMB (High Resolution Operational Model of the Baltic Sea) model is applied for making of sea level forecasts, 24 and 48 hour periods. Sea level data are continuously assimilated into model system and preciseness of forecasts improved that way remarkably. Sea level forecasts are broadcasted together with measurement data via same freely accessible to the public, web interface.

Abstract 152

Session: 3 - User Oriented services and products

MATCOR tool for the management and analysis of time series data

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To understand the movement of the water masses, researchers must obtain accurate and direct measures of their velocity. Some currentmeters deployed along a line give the opportunity to study time variations as well as the simultaneous water behaviour in different layers. The advances in the development of electronic systems of measure that make possible both the reduction of the intervals of measure, and the storing of big volumes of digital data, allows that the currentmeters should remain moored long-time periods and has been one of the big technological advances in the modern oceanography.

An important part of the IEO Data Center activity is to perform standard analysis over the data set stored in its own database. This analysis of large amounts of data have to be homogeneous for the whole set and implies an enormous work that have to be performed in a effective way by using computers routines and automating processes.

The IEO Oceanographic Data Center stores, in standard format, the time series of mooring currentmeter proceeding from the different projects. Throughout the time, IEO researchers in physical oceanography in collaboration with the data center have developed a methodology and the corresponding computer applications for the elaboration and the study of currents ([Pascual and Gonzalo, 1984, Arévalo and García~Lafuente, 1983, Alonso et~al., 1993], etc.). In 2005, the Data Center, in order to spread up relevant information generated from these moorings, has elaborated the reports with the results obtained across the standard analysis of the deployed currentmeter time series.

MATCOR is a set of MATLAB functions and utilities for visualizating and analyzing moored currentmeters in a routinely and friendly way. MATCOR unifies and uses different sets of tools already developed by other scientists along the time, for example, to map the position (M_MAP,[Pawlowicz]) or calculate the seawater properties (SEAWATER, [Morgan, 1994]) -a complete list of libraries can be found at MATCOR manual-. The program presents a graphical interface that allows it to be simply used by non-expert MATLAB users. This set of routines has been used in the IEO to produce standard reports of currents for each line of moorings. An additional capability of

MATCOR is that, after the analysis, the user can create a LaTex document integrating all the previous obtained outputs. The numerical outputs and the graphics provide enough information to be advantageously used by the policy makers, managers and non-scientist users. MATCOR is freely distributed under request.

MATCOR functionality.

Organization and quality control.

In general, IEO performs a series of quality control (QC) tests that provides a quality flag.

This QC and flags are according to the ICES WGWDM guidelines for Moored Currentmeter Data

(http://www.ices.dk/committe/occ/mdm/guidelines/). In addition, the data are archived in standardized format in agreement with the protocols established by MEDATLAS Group in the framework of MEDAR/MEDATLAS project ([Maillard et~al., 2001, Millard et~al., 1999]). This QC flags allows to select the data according to the quality flags for the analysis. It is important to remark that MATCOR does not perform these QC procedures, but uses the previously mentioned quality flags to select the valid data. The MATCOR provides a series of files for the analysis outputs: graphics and data. In order to avoid further mistakes, each output file is identified by the currentmeter number.

Time series visualization.

According to Godin [1991] any analysis of currents must begin with a graphical visualization of the original currents. The classic method consists of representing the measured variable opposite to the time, which in case of vectorial variables needs the drawing of at least two variables opposite to the time. In this case there are represented componentes E-W and N-S as well as the the module and the direction, and simultaneously a plot of sticks and the progressive vector. Also, time evolution of temperature and salinity is plotted as time series and in a TS-diagram.

Basic statistics.

The statistics realized on the series include the maximum and minimal values of the time series in addition to the mean value and the standard deviation. Equally the distributions of frequencies have been calculated and their histograms has been facilitated. For the series of of current there has been designed a rose of currents, the graphical output that contains information both of the intensity and of the direction. Mean Kinetic Energy and Total Kinetic Energy (thorough the Equation of State for the Seawater EOS-80 ([Dobrolyubov, 1991]) has been calculated when they have been possible. Additionally, if there are some different data time series in the same station, MATCOR have a separated routine to obtain the statistics for the whole period and their corresponding graphs. That allows to obtain a more complete characterization of the currents at this point and to find out seasonal, annual or decadal variations, depending on series lengths and gaps.

Data filtering.

Godin's filter is one of the simplest filters of mean averages and it is widely used in physical oceanography. It consists of the successive application of a series of operators An (Godin's operators). The technique implemented on MATCOR consists of applying An successively to the series, each of them acting on the result of the previous filter. This iterative filters allow to obtain hourly sample series and subinertial ones, that also MATCOR plots.

Spectral Analysis.

The spectral analysis allows to know the energy distribuitn in terms of power spectral density (energy per unit of time). The method used in MATCOR is based on the discrete Fourier's transform. To evaluate the uncertainty, the typical way of working is to divide the series in segments, to calculate the spectrum in every segment and to divide equally these to obtain an average spectrum. this methodology is known as "block averaging" [Emery and Thompson, 2001], and divides the series to analyzing in m-blocks of length (N-m) that are superposed in order to have a sufficient number of samples without a important series length reduction. The values expected from this spectrum are distributed as a function chi^2.

As the velocity of the currents are vectorial series, the velocity vector that can be decomposed by two rotating vectors with its module and phase. The anticlockwise one corresponds to positive frequencies. This decomposition allows to determine for every frequency -tidal or not- an ellipse of current which rotation sense is indicated by the size of two components: clockwise and anticlockwise. To study rotating fluids, this decomposition and its rotating spectrum are more interesting than the most classic of Cartesian components. For example, the spectrum could advance clockwise movement of all the tidal ellipses in the semidiurnal band, the existence of inertial currents and the anticlockwise predominance in the lowest frequency, which indicates that the subinertial currents turning anticlockwise.

Harmonic analysis of tidal currents.

Of form similar to the analysis of tides that is realized over sea level, it is possible to realize a harmonic analysis over current velocity. The tidal currents are composed by a limited number of harmonic components. The calculation of the ellipses and phases of the tidal componentes has been realized by means of the Instituto Español de

Oceanografía 3 usual method [Foreman, 1978, Godin, 1972] of harmonic analysis: adjustment of minimums squared to the above mentioned given frequencies. This method does not allow to separate components of very nearby frequencies when the record length is lower than a year. MATCOR uses the T_TIDE routines developed by Pawlowicz et~al. [2002] and draw the tidal ellipses of the most energetic components.

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Abstract 153

Session: 3 - User Oriented services and products

A gridded climatological dataset for the Mediterranean Sea: technics and preliminary results

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A new gridded climatology for the Mediterranean Sea has to be computed in the frame of the EU-Project SEADATANET. This work describes the data used and the optimal interpolation technics adopted in order to set up the work strategy for the computation of new climatology on a regular grid. The horizontal resolution is of 1/8x1/8 of degree and 32 unevely spaced vertical levels. The work will point out the data spatial and temporal distribution, the problems encountered and the preliminary results of the gridded climatology for the physical parameters.

Climatological and Oceanographic data server infrastucture based on THREDDS technology

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The ISAC-GOS is responsible of the Mediterranean satellite operational system in the framework of MOON Patnership.This Observing System acquires satellite data and produces Near Real Time, Delayed Time and Reanalysis of Ocean Colour and Sea Surface Temperature products covering the Mediterranean and the Black Sea.

In the framework of SeaDataNet, the GOS is developing and producing Climatological datasets based on both optimal interpolation and Variational (DIVA software) technique.

The GOS has built an informatic infrastructure data repository and delivery based on THREDDS technology. The datasets are generated in NETCDF format, compliant both to the CF convention and the international satellite-oceanographic specification, as GHRSST (for SST). All data produced, are made available to the users through a THREDDS server catalog.

In the poster we will give an overview of:

- the features of these catalogs, pointing out the powerful characteristics of this new middleware that has replaced the "old" OPENDAP Server;
- the importance of adopting a common format (as NETCDF) for data exchange;
- the tools (e.g. LAS) connected with THREDDS and NETCDF format use.

We will present also specific basin-scale High Resolution products and Ultra High Resolution regional/coastal products available on these catalogs.

Abstract 155

Session: 3 - User Oriented services and products

Hydrostatic and advection constraints in the software DIVA: theory and applications

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Griding data is a frequently demanded process in geophysics: it consists in determining the value of a given field on a regular grid from the knowledge of this field at sparse locations within the domain of sake.

The most used methods are based on interpolation techniques with an assumption of isotropic behavior of the field. However, such techniques are not well adapted to the intrinsic nature of geophysical data:

1. *in situ* measurements are always sullied with an uncertainty on the field value, thus a strict interpolation is not suitable;
2. the effects of currents and coastlines make obsolete the assumption of isotropy.

Diva (Data-Interpolating Variational Analysis) aims at bridging over the mentioned deficiencies by implementing the Variational Inverse Method (VIM, Brasseur et al., 1996). The principle of the method consists in minimizing a variational principle which accounts for:

- the differences between the observations and the reconstructed field;
- the relative weights of the data;
- the influence of the gradients and
- the variability of the reconstructed field.

Its major assets over classical methods are: 1. the resolution by the finite-element method, which allows a great numerical efficiency and the consideration of problems with arbitrarily complicated contours; 2. the additional tools designed in order to facilitate the the analysis and make it as objective as possible; 3. the error field (Brankart and Brasseur, 1998; Rixen et al., 2000) based on the data coverage and noise, provided along with the analysis; 4. the readiness of utilisation, with only three input file required for a typical analysis (analysis parameters, specification of the domain contours and data themselves).

Among the available tools, let us mention:

- the advection constraint during the field reconstruction through the specification of a velocity field on a regular grid, forcing the analysis to align with the velocity vectors;
- the Generalized Cross Validation for the determination of analysis parameters (signal-to-noise ratio);
- creation of contours at the selected depths;
- the detection of possible outliers.

The latest developments of Diva in the frame of the SeaDataNet project include:

1. the hydrostatic constraint for eliminating the potential hydrostatic instabilities arisen from the combined analysis of temperature and salinity data in several horizontal planes independently.
2. the specification of a variable correlation length over the domain, allowing one to consider different scales of interest according to the location;
3. the computation of the error field based on the real correlation function of the considered data.

Data sets of temperature and salinity in the Eastern North Atlantic are analyzed for illustrating the new features of the software: after gathering data from several sources (World Ocean DataBase, Coriolis, HydroBase2, Canigo) in the selected region (0-50°N, 0-50°W), we perform analysis at standard levels on annual, seasonal and monthly bases.

The complexity of the analysis is progressively increased by the consideration of realistic coast-lines, bottom topography and advection constraint.

Results are then compared with widespread climatologies from the World Ocean Atlas, giving rise to meso-scale features not properly represented in the latter, due to its lack of resolution.

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Abstract 156

Session: 3 - User Oriented services and products

Decision Support on the Basis of Marine Information Systems

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The problems that do not permit environmental data to be turned to good advantage can be outlined as follows. Damage caused by emergencies is attributable not so much to the lack of significant technological advancement as to the low level of decision makers' (DMs) awareness and inadequate account of the available information. In most cases DMs use information by intuition or on the basis of their own experience. Totally identical conditions of the environment recur very rarely. As a result the knowledge gained by DMs in the course of their activities tends to disappear after a while and cannot be used when identical environmental conditions are experienced again. Training of DMs to take due account of environmental conditions requires considerable resources. Dependence of the economy performance on the environment has not been studied adequately. Due to the large amount of information DMs can not respond to the continuous changes in the environmental conditions in a timely fashion. Sometimes information is not properly recorded, sometimes it is not delivered, and often it is not used properly or just ignored. Forms of information delivery are far from being perfect, information comes from various sources. It takes considerable time to deliver information. Sometimes delivery time is too long for DMs. Not all steps of information processing are automated. DM does not always know how and when to use operational, forecasting and climatic information. There are no legal norms to bring DMs to responsibility for not using information or for not taking measures to prevent damage. Potential damage from underestimation of environmental conditions may be significant and therefore the cost of the inadequate use of information may also be high. Attempts to improve consideration of environmental conditions by increasing the amount and range of information can cause even more difficulties for DMs. A number of potential emergency situations are huge, but a number of recommendations should be reasonable.

To resolve the above problems or to make them less significant it is necessary to develop decision support systems (DSS). DMs need not tables with initial data, analytical, forecasting and climatic information, but messages containing warnings on critical value accidence, information on probability of hazards, information on potential losses, and information on hazardous impacts and recommendations on decision making.

DSS can do the following: take into account impacts on specific points and on the total area under consideration; allow for the effects of the environment on economic entities (objects) in any geographical region to be analyzed; distinguish impacts and changes caused both by different phenomena and by their combination; signal when objects are or can be in adverse environmental conditions, e.g. in the area affected by fog, storm, tropical cyclone or in the area where the probability of hazardous ice events is very high, etc.

The main component of DSS is a knowledge base based on the following concept: if we know environmental conditions it is possible to predict potential impacts on the economy; if we know impacts it is possible to give a set of recommendations on how to prevent (reduce) losses or how to use natural resources most efficiently. Decision making criteria are safety of people and property, reduction of losses, increase of profit, materials saving, etc.

Knowledge base is a set of rules formulated in a formalized way using if, that, else. E.g. If "Wave height >5 m" that "To give out warning information "Hazards for small ships is possible" and recommendations "The all ships go out to small bays, gulfs, ports" else "To switch another rule".

To have a knowledge base in place it is necessary to: develop tools of identifying and getting knowledge from experts; arrange the information flow from available information systems (operational data, analyses, forecasts, climatic information) through the system of information resources integration; maintain knowledge bases up to date. The last step includes the following: development and maintenance of knowledge bases in the distributed environment; formalization and dissemination of knowledge and provision of access to knowledge; knowledge coordination and consistency check; registration of users by setting personal user profiles; continuous check of coming data for critical value accidence with respect to specific economic object and specific technological processes typical for these objects; generation and delivery of messages to DMs

Key DSS data processing and use operations are:

- collection and compilation of information on a specific object and relevant environmental conditions and the first notification when needed;
- processing and storage of information with various levels of aggregation;
- computer or man-computer assessment of an object and environmental conditions and prediction of possible expected changes;
- search for recommendations under various conditions of an object and the environment or under unfavorable tendencies;
- optimization of recommendations;
- making decision with a possibility to activate for analysis both data forming the basis of recommendation and rules being used;

- implementation of recommendations, assessment of implementation and documenting of all steps of the system operation.

DSS should actively employ various models such as those used for forecasting of hydrometeorological conditions, evaluation of environmental impacts on economic objects, optimization of recommendations, evaluation of damage and profit.

Significant contribution to decision support would be made by GIS in the form of a detailed layout of economic objects; local, regional and global maps of environmental conditions where potentially hazardous regions are marked; climate change analyses and projections.

In the future it is planned to adjust indicators, to identify vulnerability of the economy to natural hazards (intersection of economic centers and natural hazard risks), to develop tools to identify specific regions with complicated socio-technical environment exposed to natural hazards.

DSS makes it possible to: deliver initial, analytical, forecasting and climatic information at any moment, in any point, on any region and to any device; take into account all operational information and on its basis provide recommendations on decision making; optimize shirt-term and long-term planning; minimize damage and losses due to prompt and informed decisions.

Currently a static page showing examples of impacts and recommendations for various marine hazards is available at http://www.meteo.ru/nodc/project2/action.htm,http://www.meteo.ru/nodc/Product/recom.htm#m. Besides an application has been developed to show on-line on maps stations at which critical values of environmental parameters are exceeded (http://data.meteo.ru:8080/tsunami/ru/map.jsp) and by E-mail send current information on these stations. A DSS prototype for several economic objects has also been developed http://data.oceaninfo.ru/resource/analytic/objects.

Abstract 157

Session: 3 - User Oriented services and products

Discovering surface oceanic circulation dynamics in the Mediterranean from remotely sensed data

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Local and regional oceanic circulation dynamics in the Mediterranean Sea was studied using weekly sea surface temperature (SST) data derived from the NOAA Advanced Very High Resolution Radiometer (AVHRR) from 1982 - 2000. The data from descending pass (night-time) are used. Geographical information system (GIS) and statistical techniques were used for data processing and analysis. Data were integrated in GIS in grid format with the spatial resolution of 2048/360 degree per pixel, i.e., the size of a pixel at the equator is 19.55 km. SST gradients and local SST relative variability (SST RV) were calculated. The data of 8 weeks in winter season and 8 weeks in summer season were used in analysis. The Mediterranean Sea was divided into 3 sub-areas according to the spatial and temporal patterns of surface oceanic circulation revealed by SST RV: inshore area, offshore area, and seasonal hot-spot area (most locate in offshore area). The each sub-area revealed the spatial and temporal oceanic circulation characteristics in each sub-area, and the difference between the sub-areas (i.e., inshore area, offshore area, and hot-spot area). The local and regional oceanic circulation shows significant difference in winter and summer seasons. The study also shows that, SST RV is likely a better parameter for study local and regional oceanic circulation features than the SST gradient.

Italian Sea Waves Measuring Network

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The Marine Service of Italian Agency for the Protection of the Environment and Technical Services (APAT), provides the survey and the elaboration of the processes involved in coastal hydrodynamic: in particular way the sea levels data and the sea wave data in costal area (that ones represents meteo-oceanographic data). The Marine Service manages the public distribution of the data, their elaboration, and the related cartography. It fixes the criteria to be met, and the prescriptions to collect, analyse and archive the information. It supports governmental and local Authorities in the marine technical services fields but provides data, methods, suggestions, and consultancy to everyone who asks for it. It runs the National Tide Gauge Network or "RMN", and the Sea Wave monitoring Network, or "RON". Both are necessary to:

- marine engineering study or projects (harbours, coastal protections, etc.);
- navigation;
- off-shore production activities;
- environmental protection.

In particular, the RON provides data of local directional wave climate, very important due to the complex geographical configuration of the Italian peninsula and his variable exposure to sea winds. The RON is based on a direct measurement system of gravity waves. The buoys are solar powered so they needs an hybrid shell: they has a stainless-steel hull and a polycarbonate dome, which are environmentally sealed with a wide footprint silicon gasket. The hull features a high strength to weight ratio, corrosion resistant shell, and secure mooring and lifting points. The optically clear polycarbonate dome allows sunlight to reach the solar panels and ensure the internal protection of the radio antenna, obstruction light and infrared serial data link.

The buoy's software WAVE VIEW to analyse data from six motion sensors and a fluxgate compass, has been developed by the Canadian Hydraulics Centre of the National Research Council of Canada. The system processing software uses an iterative algorithm based on fast Fourier transform analysis to solve the full non-linear equations of motion of the buoy in six degrees of freedom as defined by the measured accelerometer and angular rate gyro signals. Roll, pitch and yaw angles, as well as displacements, velocities and accelerations for heave, surge, sway can be computed at any reference point on the buoy. Since the full non-linear equations of motion are used; accurate motion data are obtained for extreme conditions with roll and pitch angles up to 60°. As a result, the directional wave characteristics are computed with much greater accuracy. The use of surge and sway velocities (instead of the roll and pitch angles used in the older buoys Datawell) also provides much better measure of the wave kinematics that define directional wave properties. Furthermore, full directional wave spectra can also be computed by the maximum entropy method in addition to the mean wave direction and the spreading width as functions of frequency. The software also performs a zero-crossing analysis to compute various time-domain wave parameters. These features allow more accurate analyses of wave parameters in Italian seas and minimize permanent data loss risks. The network functionality in real-time has enabled the realisation of automatic consultation services both on Internet or in teletext and transmission of measured data to the main meteorological centres through the World Meteorological Organization Global Telecommunication System (GTS).

Servicing the buoy is simple, with all modular components including batteries, easily accessed by removing the dome. The processing unit is connected to the user's external computer either via hardwire or infrared links through the dome.

Once connected, onboard boats, through a series of simples menus you may set buoy parameters such as:

- sample duration;
- sample interval;
- processing;
- transmission intervals;
- test parameters.

On the basis of the experience gained, it can be stated that the main causes of network failure are related to:

- radio interference 5%
- signal transmission problems from the buoy to the onshore station 10%
- sensor failure 15%
- ordinary and extraordinary maintenance (batteries recharges) 20%
- vandalisms and occasional buoy unmooring 50%.

A lot of buoys (almost the 50%) has been damaged by boats impact because they are not well visible for the low profile without the radar reflector. Moreover, fishermen's boats keep their fishing operations near the buoys because the buoys may attract fish, so, frequently, the fishing gear tangles with the buoy damaging or they cuts the mooring to retrieve the net. Activities of the RON are expected to go on and other data acquisition systems will be upgraded. In fact, at the moment, satellite measurements in the Mediterranean Sea have a limited coverage and are not accurate considering the on-shore proximity and the fetch-limited short wind waves. Moreover, even forecasts from numerical models are still affected by considerable approximation, related mainly to the incorrect reproduction of the rapidly variable wind field in areas with complex topography.

The 16 years incessant functioning of the network, with an overall efficiency greater than 80% in terms of stored data, gives access to a huge amount of data valuable both for scientific and engineering processing.

The Data Processing and Storage Centre is now operating at the APAT Marine Service. It also carries out the network status supervising service, the real time synthetic data acquisition, and the historical data storage and processing.

These activities specifically deal with: a continuous validation of the entire devices' functionality; with real time synthetic data acquisition; with data storage, processing and distribution. The maritime area directly deals with the processing and production of Wavemeter Recording Bulletins. These quarterly issues report:

- the detection systems functioning;
- processed wave height data printouts: significant height, peak period, and mean directional width;
- graphic processing of significant wave height time series;
- graphic processing of the spectral analyses (when remarkable wave heights have values greater than the pre-established threshold for each station).

A floppy disk containing data in ASCII format relating to the required trimester is attached to the Bulletin.

Since the beginning of 1997, real time data, together with statistic and climatologic processing are provided on demand and cover the entire available period.

The sample of estimated data is filtered on the buoy with a low-pass filter of the 7° order of Butterworth with a 0,6 Hz frequency cut-off in order to avoid errors due to aliasing. The sample is transmitted every 0,78125 seconds as a 128 bit sequence. The receiver decodes the 128 bit unit, locating and correcting the errors. Then, the absolute value and the slope of the magnetic field are computed. Since both these values, in a state of standard performance, must remain nearly stable, a comparison with average values based upon 256 previous valid samples is carried out in order to perform the quality test. The values of the assessed data are accepted if the bias of the average absolute value of the terrestrial magnetic field is lower than 10%, and if the slope of the terrestrial magnetic field has an average bias lower than 5,5°. The heave value is compared with the expected value deriving from the interpolation of previous and following values. The general criterion of acceptability is that the difference between measured and expected value should be four times lower than the standard bias of the differences in the series and, however, it should be lower than 0.7 m, which is the maximum absolute difference admitted.

The values of the heave terns, the N/S slope and the E/W slope are gathered in units of 256 samples, each corresponding to a 200 seconds interval. The sampling starts all over again if more than 25 detected samples are not considered valid (10%), or if two or more adjacent samples are missing. In that case, the previous data within the 256 unit are excluded. The total amount of 256 data units used in further processing is equal to the number of the accepted units. The first and last 32 samples of the unit of 256 data terns are filtered. This operation prevents the Fast Fourier Transform, used in the processing, from fluctuating to the extreme points of the observation interval, as shown here following.

The method by which the analysis of the data transmitted from the buoy is carried out allows the location of four characteristic parameters for the directional distribution of the frequency, with no preliminary hypothesis concerning the form of the distribution. The distribution is approximated by a Fourier series development cut off at the first four coefficients. Nine spectral density functions are achieved by a Fast Fourier Transform routine of filtered data units of 256 heave terns, north/south slope and east/west slope, during the interval between 0,005 Hz and 0,635 Hz, for 127 frequency bands with 0,005 Hz of width: 3 autospectra, 3 cospectra, 3 quadrature spectra. The matrix of 127 lines for 9 columns achieved by the processing of the first unit is mediated with the matrix of the second one and so on until the representative matrix of the 30 minutes observation is acquired.

The magnitudes can be derived directly from the heave autospectrum:

Hs, significant spectral wave height, Tm, mean period and Tz, peak period.

Marine geo-databases – from CI-SR to SI-CR (Where: C–complex; I–ideas; S–simple; R–requirements)

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Scientific Objectives

Modern paradox with marine geo-database (DB) (and not only) is that they successfully have realized the initial complex ideas and huge data volumes input and now are fast and simple (user friendly) but boring and not intuitive. Therefore, the users-scientist often must demonstrate more creativity creating numerous searches, than solving pure scientific tasks. If we compare the science and the "art of DB maintenance" to runners, then their complicity growth could be describe as faster and faster run but not contrary. Step by step the science becomes maid to DB, which look for clients with money (of course this is not the science). This conference is a good example. Participants are only "queens" (DBs), but not "maids" (science)...

How to make the distance between "runners" shorter? The author optimistically maintains that this is a task of the next stage: "SI-CR" or "From simple ideas to complex requirements".

Context

Let start describing of the main characteristic of the DBs in the next stage.

The new stage could be named "The era of relational DBs". Why? To answer, let go into a example. To study the gas hydrates as factor for climate change are needed all three of the next DB:

- Coastal and deep-sea operational oceanography information systems;
- Physical and bio-chemical DBs for climate studies;
- Geophysical and geological DBs.

These 3 DBs are artificially and unduly separated not only in the conference program, but probably everywhere. Only a relational DB will allow me to find needed data "with one blow".

To work with the future DBs will not be so easy. Remember that maybe 99% of the Google clients use rather simple search strings and strategies. This type of education must start from schools and continue in universities.

The simple idea (SI) to realize this is to open the best and most interesting data (or only examples) for European students and graduates. The universities outside Europe and commercial clients will pay. The quality and quantity of data which we will "open" for the European education will determine the future level of education.

Other SI to make a DB portal more attractive is to allow on-line calculations with the same rules for the same public. This easy to say but hard to be done SI is perfect because is maybe the only which will gather efforts of "maids" and "queens". Thus the problem "who is who" disappears and with it - the distance between "runners".

These and other SIs which will determine the not-so-distant future of DBs are discussed on the base of the author experience and the recent realizations of leaders of the DB fashion (Semantic Web, Opine; Farecast; Avatar Semantic Search, etc.).

Summary of Contribution

The author tries to systematize and discuss SIs which could improve significantly the usefulness of DBs in short terms with examples from real marine geophysical tasks.

Main Conclusions

Predicted is a new short stage in DBs improvement which could be described with the phrase "From simple ideas to complex requirements". This short stage will "melt" the growing distance between science and scientific DBs and will compile huge information about the links knowledge-data for generalization during the next stage.

Acknowledgements

My special thanks to my colleagues and teachers from HCMR, Greece: Sissy Iona, Angelos Lykiardopoulos and Dr Efstathios Balopoulos. They made my first appointment with professional marine DBs really pleasant and open my eyes to see not only trees, but the forest, too.

IODE Capacity building in Ocean Data and Information Networks (ODINs): current status and challenges for the future

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The IODE (International Oceanographic Data and Information Exchange Programme) system forms a worldwide service-oriented network of over 60 marine data centres. This network has been able to collect, control the quality of, and archive millions of ocean observations, and makes these available to Member States of IOC. One of objectives of the IODE programme is providing assistance to member states to acquire the necessary capacity to manage marine data and information and become partners in the IODE network. These capacity building activities are embedded within the regional ODIN projects of IODE. The ODIN strategy (or Ocean Data and Information Networks) consists of several elements to support data centres: provision of equipment, training and seed funding for operational activities of newly created data centres and marine libraries. It works in a regional context, with six ODINs having been deployed. Capacity building activities are adapted to the specific needs of the different ODINs and take into account the level of development of the individual marine data and information centres. IODE capacity building has shifted more and more from basic data and information management courses in the past towards training for development and support of advanced data and information products and techniques (e.g. coastal atlases, modeling, sea level monitoring, electronic repositories, data management for modeling purposes, GIS and remote sensing). Training activities of the IODE Programme are organized either at the UNESCO/IOC Project Office for IODE in Ostend (Belgium), which is fully equipped to serve this purpose, or in IOC Member States. IODE training activities are underpinned by OceanTeacher, the main e-learning tool used by the IODE community and a growing group of university students and scientists (http://www.oceanteacher.org). It contains a huge collection of reference documents (digital library) as well as courses (including hands-on data management exercises and tools). The training materials in OceanTeacher are further supported by online video lectures, which enable distance learning and continuous professional development. In order to continuously assess the impact of IODE training on the career of former trainees, the IODE alumni database has been developed (http://www.iode.org/alumni).

Abstract 161

Session: 4 - Databases and tools for education

Portal OCEANICO, the regional ocean portal for the Caribbean and Latin america

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Background

The regional ocean Portal for Latin America and the Caribbean is 5 years old. The Project is an UNESCO Initiative, under the umbrella of a Cross cutting Project denominated: "The contribution of information and communication technologies to the development of education, science and culture and the construction of the knowledge society".

The project begun on May 2002, and has meant a great effort actually reflected in the number of posted contents and daily visits rate. The effort of editors has been decisive to keep the interest from multiple audiences which include scientists, students of all academic levels, stakeholders, decision makers, authorities, common users and children.

The goal of Portal Oceanico

To facilitate access to information and data on all aspects of ocean/coastal research and management for the benefit of stakeholders in Latin America and the Caribbean regions by using collaborative websites and distance learning technologies.

Objectives

1. Address the ocean/coastal information and data needs of as wide an audience as possible;
2. Increase ability of partners to communicate their expertise to a non-academic audience;
3. Facilitate improved access to portal and its information (both on the internet and in other forms).

Portal Oceanico implementation

The implementation of Information technologies in Latin America and the Caribbean was always a known challenge, considering the digital divide between developed and developing countries, the low connectivity indexes in our region and the limited access to computers in public Schools of several countries.

After 5 years the Regional Ocean Portal for Latin America and the Caribbean: Portal Oceanico (www.portaloceanico.net), has compiled more than 5,488 knowledge objects related with ocean issues such as maritime affairs, environmental themes, papers, libraries, catalogues, educational resources, ocean services, ocean sciences, disaster management information, inventory of marine institutions, international activities and many other information material. The Portal has recruited more than 501 editors from Latin America and the Caribbean regions, and contains contributions mostly in Spanish, but also have material in Portuguese, English and French. National marine information from 40 countries is included in the portal. More than 821 subjects and 77 discussion fora were established. A total of more than 96,804 visits to the portal have been registered. Visitors came from 118 different countries. 81,2% of them come from Latin America and the Caribbean, 16,7% from the USA, Canada, Europe and the other comes from Asia, Africa and Oceania.

Until the end of 2007, the average number of daily visits is between 80-150. To get sustainability in the Portal, increase the number of visitors, institutional mechanisms must be established to get the support of relevant Marine institutions from the region, to keep the Portal useful to visitors offering usable information about the Ocean.

The Portal must be considered the exhibition hall of the marine institutions of Latin America and the Caribbean, and it is highly desirable that countries through National institutions will be motivated to be inside the Portal as member of a regional information effort, which could be useful for everyone.

Finally, is important to look for additional funding to keep this relevant information resource for benefit of Latin America and the Caribbean regions.

Abstract 162

Session: 4 - Databases and tools for education

The African Marine Atlas; challenges and opportunities for a web-based atlas of public domain data for Africa

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The African Marine Atlas is a digital web atlas of marine and coastal geo-data arranged under five themes; atmosphere, hydrosphere, biosphere, Geosphere, human environment and basemap themes. Under the Ocean Data and Information Network for Africa (ODINAFRICA), funded by the Intergovernmental Oceanographic Commission, twelve coastal African countries and two international programmes collaborated to develop the atlas. Launched in February 2007, the atlas project had several objectives. It sought to increase access to public-domain data for African scientists, resource managers and decision-makers; to develop capacity for marine data management in Africa, and to increase collaboration between data managers and projects collecting or disseminating African marine & coastal data.

The atlas was developed by a team of 16 scientists with Geographic Information Systems skills and currently incorporates over 800 continental-scale public domain data sets on the marine and coastal environments. Two web portals offer different products, one being a static website which acts as a clearinghouse for the full complement of data in the atlas, and a second (www.africanmarineatlas.net) which is the dynamic web atlas prototype.

This paper will address the process of international cooperation for the development of the atlas to date, current data infrastructures and management tools, and outline proposed ideas for improved access to these data. Mechanisms for building links between the African Marine Atlas and other Global and African data portals and programmes utilizing large-scale marine data sets will be discussed.

The Coastal and Marine Wiki: an Internet encyclopaedia providing up-to-date high quality information for and by coastal and marine professionals

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ABSTRACT - The Coastal and Marine Wiki (www.encora.eu/coastalwiki) is an Internet encyclopaedia providing up-to-date high quality information for coastal and marine professionals, which is continuously improved, complemented and updated by expert users. To take better advantage of existing knowledge, especially for use in practice and policy, the open source MediaWiki Software was implmented to allow collaborative writing by authors who can add new articles or improve and update existing articles. Main difference between the Coastal and Marine Wiki and the online Wikipedia are the procedures to maintain the quality, consistency and comprehensiveness of the information. The Coastal and Marine Wiki targets professionals who are either generalists who need to update their knowledge about a broad range of subjects or specialists who need to gain an understanding of other sectors or disciplines in order to work in an integrated manner.

The issue: taking better advantage of existing knowledge

There is abundant information on coastal and marine processes and issues. But most of this information is not easy to find or to use. Existing documentation and publication practices do not enable taking full advantage of present knowledge and experience. The present situation is:

1. scientific knowledge is communicated mainly among fellow experts; scientific publications focus on specific disciplinary aspects and are almost inaccessible to non-expert coastal and marine professionals;
2. integrated assessments of coastal and marine issues often refer to specific field situations and are published as grey literature or brochures, which are hard to find and to get;
3. results published on project sites often become inaccessible shortly after the project has ended.

Powerful search systems have been developed to retrieve information from the Internet, but due to the huge proliferation of websites generally not more than a fraction of the relevant information is found. Use of this information is further hampered by lack of coherence among the information pieces and lack of comprehensiveness and context. Some pieces of information may be outdated and others may be unreliable. For these reasons much coastal and marine knowledge existing in research institutes and in practitioners organizations throughout Europe is not fully used and similar studies are carried out more than once. New knowledge dissemination practices are needed for Europe to take better advantage of existing knowledge, especially for use in practice and policy.

The Coastal and Marine Wiki concept

A Wiki is a searchable website that allows visitors to easily add or remove information and otherwise edit and change some available articles. It is the product of collaborative writing by authors who can add new articles or improve and update existing articles. The whole history of additions and improvements can be traced, no information gets definitively lost. The Coastal and Marine Wiki can best be described as an information web equipped with a powerful search tool. Articles of typically 2-3 pages are structured according to different layers of specialisation. Authors focus in their articles on a single topic at a certain level of detail, but are capable to provide a wider context and to provide more detailed information by introducing internal and or external links to related articles. Well chosen links ensure a coherent access to the body of information. you are guided to the information you need. The wikipedia concept complements present knowledge dissemination practices and mitigates major shortcomings: scientific publications only accessible to experts, lack of interdisciplinary links, difficult access to practical knowledge and experience due to dispersal over grey literature sources, lack of comprehensiveness and consistency among sources, not freely accessible literature and sources which are not up to date; unacceptable delays in establishing intellectual property rights through traditional publishing routes.

The Coastal and Marine Wikipedia is a professional Internet encyclopaedia that guarantees high quality information. Several procedures are implemented to ensure quality, consistency and comprehensiveness. A major difference with the general Wikipedia is the requirement of an editing authorisation for contributors. Anonymous contributions are precluded; authors and co-authors of articles or article revisions are explicitly acknowledged. The access to the Coastal and Marine Wikipedia is free to any coastal and marine stakeholder, but only experts registered in the Wiki Contact Database are entitled to enter new information. This contact database has been developed in house and is managed at a marine datacentre. Editing authorisations will be granted only to users with a professional background, checked by the editorial team. This team will oversee the overall quality of the Coastal and Marine Wikipedia.

Target user groups

The primary users of the Coastal and Marine Wikipedia are professionals, usually with higher education, who are either generalists who need to update their knowledge about a broad range of subjects or specialists who need to gain an understanding of other sectors or disciplines in order to work in an integrated manner. Target user groups are:

1. Policy makers: e.g. a coastal mayor, an employee at high management level in regional or national administration, European Commission staff, or managers of influential NGOs;
2. Practitioners: e.g. a marine protected area manager, an expert working for administration, a planner or consultant at all administrative levels, employees of firms active in the coastal and marine area;
3. Scientists: e.g. a researcher (from any area of marine-related science) needing information from other than his/her own field of interest or as a start-up to enter a new research area;
4. Students at academic institutions and trainees, who want to familiarise with concepts of coastal and marine science and with practices of coastal and marine management;
5. Public stakeholders with particular interest in coastal and marine information, e.g. water sports practitioners, amateur fishermen, seaside visitors, etc.
6. The wider public. With this group in particular, a pro-active approach to the dissemination of research outputs is necessary and foreseen in the project.

The way forward: integrating project-specific information

Besides the internal linking, similar Wiki Articles can also be grouped together using different categories. The combination of internal linking and categorisation allows to create a web of linked information that can be organised and accessed in several ways. The Coastal and Marine Wiki was at first grouped within the Ten Thematic Networks of the European Network of Coastal Research (ENCORA); a revision implemented a additional classification based on a Coastal and marine ontology which starts from 6 main categories: the Natural Environment, Issues and Impacts, Human Activities, Locations, Coastal Management and People and Organisations in ICZM. Recently, SPICOSA (Science and Policy Integration for Coastal System Assessment) and MarBEF (Marine biodiversity and ecosystem functioning), two Coastal and Marine FP6 projects, decided to contribute their project results to the Coastal and Marine Wiki. In this way the major outcomes of their research will be reflected in the Coastal and Marine Wiki enhancing the knowledge dissemination and integration of their project-specific information.

The Coastal and Marine Wiki aims to involve more FP5, 6 and 7 marine and coastal projects in the near future to fill the wikipedia with new insight gained in these projects. The format ensures a coherent and comprehensive presentation, within the context of existing knowledge, and effective guidance of expert and non-expert users to the knowledge they need. The Wiki cross-links provide a quick overview of all related aspects of a particular issue; it provides an information base for performing integrated assessments.

Acknowledgements:

The Coastal and Marine Wik was developed within the framework of ENCORA (FP6-2004-Global-3-518120). Additional funding was provided by the RIKZ (Rijksinstituut voor Kust en Zee).

Tools for education and capacity building developed in the frame of the SeaDataNet European project

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In the frame of SeadataNet project, specific software has been developed for the partners of the project.

SeaDataNet developed ISO-19115 descriptions for the catalogues managed in the project : cruise summary reports (CSR), marine environmental data sets (EDMED), marine environmental research projects (EDMERP), common data index (CDI), European directory of the ocean-observing System (EDIOS).

Common vocabularies have been set up to make sure that all partners use Standards for meta-data and communication.

The project has also defined common format for the data exchange which are NetCDF, ODV (Ocean Data View) both mandatory, and MEDATLAS optional.

Two tools have been designed to help the partners to generate the standard catalogue descriptions and the standard formats of SeaDatNet :

- MIKADO : is a XML catalogue description generator used to create XML files for metadata exchange of CSR, EDMED, CDI, EDMERP and EDIOS.

MIKADO can be used into 2 different ways :

- One manual way, to input manually information for catalogues in order to generate XML files.
- One automatic way, to generate these descriptions automatically if information is catalogued in a relational database or in an Excel file.

- NEMO is a reformatting software used for data exchange between SeaDataNet partners. Its objective is to reformat any ASCII file of vertical profiles (like CTD, Bottle, XBT) or time-series (like current meters, sea level data) to a SeaDataNet ASCII format (ODV or MEDATLAS).

These two tools are written in Java Language which means that they are available under multiple environment (Windows 2000, XP, VISTA), Unix (Solaris with the graphical library GTK) and Linux with GTK also.

They both use the SeaDataNet common vocabularies web services to update lists of values which are then uploaded locally. That means that they need network connections in order to have up to date lists of values.

Training and capacity building:

MIKADO version 0.2 is operational since 2007 and a number of partners have already used it for their XML generation of Metadata descriptions. It was teached and demonstrated in a training course organised at the IODE centre of Ostende (Belgium).

A new version is under development for the version 1 of the SeaDataNet project which takes into account the evolutions of the XML schemas of the catalogues.

NEMO will be demonstrated at the next training course also in Ostende, during the session organised in June 2008.

The software are freely available to the scientific community.

Studying of the Ukrainian coastal zone: data bases, beaches and its dynamic

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The beaches are considered to be the most important recreational objects for many coastal states. However at present, any reliable information on the state of the recreational zones, including beaches, in Ukraine, and in particular in the Crimea is absent. It hampers designing systems for planning development of the Crimea as a recreational zone.

In this connection, the Marine Hydrophysical Institute accomplishes a number of scientific tasks on development of a system for the cadastral survey of the Crimean beaches accounting recommendations of international organizations.

For estimating the natural component the following parameters can be recommended as integral indexes:

1. coefficient of natural and technogenic dynamics - the characteristic of geomorphological beach variability;
2. cost of a plot of land used as a beach;
3. cost of a beach considered as an object of recreation;
4. factor of recreationa| influence - sum of factors influencing upon human health benefit;
5. cost of recreational| resources of a beach;
6. index of natural attractiveness - coefficient characterizing the degree of attractiveness of a beach from the point of particular natural features, historical monuments and memorials and other attributes;
7. climatic index of prestige - characterizing the sum of particular dignities of every beach including duration of bathing season, a number of sun days in a bathing season and some other factors;

8. index of comfort – description of a beach infrastructure and service level;

9. coefficient of natural danger - coefficient corresponding to one or another probability of natural catastrophic anomalies;

10. level of social (criminogenic and political) tension in a region.

It is evident that a complete list of parameters cannot be calculated for every beach, for example for natural beaches with no infrastructures factors 3 and 8 do not make sense.

In situ study of two beaches in the Sevastopol region was accomplished. In addition to that, data measured on two beaches in the Feodosiya region in December 2006 were done. The choice of the beaches can be explained by a maximal variety of natural parameters particular to different areas of the Crimea. This approach seems to be of a considerable importance at the initial steps of the cadastre development when analytic and calculation algorithms are tested. For each of the beaches, the water edge and the beach back border were mapped, as well as the survey of level rises was executed on several cross-sections located evenly along the beach, or on characteristic areas. On the same sections the georadar survey of the beaches was made.

In addition to that, the study of water areas was accomplished for the beaches in the Sevastopol region including measuring turbidity on vertical profiles located at 1, 3, 5, 10, 20 and 50 m distance from the shore on the lines continuing those of the cross-sections.

The following measured and derivative values can be considered as the cadastre descriptions: length of beach (the distance between its two extreme points), length of coastline, perimeter and area, coastline curvature, mean values of width, level and slope gradients determined separately for the beach coastal and water areas, area of the beach aquatorium limited within depths 0,5 and 1,5 m (areas of safe bathing for children and adults). Height and slope of cliff are additionally determined if it exists, as well as average slopes of berm (littoral zone) and bench (a littoral slope of bed-rock).

So, the accomplished work resulted in the unique set of geomorphological cadastre indexes in the format of ArcGIS geoinformation system for the four beaches under consideration. The cadastre survey provides periodic observation on the state of beaches and the subsequent analysis of their natural, ecological and infrastructural dynamics, as well as making proposals concerned supporting this objects in the stable state.

The MHI BOD systematized hydrological, hydrochemical, hydrooptical and biological data as well as current measurements (as one of the factors providing matter transfer and distribution in the marine environment) concerned the Black Sea coastal zone.

A combined analysis of archived and up-to-date data allows studying the dynamics of beaches development.

Desktop Version of Database management System for MEDACC

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An alternative desktop version of management software for the MEDACC database was developed in framework of SESAME project (WP9). It contains data selection, quality check and data processing modules. The data selection module provides visual creation and implementation of data requests to MEDACC database by spatial and temporal parameters, country, research vessel, cruise, etc. It is possible to select data in space for rectangle region, free region (including selection by isobaths), Marsden Squares (or HMS squares for the Black sea only), cross-sections. Two ways for temporal data selection are by interval of dates and for months and years.

The quality control module realizes a procedure of hydrological and hydrochemical data quality check for the Black and Mediterranean Seas. The procedure uses the climatic array prepared on the base of several products - MEDAR/MEDATLAS II, "Physical Oceanography of the Black sea" climatic atlas and "Oxic/Anoxic Zone in the Black Sea" computer atlas. It works both in automatic and manual modes and includes metadata and data quality control procedures. The first of them finds possible errors in station location, date and time of station implementations, velocity between stations, depth of last observation in profile, etc. The second one fixes data errors using the climatic arrays mentioned above. The manual mode gives a possibility of metadata and data correction.

New version of oceanographic data processing module for cruise multiparametric database is created. The software lets visualize vertical profiles, sections and maps of arbitrary selected casts both for measured properties and for calculated ones. Calculation of such properties as potential temperature, density, sound speed, Brunt-Väisälä frequency, geostrophic currents, vertical stability, density ratio, available potential energy, heat storage, etc. are based on IOC-UNESCO standard routines. The program uses isobaric and isopycnal vertical axes, provides property-property distributions, creates maps of arbitrary iso-surface depth or any property value on this iso-surface, calculates statistical values, vertical and horizontal gradients. Auxiliary possibilities include geographical position and distance control, oceanographic calculator, temporal sections, maps of properties manually picked out on vertical profiles. The software package was developed in programming language Delphi. The

software provides a link with Golden Software Surfer 8 by means of program-generated command files for GS Scripter to plot contour and color plots. Map of the Mediterranean Sea including depth contours on the basis of GEBCO dataset was created and added into the software package. First version of interface block for the latest version of SESAME ACCESS database was designed.

Educational tools in SeaDataNet

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SeaDataNet (SDN) is engaged in the development of internet based educational services. SDN virtual Educational Centre (VEC) focuses learning on the process of science while capitalising on new opportunities created by data access in distributed systems and web facilities. The goals of SDN VEC is to support inquiry- and discovery-based learning and to inform on on-line data delivery tools, services and best practices in using data.

SDN VEC is based on the idea that students can learn from data to:

- address real world complex problems
- develop ability to use scientific methods
- critically evaluate the quality of the data and their consequent interpretation
- consider the values of the data
- include ethics consideration of working with data.

Data are broadly defined to include observations, images and model outputs.

SDN VEC is providing basic information on the ocean and factors affecting the marine environmental variability and changes. It improves the learning strategy by focusing on three main areas: disseminating examples of effective practices, improve the impact of data-enhanced learning, providing information on data access infrastructures and services. In particular SDN VEC aims at enhancing the ability of the student to perform critical tasks by providing tools for:

- find and access data relevant to the topic they are investigating
- evaluate the quality of this data
- combine multiple and divers data sets
- generate visualisation and representations that communicate interpretations and conclusions

Abstract 168

Session: 4 - Databases and tools for education

Data Quality Requirements for Informed Decision Making

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Informed Decision Making requires the correct data together with a systematic evaulation capacity. Participation of the citizens is also one of the key factors determining the quality of the decision making process.

When we are dealing with nature and trying to understand the damage caused by human activities to the living space on earth, the starting point must be the fullfılment of the requirements of a Science for Society Approach.

If the data is not collected as an input for defining the problems correctly and finding solutions which can be implemented, it is not possible to correct the data by education.

Each set of data collected should be related to the human activity causing changes.

Making available data to the users is not enough for them to make use of this data. Users must be involved during the planning phase of the data collection.

In this study we shall try to make a bridge between the researcher and the user in order to save from the research, education and environmental protection budgets.

Towards a data management system for long term monitoring of oceans around Southern Africa

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The South African Environmental Observation Network (SAEON) aims to provide a comprehensive, sustained, co-ordinated and responsive South African Earth observation network that delivers long-term reliable data for scientific research and informs decision making for a knowledge society and improved quality of life. SAEON addresses the environmental observation and information needs of future generations, reaching far and wide, nationally, regionally and globally, and its success as a platform for environmental observations depends on delivery of reliable environmental data and products for science, policy and management. Education-Outreach, based on environmental sciences, has a specific focus on science educators, learners and research students.

The marine offshore node of SAEON (Egagasini, Zulu word for "Place of waves") aims to fill the gaps in long-term ocean monitoring, helping to understand the impact of climate change on oceans and their resources surrounding South Africa, as well as improving our knowledge of the oceans' influence on climate change. It is vital that we better understand these oceans as they have been shown to play a major role in the weather and climate patterns over southern Africa. Thus the impacts of climate change through factors such as increases in temperature and sea level rise, which are already evident, are likely to have devastating effects on the lives of millions of impoverished people.

Egagasini, and the other nodes, deliver data into the CoGIS (Collaborative GIS) platform of SAEON. Egagasini also uploads physical and chemical oceanographic data, as well as meteorological data, into the longstanding and reliable archive at SADCO (South African Data Centre for Oceanography). CoGIS is a joint development venture between SAEON, the Department of Minerals and Energy (DME) and the Council for Scientific and Industrial Research (CSIR). CoGIS is open source and open standards, and complies with the specification of the Open GIS Consortium. International standards for data and metadata are incorporated in the design. The system is rapidly developing into a Collaborative Spatial Analysis and Modeling Platform (CoSAMP), and is designed to integrate data from different formats, scales and resolutions from different sources, into

an integrated product for the end user. Data can come from different platforms such as ESRI or GeoServer (proprietary or opensource) and be located at different organizations so long as the relevant standards are adhered to.

SAEON is funded by the Department of Science and Technology (DST) of the Republic of South Africa

SAEON website: www.saeon.ac.za

SADCO website: sadco.csir.co.za

CoGIS website: www.cogis.co.za

IOC Workshop Reports

The Scientific Workshops of the Intergovernmental Oceanographic Commission are sometimes jointly sponsored with other intergovernmental or non-governmental bodies. In most cases, IOC assures responsibility for printing, and copies may be requested from:

Intergovernmental Oceanographic Commission – UNESCO
1, rue Miollis, 75732 Paris Cedex 15, France

No.	Title	Languages
1	CCOP-IOC, 1974, Metallogenesis, Hydrocarbons and Tectonic Patterns in Eastern Asia (Report of the IDOE Workshop on); Bangkok, Thailand, 24-29 September 1973 UNDP (CCOP),	E (out of stock)
2	CICAR Ichthyoplankton Workshop, Mexico City, 16-27 July 1974 (UNESCO Technical Paper in Marine Sciences, No. 20).	E (out of stock) S (out of stock)
3	Report of the IOC/GFCM/ICSEM International Workshop on Marine Pollution in the Mediterranean; Monte Carlo, 9-14 September 1974.	E,F E (out of stock)
4	Report of the Workshop on the Phenomenon known as 'El Niño'; Guayaquil, Ecuador, 4-12 December 1974.	E (out of stock) S (out of stock)
5	IDOE International Workshop on Marine Geology and Geophysics of the Caribbean Region and its Resources; Kingston, Jamaica, 17-22 February 1975	E (out of stock) S
6	Report of the CCOP/SOPAC-IOC IDOE International Workshop on Geology, Mineral Resources and Geophysics of the South Pacific; Suva, Fiji, 1-6 September 1975.	E
7	Report of the Scientific Workshop to Initiate Planning for a Co-operative Investigation in the North and Central Western Indian Ocean, organized within the IDOE under the sponsorship of IOC/FAO (IOFC)/UNESCO/ EAC; Nairobi, Kenya, 25 March-2 April 1976.	E, F,S, R
8	Joint IOC/FAO (IPFC)/UNEP International Workshop on Marine Pollution in East Asian Waters; Penang, 7-13 April 1976	E (out of stock)
9	IOC/CMG/SCOR Second International Workshop on Marine Geoscience; Mauritius 9-13 August 1976.	E, F, S, R
10	IOC/WMO Second Workshop on Marine Pollution (Petroleum) Monitoring; Monaco, 14-18 June 1976	E, F E (out of stock) R
11	Report of the IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions; Port of Spain, Trinidad, 13-17 December 1976.	E, S (out of stock)
11 Suppl.	Collected contributions of invited lecturers and authors to the IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions; Port of Spain, Trinidad, 13-17 December 1976	E (out of stock), S
12	Report of the IOCARIBE Interdisciplinary Workshop on Scientific Programmes in Support of Fisheries Projects; Fort-de-France, Martinique, 28 November-2 December 1977.	E, F, S
13	Report of the IOCARIBE Workshop on Environmental Geology of the Caribbean Coastal Area; Port of Spain, Trinidad, 16-18 January 1978.	E, S
14	IOC/FAO/WHO/UNEP International Workshop on Marine Pollution in the Gulf of Guinea and Adjacent Areas; Abidjan, Côte d'Ivoire, 2-9 May 1978	E, F
15	CPPS/FAO/IOC/UNEP International Workshop on Marine Pollution in the South-East Pacific; Santiago de Chile, 6-10 November 1978.	E (out of stock)
16	Workshop on the Western Pacific, Tokyo, 19-20 February 1979.	E, F, R
17	Joint IOC/WMO Workshop on Oceanographic Products and the IGOSS Data Processing and Services System (IDPSS); Moscow, 9-11 April 1979.	E
17 suppl.	Papers submitted to the Joint IOC/WMO Seminar on Oceanographic Products and the IGOSS Data Processing and Services System; Moscow, 2-6 April 1979.	E
18	IOC/UNESCO Workshop on Syllabus for Training Marine Technicians; Miami, U.S.A., 22-26 May 1978 (UNESCO reports in marine sciences, No. 4 published by the Division of Marine Sciences, UNESCO).	E (out of stock), F, S (out of tock), R
19	IOC Workshop on Marine Science Syllabus for Secondary Schools; Llantwit Major, Wales, U.K., 5-9 June 1978 (UNESCO reports in marine sciences, No. 5, published by the Division of Marine Sciences, UNESCO).	E (out of stock), S, R, Ar
20	Second CCOP-IOC Workshop on IDOE Studies of East Asia Tectonics and Resources; Bandung, Indonesia, 17-21 October 1978	E
21	Second IDOE Symposium on Turbulence in the Ocean; Liège, Belgium, 7-18 May 1979.	E, F, S, R
22	Third IOC/WMO Workshop on Marine Pollution Monitoring; New Delhi, 11-15 February 1980.	E, F, S, R
23	WESTPAC Workshop on the Marine Geology and Geophysics of the North-West Pacific; Tokyo, 27-31 March 1980.	E, R
24	WESTPAC Workshop on Coastal Transport of Pollutants; Tokyo, Japan, 27-31 March 1980.	E (out of stock)
25	Workshop on the Inter-calibration of Sampling Procedures of the IOC/ WMO UNEP Pilot Project on Monitoring Background Levels of Selected Pollutants in Open-Ocean Waters; Bermuda, 11-26 January 1980.	E (Superseded by IOC Technical Series No.22)
26	IOC Workshop on Coastal Area Management in the Caribbean Region; Mexico City, 24 September- 5 October 1979.	E, S
27	CCOP/SOPAC-IOC Second International Workshop on Geology, Mineral Resources and Geophysics of the South Pacific; Nouméa, New Caledonia, 9-15 October 1980.	E
28	FAO/IOC Workshop on the effects of environmental variation on the survival of larval pelagic fishes. Lima, 20 April-5 May 1980.	E
29	WESTPAC Workshop on Marine Biological Methodology; Tokyo, 9-14 February 1981.	E
30	International Workshop on Marine Pollution in the South-West Atlantic; Montevideo, 10-14 November 1980.	E (out of stock) S
31	Third International Workshop on Marine Geoscience; Heidelberg, 19-24 July 1982.	E, F, S
32	UNU/IOC/UNESCO Workshop on International Co-operation in the Development of Marine Science and the Transfer of Technology in the context of the New Ocean Regime; Paris, France, 27 September-1 October 1982.	E, F, S
32 Suppl.	Papers submitted to the UNU/IOC/ UNESCO Workshop on International Co-operation in the Development of Marine Science and the Transfer of Technology in the Context of the New Ocean Regime; Paris, France, 27 September-1 October 1982.	E
33	Workshop on the IREP Component of the IOC Programme on Ocean Science in Relation to Living Resources (OSLR); Halifax, 26-30 September 1963.	E
34	IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Western Africa); Tenerife, 12-17 December 1963.	E, F, S
35	CCOP/SOPAC-IOC-UNU Workshop on Basic Geo-scientific Marine Research Required for Assessment of Minerals and Hydrocarbons in the South Pacific; Suva, Fiji, 3-7 October 1983.	E
36	IOC/FAO Workshop on the Improved Uses of Research Vessels; Lisbon, Portugal, 28 May-2 June 1984.	E
36 Suppl.	Papers submitted to the IOC/FAO Workshop on the Improved Uses of Research Vessels; Lisbon, 28 May-2 June 1984	E
37	IOC/UNESCO Workshop on Regional Co-operation in Marine Science in the Central Indian Ocean and Adjacent Seas and Gulfs; Colombo, 8-13 July 1985.	E
38	IOC/ROPME/UNEP Symposium on Fate and Fluxes of Oil Pollutants in the Kuwait Action Plan Region; Basrah, Iraq, 8-12 January 1984.	E
39	CCOP (SOPAC)-IOC-IFREMER-ORSTOM Workshop on the Uses of Submersibles and Remotely Operated Vehicles in the South Pacific; Suva, Fiji, 24-29 September 1985.	E
40	IOC Workshop on the Technical Aspects of Tsunami Analysis, Prediction and Communications; Sidney, B.C., Canada, 29-31 July 1985.	E
40 Suppl.	First International Tsunami Workshop on Tsunami Analysis, Prediction and Communications, Submitted Papers; Sidney, B.C., Canada, 29 July-1 August 1985.	E
41	First Workshop of Participants in the Joint FAO/IOC/WHO/IAEA/UNEP Project on Monitoring of Pollution in the Marine Environment of the West and Central African Region (WACAF/2); Dakar, Senegal, 28 October- 1 November 1985.	E
43	IOC Workshop on the Results of MEDALPEX and Future Oceanographic Programmes in the Western Mediterranean; Venice, Italy, 23-25 October 1985.	E
44	IOC-FAO Workshop on Recruitment in Tropical Coastal Demersal Communities; Ciudad del Carmen, Campeche, Mexico, 21-25 April 1986.	E (out of stock) S
44 Suppl.	IOC-FAO Workshop on Recruitment in Tropical Coastal Demersal Communities, Submitted Papers; Ciudad del Carmen, Campeche, Mexico, 21-25 April 1986.	E
45	IOCARIBE Workshop on Physical Oceanography and Climate; Cartagena, Colombia, 19-22 August 1986.	E
46	Reunión de Trabajo para Desarrollo del Programa "Ciencia Oceánica en Relación a los Recursos No Vivos en la Región del Atlántico Sud-occidental"; Porto Alegre, Brasil, 7-11 de abril de 1986.	S
47	IOC Symposium on Marine Science in the Western Pacific: The Indo-Pacific Convergence; Townsville, 1-6 December 1966	E
48	IOCARIBE Mini-Symposium for the Regional Development of the IOC-UN (OETB) Programme on 'Ocean Science in Relation to Non-Living Resources (OSNLR)'; Havana, Cuba, 4-7 December 1986.	E, S
49	AGU-IOC-WMO-CPPS Chapman Conference: An International Symposium on 'El Niño'; Guayaquil, Ecuador, 27-31 October 1986.	E
50	CCALR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill (organized in collaboration with SCAR and SCOR); Paris, France, 2-6 June 1987.	E
51	CCOP/SOPAC-IOC Workshop on Coastal Processes in the South Pacific Island Nations; Lae, Papua-New Guinea, 1-8 October 1987.	E
52	SCOR-IOC-UNESCO Symposium on Vertical Motion in the Equatorial Upper Ocean and its Effects upon Living Resources and the Atmosphere; Paris, France, 6-10 May 1985.	E
53	IOC Workshop on the Biological Effects of Pollutants; Oslo, 11-29 August 1986.	E
54	Workshop on Sea-Level Measurements in Hostile Conditions; Bidston, UK, 28-31 March 1988.	E
55	IBCCA Workshop on Data Sources and Compilation, Boulder, Colorado, 18-19 July 1988.	E
56	IOC-FAO Workshop on Recruitment of Penaeid Prawns in the Indo-West Pacific Region (PREP); Cleveland, Australia, 24-30 July 1988.	E
57	IOC Workshop on International Co-operation in the Study of Red Tides and Ocean Blooms; Takamatsu, Japan, 16-17 November 1987.	E
58	International Workshop on the Technical Aspects of the Tsunami Warning System; Novosibirsk, USSR, 4-5 August 1989.	E
58 Suppl.	Second International Workshop on the Technical Aspects of Tsunami Warning Systems, Tsunami Analysis, Preparedness,	E

No.	Title	Languages
	Observation and Instrumentation. Submitted Papers; Novosibirsk, USSR, 4-5 August 1989.	
59	IOC-UNEP Regional Workshop to Review Priorities for Marine Pollution Monitoring Research, Control and Abatement in the Wider Caribbean; San José, Costa Rica, 24-30 August 1989.	E, F, S
60	IOC Workshop to Define IOCARIBE-TRODERP proposals; Caracas, Venezuela, 12-16 September 1989.	E
61	Second IOC Workshop on the Biological Effects of Pollutants; Bermuda, 10 September-2 October 1988.	E
62	Second Workshop of Participants in the Joint FAO-IOC-WHO-IAEA-UNEP Project on Monitoring of Pollution in the Marine Environment of the West and Central African Region; Accra, Ghana, 13-17 June 1988.	E
63	IOC/WESTPAC Workshop on Co-operative Study of the Continental Shelf Circulation in the Western Pacific; Bangkok, Thailand, 31 October-3 November 1989.	E
64	Second IOC-FAO Workshop on Recruitment of Penaeid Prawns in the Indo-West Pacific Region (PREP); Phuket, Thailand, 25-31 September 1989.	E
65	Second IOC Workshop on Sardine/Anchovy Recruitment Project (SARP) in the Southwest Atlantic; Montevideo, Uruguay, 21-23 August 1989.	E
66	IOC ad hoc Expert Consultation on Sardine/ Anchovy Recruitment Programme; La Jolla, California, U.S.A., 1989	E
67	Interdisciplinary Seminar on Research Problems in the IOCARIBE Region; Caracas, Venezuela, 28 November-1 December 1989.	E (out of stock)
68	International Workshop on Marine Acoustics; Beijing, China, 26-30 March 1990.	E
69	IOC-SCAR Workshop on Sea-Level Measurements in the Antarctica; Leningrad, USSR, 28-31 May 1990.	E
69 Suppl.	IOC-SCAR Workshop on Sea-Level Measurements in the Antarctica; Submitted Papers; Leningrad, USSR, 28-31 May 1990.	E
70	IOC-SAREC-UNEP-FAO-IAEA-WHO Workshop on Regional Aspects of Marine Pollution; Mauritius, 29 October - 9 November 1990.	E
71	IOC-FAO Workshop on the Identification of Penaeid Prawn Larvae and Postlarvae; Cleveland, Australia, 23-28 September 1990.	E
72	IOC/WESTPAC Scientific Steering Group Meeting on Co-Operative Study of the Continental Shelf Circulation in the Western Pacific; Kuala Lumpur; Malaysia, 9-11 October 1990.	E
73	Expert Consultation for the IOC Programme on Coastal Ocean Advanced Science and Technology Study; Liège, Belgium, 11-13 May 1991.	E
74	IOC-UNEP Review Meeting on Oceanographic Processes of Transport and Distribution of Pollutants in the Sea; Zagreb, Yugoslavia, 15-18 May 1989.	E
75	IOC-SCOR Workshop on Global Ocean Ecosystem Dynamics; Solomons, Maryland, U.S.A., 29 April-2 May 1991.	E
76	IOC/WESTPAC Scientific Symposium on Marine Science and Management of Marine Areas of the Western Pacific; Penang, Malaysia, 2-6 December 1991.	E
77	IOC-SAREC-KMFRI Regional Workshop on Causes and Consequences of Sea-Level Changes on the Western Indian Ocean Coasts and Islands; Mombasa, Kenya, 24-28 June 1991.	E
78	IOC-CEC-ICES-WMO-ICSU Ocean Climate Data Workshop Goddard Space Flight Center; Greenbelt, Maryland, U.S.A., 18-21 February 1992.	E
79	IOC/WESTPAC Workshop on River Inputs of Nutrients to the Marine Environment in the WESTPAC Region; Penang, Malaysia, 26-29 November 1991.	E
80	IOC-SCOR Workshop on Programme Development for Harmful Algae Blooms; Newport, U.S.A. 2-3 November 1991.	E
81	Joint IAPSO-IOC Workshop on Sea Level Measurements and Quality Control; Paris, France, 12-13 October 1992.	E
82	BORDOMER 92: International Convention on Rational Use of Coastal Zones. A Preparatory Meeting for the Organization of an International Conference on Coastal Change; Bordeaux, France, 30 September-2 October 1992.	E
83	IOC Workshop on Donor Collaboration in the Development of Marine Scientific Research Capabilities in the Western Indian Ocean Region; Brussels, Belgium, 12-13 October 1992.	E
84	Workshop on Atlantic Ocean Climate Variability; Moscow, Russian Federation, 13-17 July 1992	E
85	IOC Workshop on Coastal Oceanography in Relation to Integrated Coastal Zone Management; Kona, Hawaii, 1-5 June 1992.	E
86	International Workshop on the Black Sea; Varna, Bulgaria, 30 September – 4 October 1991	E
87	Taller de trabajo sobre efectos biológicos del fenómeno «El Niño» en ecosistemas costeros del Pacífico Sudeste; Santa Cruz, Galápagos, Ecuador, 5-14 de octubre de 1989.	S only (summary in E, F, S)
88	IOC-CEC-ICSU-ICES Regional Workshop for Member States of Eastern and Northern Europe (GODAR Project); Obninsk, Russia, 17-20 May 1993.	E
89	IOC-ICSEM Workshop on Ocean Sciences in Non-Living Resources; Perpignan, France, 15-20 October 1990.	E
90	IOC Seminar on Integrated Coastal Management; New Orleans, U.S.A., 17-18 July 1993.	E
91	Hydroblack'91 CTD Intercalibration Workshop; Woods Hole, U.S.A., 1-10 December 1991.	E
92	Réunion de travail IOCEA-OSNLR sur le Projet « Budgets sédimentaires le long de la côte occidentale d'Afrique » Abidjan, côte d'Ivoire, 26-28 juin 1991.	E
93	IOC-UNEP Workshop on Impacts of Sea-Level Rise due to Global Warming. Dhaka, Bangladesh, 16-19 November 1992.	E
94	BMTC-IOC-POLARMAR International Workshop on Training Requirements in the Field of Eutrophication in Semi-enclosed Seas and Harmful Algal Blooms, Bremerhaven, Germany, 29 September-3 October 1992.	E
95	SAREC-IOC Workshop on Donor Collaboration in the Development of Marine Scientific Research Capabilities in the Western Indian Ocean Region; Brussels, Belgium, 23-25 November 1993.	E
96	IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; Zanzibar, United Republic of Tanzania, 17-21 January 1994.	E
96 Suppl.	IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; Submitted Papers 1. Coastal Erosion; Zanzibar, United Republic of Tanzania 17-21 January 1994.	
96 Suppl	IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; Submitted Papers 2. Sea Level; Zanzibar, United Republic of Tanzania 17-21 January 1994.	E
97	IOC Workshop on Small Island Oceanography in Relation to Sustainable Economic Development and Coastal Area Management of Small Island Development States; Fort-de-France, Martinique, 8-10 November, 1993.	E
98	CoMSBlack '92A Physical and Chemical Intercalibration Workshop; Erdemli, Turkey, 15-29 January 1993.	E
99	IOC-SAREC Field Study Exercise on Nutrients in Tropical Marine Waters; Mombasa, Kenya, 5-15 April 1994.	E
100	IOC-SOA-NOAA Regional Workshop for Member States of the Western Pacific - GODAR-II (Global Oceanographic Data Archeology and Rescue Project); Tianjin, China, 8-11 March 1994.	E
101	IOC Regional Science Planning Workshop on Harmful Algal Blooms; Montevideo, Uruguay, 15-17 June 1994.	E
102	First IOC Workshop on Coastal Ocean Advanced Science and Technology Study (COASTS); Liège, Belgium, 5-9 May 1994.	E
103	IOC Workshop on GIS Applications in the Coastal Zone Management of Small Island Developing States; Barbados, 20-22 April 1994.	E
104	Workshop on Integrated Coastal Management; Dartmouth, Canada, 19-20 September 1994.	E
105	BORDOMER 95: Conference on Coastal Change; Bordeaux, France, 6-10 February 1995.	E
105 Suppl.	Conference on Coastal Change: Proceedings; Bordeaux, France, 6-10 February 1995	E
106	IOC/WESTPAC Workshop on the Paleographic Map; Bali, Indonesia, 20-21 October 1994.	E
107	IOC-ICSU-NIO-NOAA Regional Workshop for Member States of the Indian Ocean - GODAR-III; Dona Paula, Goa, India, 6-9 December 1994.	E
108	UNESCO-IHP-IOC-IAEA Workshop on Sea-Level Rise and the Multidisciplinary Studies of Environmental Processes in the Caspian Sea Region; Paris, France, 9-12 May 1995.	E
108 Suppl.	UNESCO-IHP-IOC-IAEA Workshop on Sea-Level Rise and the Multidisciplinary Studies of Environmental Processes in the Caspian Sea Region; Submitted Papers; Paris, France, 9-12 May 1995.	E
109	First IOC-UNEP CEPPOL Symposium; San José, Costa Rica, 14-15 April 1993.	E
110	IOC-ICSU-CEC regional Workshop for Member States of the Mediterranean - GODAR-IV (Global Oceanographic Data Archeology and Rescue Project) Foundation for International Studies, University of Malta, Valletta, Malta, 25-28 April 1995.	E
111	Chapman Conference on the Circulation of the Intra-Americas Sea; La Parguera, Puerto Rico, 22-26 January 1995.	E
112	IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials (GESREM) Workshop; Miami, U.S.A., 7-8 December 1993.	E
113	IOC Regional Workshop on Marine Debris and Waste Management in the Gulf of Guinea; Lagos, Nigeria, 14-16 December 1994.	E
114	International Workshop on Integrated Coastal Zone Management (ICZM) Karachi, Pakistan; 10-14 October 1994.	E
115	IOC/GLOSS-IAPSO Workshop on Sea Level Variability and Southern Ocean Dynamics; Bordeaux, France, 31 January 1995	E
116	IOC/WESTPAC International Scientific Symposium on Sustainability of Marine Environment: Review of the WESTPAC Programme, with Particular Reference to ICAM, Bali, Indonesia, 22-26 November 1994.	E
117	Joint IOC-CIDA-Sida (SAREC) Workshop on the Benefits of Improved Relationships between International Development Agencies, the IOC and other Multilateral Inter-governmental Organizations in the Delivery of Ocean, Marine Affairs and Fisheries Programmes; Sidney B.C., Canada, 26-28 September 1995.	E
118	IOC-UNEP-NOAA-Sea Grant Fourth Caribbean Marine Debris Workshop; La Romana, Santo Domingo, 21-24 August 1995.	E
119	IOC Workshop on Ocean Colour Data Requirements and Utilization; Sydney B.C., Canada, 21-22 September 1995.	E
120	International Training Workshop on Integrated Coastal Management; Tampa, Florida, U.S.A., 15-17 July 1995.	E
121	Atelier régional IOC-CERESCOR sur la gestion intégrée des zones littorales (ICAM), Conakry, Guinée, 18–22 décembre 1995	F
122	IOC-EU-BSH-NOAA-(WDC-A) International Workshop on Oceanographic Biological and Chemical Data Management, Hamburg, Germany, 20-23 May 1996	E
123	Second IOC Regional Science Planning Workshop on Harmful Algal Blooms in South America; Mar del Plata, Argentina, 30 October–1 November 1995.	E, S
124	GLOBEC-IOC-SAHFOS-MBA Workshop on the Analysis of Time Series with Particular Reference to the Continuous Plankton Recorder Survey; Plymouth, U.K.,4-7 May 1993.	E
125	Atelier sous-régional de la COI sur les ressources marines vivantes du Golfe de Guinée ; Cotonou, Bénin, 1-4 juillet 1996.	E

No.	Title	Languages
126	IOC-UNEP-PERSGA-ACOPS-IUCN Workshop on Oceanographic Input to Integrated Coastal Zone Management in the Red Sea and Gulf of Aden. Jeddah, Saudi Arabia, 8 October 1995.	E
127	IOC Regional Workshop for Member States of the Caribbean and South America GODAR-V (Global Oceanographic Data Archeology and Rescue Project); Cartagena de Indias, Colombia, 8-11 October 1996.	E
128	Atelier IOC-Banque Mondiale-Sida/SAREC-ONE sur la Gestion Intégrée des Zones Côtières ; Nosy Bé, Madagascar, 14-18 octobre 1996.	E
129	Gas and Fluids in Marine Sediments, Amsterdam, the Netherlands; 27-29 January 1997.	E
130	Atelier régional de la COI sur l'océanographie côtière et la gestion de la zone côtière ;Moroni, RFI des Comores, 16-19 décembre 1996.	E
131	GOOS Coastal Module Planning Workshop; Miami, USA, 24-28 February 1997	E
132	Third IOC-FANSA Workshop; Punta-Arenas, Chile, 28-30 July 1997	S/E
133	Joint IOC-CIESM Training Workshop on Sea-level Observations and Analysis for the Countries of the Mediterranean and Black Seas; Birkenhead, U.K., 16-27 June 1997.	E
134	IOC/WESTPAC-CCOP Workshop on Paleogeographic Mapping (Holocene Optimum); Shanghai, China, 27-29 May 1997.	E
135	Regional Workshop on Integrated Coastal Zone Management; Chabahar, Iran; February 1996.	E
136	IOC Regional Workshop for Member States of Western Africa (GODAR-VI); Accra, Ghana, 22-25 April 1997.	E
137	GOOS Planning Workshop for Living Marine Resources, Dartmouth, USA; 1-5 March 1996.	E
138	Gestión de Sistemas Oceanográficos del Pacifico Oriental; Concepción, Chile, 9-16 de abril de 1996.	S
139	Sistemas Oceanográficos del Atlántico Sudoccidental, Taller, TEMA;Furg, Rio Grande, Brasil, 3-11 de noviembre de 1997	S
140	IOC Workshop on GOOS Capacity Building for the Mediterranean Region; Valletta, Malta, 26-29 November 1997.	E
141	IOC/WESTPAC Workshop on Co-operative Study in the Gulf of Thailand: A Science Plan; Bangkok, Thailand, 25-28 February 1997.	E
142	Pelagic Biogeography ICoPB II. Proceedings of the 2nd International Conference. Final Report of SCOR/IOC Working Group 93; Noordwijkerhout, The Netherlands, 9-14 July 1995.	E
143	Geosphere-biosphere coupling: Carbonate Mud Mounds and Cold Water Reefs; Gent, Belgium, 7–11 February 1998.	E
144	IOC-SOPAC Workshop Report on Pacific Regional Global Ocean Observing Systems; Suva, Fiji, 13-17 February 1998.	E
145	IOC-Black Sea Regional Committee Workshop: 'Black Sea Fluxes' Istanbul, Turkey, 10-12 June 1997.	E
146	Taller Internacional sobre Formacion de Capacidades para el Manejo de las Costas y los Oéanos en le Gran Caribe, La Habana, – Cuba, 7–10 de Julio de 1998 / International Workshop on Management Capacity-Building for Coasts and Oceans in the Wider Caribbean, Havana, Cuba, 7–10 July 1998	S/E
147	IOC-SOA International Training Workshop on the Intregration of Marine Sciences into the Process of Integrated Coastal Management, Dalian, China, 19-24 May 1997.	E
148	IOC/WESTPAC International Scientific Symposium – Role of Ocean Sciences for Sustainable Development Okinawa, Japan, 2-7 February 1998.	E
149	Workshops on Marine Debris & Waste Management in the Gulf of Guinea, 1995-97.	E
150	First IOCARIBE-ANCA Workshop Havana, Cuba, 29 June-1 July 1998.	E
151	Taller Pluridisciplinario TEMA sobre Redes del Gran Caribe en Gestión Integrada de Áreas Costeras Cartagena de Indias, Colombia, 7-12 de septiembre de 1998.	S
152	Workshop on Data for Sustainable Integrated Coastal Management (SICOM) Maputo, Mozambique, 18-22 July 1998	E
153	IOC/WESTPAC-Sida (SAREC) Workshop on Atmospheric Inputs of Pollutants to the Marine Environment Qingdao, China, 24-26 June 1998	E
154	IOC-Sida-Flanders-SFRI Workshop on Ocean Data Management in the IOCINCWIO Region (ODINEA project) Capetown, South Africa, 30 November-11 December 1998.	E
155	Science of the Mediterranean Sea and its applications UNESCO, Paris 29-31 July 1997	E
156	IOC-LUC-KMFRI Workshop on RECOSCIX-WIO in the Year 2000 and Beyond, Mombasa, Kenya, 12-16 April 1999	E
157	'98 IOC-KMI International Workshop on Integrated Coastal Management (ICM), Seoul, Republic of Korea 16-18 April 1998	E
158	The IOCARIBE Users and the Global Ocean Observing System (GOOS) Capacity Building Workshop, San José, Costa Rica, 22-24 April 1999	E
159	Oceanic Fronts and Related Phenomena (Konstantin Fedorov Memorial Symposium) – Proceedings, Pushkin, Russian Federation, 18-22 May 1998	E
160	Under preparation	
161	Under preparation	
162	Workshop report on the Transports and Linkages of the Intra-americas Sea (IAS), Cozumel, Mexico, 1-5 November 1997	E
163	Under preparation	
164	IOC-Sida-Flanders-MCM Third Workshop on Ocean Data Management in the IOCINCWIO Region (ODINEA Project), Cape Town, South Africa, 29 November – 11 December 1999	E
165	An African Conference on Sustainable Integrated Management; Proceedings of the Workshops. An Integrated Approach, (PACSICOM), Maputo, Mozambique, 18 –25 July 1998	E, F
166	IOC-SOA International Workshop on Coastal Megacities: Challenges of Growing Urbanization of the World's Coastal Areas; Hangzhou, P.R. China, 27 –30 September 1999	E
167	IOC-Flanders First ODINAFRICA-II Planning Workshop, Dakar, Senegal, 2-4 May 2000	E
168	Geological Processes on European Continental Margins; International Conference and Eight Post-cruise Meeting of the Training-Through-Research Programme, Granada, Spain, 31 January – 3 February 2000	E
169	International Conference on the International Oceanographic Data & Information Exchange in the Western Pacific (IODE-WESTPAC) 1999, ICIWP '99, Langkawi, Malaysia, 1-4 November 1999	E *(electronic copy only)*
170	IOCARIBE-GODAR-I Cartagenas, Colombia, February 2000	*under preparation*
171	Ocean Circulation Science derived from the Atlantic, Indian and Arctic Sea Level Networks, Toulouse, France, 10-11 May 1999	E
172	*(Under preparation)*	
173	The Benefits of the Implementation of the GOOS in the Mediterranean Region, Rabat, Morocco, 1-3 November 1999	E, F
174	IOC-SOPAC Regional Workshop on Coastal Global Ocean Observing System (GOOS) for the Pacific Region, Apia, Samoa, 16-17 August 2000	E
175	Geological Processes on Deep-water European Margins, Moscow-Mozhenka, 28 Jan.-2 Feb. 2001	E
176	MedGLOSS Workshop and Coordination Meeting for the Pilot Monitoring Network System of Systematic Sea Level Measurements in the Mediterranean and Black Seas, Haifa, Israel, 15-17 May 2000	E
177	*(Under preparation)*	
178	*(Under preparation)*	
179	*(Under preparation)*	
180	Abstracts of Presentations at Workshops during the 7[th] session of the IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Honolulu, USA, 23-27 April 2001	E
181	*(Under preparation)*	
182	*(Under preparation)*	
183	Geosphere/Biosphere/Hydrosphere Coupling Process, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges, International Conference & Tenth Post-cruise Meeting of the Training-through-Research Programme, Aveiro, Portugal, 30 January-2 February 2002	E
184	*(Under preparation)*	
185	*(Under preparation)*	
186	*(Under preparation)*	
186	*(Under preparation)*	
187	Geological and Biological Processes at deep-sea European Margins and Oceanic Basins, Bologna, Italy, 2–6 February 2003	E
188	Proceedings of 'The Ocean Colour Data' Symposium, Brussels, Belgium, 25-27 November 2002	E
189	Workshop for the Formulation of a Draft Project on Integrated Coastal Management (ICM) in Latin America and the Caribbean (LAC), Cartagena, Colombia, 23–25 October 2003 Taller de Formulación de un Anteproyecto de Manejo Costero Integrado (MCI) en América Latina y el Caribe (ALC), Cartagena, Colombia, 23–25 de Octubre de 2003	E F *(electronic copy only)*
190	First ODINCARSA Planning Workshop for Caribbean Islands, Christchurch, Barbados, 15–18 December 2003	E *(electronic copy only)*
191	North Atlantic and Labrador Sea Margin Architecture and Sedimentary Processes — International Conference and Twelfth Post-cruise Meeting of the Training-through-research Programme, Copenhagen, Denmark, 29–31 January 2004	E
192	Regional Workshop on Coral Reefs Monitoring and Management in the ROPME Sea Area, Iran I.R., 14–17 December 2003	E *(under preparation)*
193	Workshop on New Technical Developments in Sea and Land Level Observing Systems, Paris, France, 14–16 October 2003	E *(electronic copy only)*
194	IOC/ROPME Planning Meeting for the Ocean Data and Information Network for the Central Indian Ocean Region	*(under preparation)*
195	Workshop on Indicators of Stress in the Marine Benthos, Torregrande-Oristano, Italy, 8–9 October 2004	E
196	International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean within a Global Framework, Paris, France, 3–8 March 2005	E
197	Geosphere-Biosphere Coupling Processes: The TTR Interdisciplinary Approach Towards Studies of the European and North African Margins; International Conference and Post-cruise Meeting of the Training-Through-Research Programme, Morocco, 2-5 February 2005	E
198	Second International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean, Grand Baie, Mauritius, 14–16 April 2005	E
199	International Conference for the Establishment of a Tsunami and Coastal Hazards Warning System for the Caribbean and Adjacent Regions, Mexico, 1–3 June 2005	E
200	Lagoons and Coastal Wetlands in the Global Change Context: Impacts and Management Issues — Proceedings of the International Conference, Venice, 26–28 April 2004 (*ICAM Dossier N° 3*)	E
201	Geological processes on deep-water European margins - International Conference and 15th Anniversary Post-cruise Meeting of the Training-Through-Research Programme, Moscow/Zvenigorod, Russian Federation, 29 January–4 February 2006	E
202	Proceedings of 'Ocean Biodiversity Informatics': an international conference on marine biodiversity data management Hamburg, Germany, 29 November–1 December 2004	E
203	IOC-Flanders Planning Workshop for the formulation of a regional Pilot Project on Integrated Coastal Area Management in Latin America, Cartagena de Indias, Colombia, 16–18 January 2007	*E (electronic copy only)*
204	Geo-marine Research along European Continental Margins, International Conference and Post-cruise Meeting of the Training-through-research Programme, Bremen, Germany, 29 January–1 February 2007	E
205	IODE/ICAM Workshop on the development of the Caribbean marine atlas (CMA), United Nations House, Bridgetown, Barbados, 8–10 October 2007	E *(electronic copy only)*
206	IODE/JCOMM Forum on Oceanographic Data Management and Exchange Standards, Ostend, Belgium, 21–25 January 2008	*(Under preparation)*
207	SCOR/IODE Workshop on Data Publishing, Ostend, Belgium, 17–18 June 2008	*(Under preparation)*
208	JCOMM Technical Workshop on Wave Measurements from Buoys, New York, USA, 2–3 October 2008 (IOC-WMO publication)	*(Under preparation)*

No.	Title	Languages
209	Collaboration between IOC and OBIS towards the Long-term Management Archival and Accessibility of Ocean Biogeographic Data, Ostend, Belgium, 24–26 November 2008	*(Under preparation)*
210	Ocean Carbon Observations from Ships of Opportunity and Repeat Hydrographic Sections (IOCCP Reports, 1), Paris, France, 13–15 January 2003	E ***(electronic copy only)***
211	Ocean Surface pCO_2 Data Integration and Database Development (IOCCP Reports, 2), Tsukuba, Japan, 14–17 January 2004	E ***(electronic copy only)***
212	International Ocean Carbon Stakeholders' Meeting, Paris, France, 6–7 December 2004	E ***(electronic copy only)***
213	International Repeat Hydrography and Carbon Workshop (IOCCP Reports, 4), Shonan Village, Japan, 14–16 November 2005	E ***(electronic copy only)***
214	Initial Atlantic Ocean Carbon Synthesis Meeting (IOCCP Reports, 5), Laugavatn, Iceland, 28–30 June 2006	E ***(electronic copy only)***
215	Surface Ocean Variability and Vulnerability Workshop (IOCCP Reports, 7), Paris, France, 11–14 April 2007	E ***(electronic copy only)***
216	Surface Ocean CO2 Atlas Project (SOCAT) 2nd Technical Meeting Report (IOCCP Reports, 9), Paris, France, 16–17 June 2008	E ***(electronic copy only)***
217	Changing Times: An International Ocean Biogeochemical Time-Series Workshop (IOCCP Reports, 11), La Jolla, California, USA, 5–7 November 2008	E ***(electronic copy only)***
218	Second Joint GOSUD/SAMOS Workshop, Seattle, Washington, USA, 10–12 June 2008	E ***(electronic copy only)***
219	International Conference on Marine Data management and Information Systems (IMDIS), Athens, Greece, 31 March–2 April 2008	E