MAMA - The first MedGOOS project

The Mediterranean network to Access and upgrade the Monitoring and forecasting Activity in the region

1. INTRODUCTION

Sustainable development requires the intelligent management of the marine environment, to protect the marine ecosystem and minimise the impacts of climate change and human use of resources. Operational ocean monitoring and forecasting based on sound science, reliable assessment, and efficient co-operation between nations, is the main tool for such a management. Ongoing RTD projects focussing on the Mediterranean are developing the basis of a pre-operational forecasting system, but the coverage of coastal areas and the basin wide integration of efforts among all bordering countries is still lacking. MAMA provides a framework for a concerted effort towards the establishment of a strong and common research infrastructure for the setting up of the Global Ocean Observing System in the Mediterranean (MedGOOS).

The project builds on the trans-national pooling of scientific and technological resources in the basin, through the sharing of experiences and the transfer of expertise, to bring capacities at comparable levels, and provide an integrated effort towards the planning and design of the initial ocean observing and forecasting system in the Mediterranean. The focus will be on the sustainable use of the coastal zone. MAMA will also interact with end-users and work in the whole basin to raise awareness on the benefits of ocean forecasting with dissemination of results and products. Furthermore MAMA will put in place the institutional networking and establish the basic infrastructure for the future MedGOOS operational system. It will demonstrate the usefulness of ocean observations and forecasting, trigger local awareness and build the momentum towards long term commitments by governments.

2. SCIENTIFIC/TECHNICAL OBJECTIVES AND INNOVATION

National ocean monitoring and forecasting programmes already exist in some EU Mediterranean countries, but efforts are not co-ordinated. In other cases, national capabilities, including human skills and available technology, are not sufficiently developed and generally not well integrated to provide a comprehensive approach. Data on a regional scale are rarely brought together and large expanses of the basin, especially along the southern and eastern perimeter, are not covered. Data are often taken from ‘platforms of convenience’ and at locations that may not be the best ones from an oceanographic point of view.

On the other hand, coastal seas are affected by ocean and atmospheric processes happening on a regional or global scale and dictate the need for a regional approach to observations and to the sharing of data. This is even most evident in the Mediterranean Sea, characterised by generally narrow shelf areas, where large-scale structures predominantly force the coastal ecosystem [1]. Moreover ocean forecasts require observations of sufficient duration, spatial extent and resolution as well as real-time data telemetry, assimilation into models and analysis. This is the way in which the monitoring

and forecasting of open and coastal seas will in the near future provide a comprehensive means to assess the health of the oceans, understand their variability and reaction to external changes, improve their sustained exploitation, and mitigate their peril while at the same time providing the basis for a suite of new marine services and applications.

The sustainable management of the seas and oceans was called for by Agenda 21 [2] and resulted in the launching of the Global Ocean Observing System (GOOS), to be planned and implemented regionally. The European component of GOOS was established in 1994 by 14 European agencies, reaching 30 in 2001. The EuroGOOS Association developed its strategy, technological surveys, and science plan of regional task teams including the Mediterranean [3,4,5,6,7 and 1]. MedGOOS was founded under the auspices of UNESCO/IOC in 1997 [8] and already binds together 16 members from 13 countries that will participate in MAMA. In 1999 the MedGOOS strategy was endorsed by over 30 national Institutions, interagency and intergovernmental organisations from European and almost all the Mediterranean countries.

GODAR [9] and MEDAR/MEDATLAS have located the major data holdings. The establishment of NODCs and the development of an adequate data management structure in the region (including handling of NRT data) are identified as a basic next step forward. The MFSPP is the only experience in the Mediterranean of NRT data exchange, between participating institutes, at time scales of hours (buoy data), days (XBT data) or weeks (remote sensing SST and SSH data). This exercise has demonstrated the feasibility of such a procedure but, at the same time, revealed the problems that can be faced during such kind of operational, day to day practices.

MAMA is planned on the basis of this current situation and will aid to resolve these deficiencies by staging a concerted effort, involving for the first time all the Mediterranean countries, intended to progress beyond the state-of-the-art towards the implementation of the initial observing and forecasting system in the Mediterranean. The system will integrate basin scale observations with downscaling to the coastal zone, and build upon the experiences and beyond existing elements such as MFSPP, EuroGOOS, MedGOOS, MEDAR/MEDATLAS, and already running national monitoring systems.

RTD Projects Related to MedGOOS

Ongoing EU RTD projects are providing the science base for the implementation of the Mediterranean component of GOOS. The Mediterranean Data Archaeology and Rescue of Temperature, Salinity & Bio-chemical Parameters (MEDAR/MEDATLAS) [9] and the Mediterranean Forecasting System Pilot Project – MFSPP – [7] already involve the participation of some non-EU Mediterranean contributing to co-operation in the region. The MFSPP is testing the feasibility of a Mediterranean pre-operational system to predict physical and biochemical parameters in the basin and coastal/shelf areas for time scales of weeks to months, by generating forecasts based on a nowcasting/forecasting modelling system and data from a moored station and satellites. MFSPP has also developed interfaces to users to disseminate forecast results. MFSPP is providing the science base for MedGOOS.
The MFSPP has started to identify the needs, strong and weak points of a long-term monitoring/forecasting system. It has proved that an integrated coastal/open sea monitoring/forecasting system needs a strong collaboration among the neighbouring countries to share efforts, resources and provide a monitoring system with optimised temporal/spatial coverage.

The specific objectives of the MAMA proposal are to:

- build the basin-wide network for ocean monitoring and forecasting, linking all the Mediterranean countries, broadening and strengthening the existing network of national institutions already established by the MedGOOS partners;
- identify the gaps in the monitoring systems in the region and in the capability to measure, model and forecast the ecosystem, taking stock of current RTD projects as the MFSPP, and of the EuroGOOS, MedGOOS and Africa GOOS activities;
- build capacities for expertise in the setting up and running of observing platforms, in managing data, in modelling and forecasting the ecosystem;
- design the initial forecasting system from the basin scale down to the coastal zone, inter-comparing experience and standardising practices, towards the co-ordinated upgrading of the observing and forecasting capabilities in all Mediterranean countries;
- raise awareness on the benefits of ocean forecasting at local, regional and global scales, involving stakeholders and
- disseminate results, products and demonstration applications to show the benefits of GOOS in the region.

The principal novelty of the project consists in:

- establishing the first network of all the Mediterranean countries for ocean monitoring and forecasting;
- integrating the knowledge base derived by national and EU RTD projects, by the EuroGOOS Task Team for the Mediterranean and the EuroGOOS Working Groups on science and technology, and by other international programmes of IOC and UNEP-MAP to design the initial near real time observing and forecasting system in the basin;
- working together research Institutions, operational agencies, policy makers, intergovernmental organisations, thus harmonising strategies contributing to the objectives of a European Research Area;
- providing the framework for a full geographical coverage of observations in the basin and the large transnational pooling of scientific and technological resources, for underpinning the research needed for the initial forecasting system and to downscale the forecasting skill to the coastal zone.

The expected long-term results are to:

- strengthen the co-operation of all the Mediterranean countries towards the development of the Mediterranean operational forecasting system operating at basin and local (regional to coastal) scales;
- upgrade the technical and scientific skills of human resources and the research infrastructure needed for the basin wide management of the coastal and shelf area;
- establish the platform for a Mediterranean virtual data and information centre as a basis for operational interagency exchange, merging data and information, to produce added value oceanographic information, and the delivery of user-oriented products in an operational and interactive mode.

3. PROJECT WORKPLAN

3.1 The MAMA participants

The Co-ordinator and members of the MAMA consortium are listed below together with their acronyms. The project co-ordination is in the hands of the MedGOOS Chair at the International Marine Centre in Italy, who has a long experience in managing large projects. The MedGOOS Secretariat at the IOI-Malta Operational Centre in Malta will be the assistant co-ordinator. Within MedGOOS the Secretariat is already involved in maintaining links between many of the MAMA partners. The active involvement of the co-ordinator and assistant co-ordinator in all the WPs will ease the supervision of the work progress at all stages. The MAMA decision process will moreover avail of competent WP leaders that have already served on important EU funded projects, of an Advisory Board of external evaluators of international repute, and a Full Group Committee which secures a sound project management with the representation of all participants.

Table 1

Partner	Name	Acronym	Role	Country
MB1	**Centro Marino Internazionale**	**IMC**	**Coordinator**	**Italy**
MB2	**International Ocean Institute Malta Operational Centre University of Malta**	**IOI-MOC**	**Member (Assistant Coordinator)**	**Malta**
MB3	**Marine Biological Station National Institute of Biology**	**NIB**	**Member**	**Slovenia**
MB4	**Hydro-Engineering Institute, University of Sarajevo**	**HEIS**	**Member**	**Bosnia Herzegovina**
MB5	**Institute of Marine Biology of Crete**	**IMBC**	**Member**	**Greece**
MB6	**Oceanography Section, Department of Fisheries & Marine Research**	**DFMR-OS**	**Member**	**Cyprus**
MB7	**Middle East Technical University, Institute of Marine Sciences**	**IMS-METU**	**Member**	**Turkey**
MB8	**Integrated Coastal Zone Study, Department of Earth Sciences, Rabat-Agdal Faculty of Sciences**	**FSR**	**Member**	**Morocco**
MB9	**Institut National des Sciences & Technologies de la Mer**	**INSTM**	**Member**	**Tunisia**
MB10	**Israel Oceanographic and Limnological Research**	**IOLR**	**Member**	**Israel**
MB11	**United Nations Environment Programme/Mediterranean Action Plan/Med Pol Programme**	**UNEP/MAP**	**Member**	**International**
MB12	**Università di Bologna, Centro Interdipartimentale di Ricerca per le Scienze Ambientali**	**UniBo/ CIRSA**	**Member**	**Italy**
MB13	**National Centre for Marine Research**	**NCMR**	**Member**	**Greece**
MB14	**ENEA – Centro Ricerche Ambiente Marino**	**ENEA**	**Member**	**Italy**
MB15	**Institut de Ciencies del Mar – CSIC**	**ICM/CSIC**	**Member**	**Spain**
MB16	**Laboratoire d'Etudes Maritimes**	**LEM**	**Member**	**Algeria**
MB17	**EuroGOOS – European Global Ocean Observing System**	**EuroGOOS**	**Member**	**United Kingdom**

MB18	**Sistemi Sensoriali ed Ambiente Marino – CNR**	**S^2AM-CNR**	**Member**	**Italy**
MB19	**Instituto Español de Oceanografia**	**IEO**	**Member**	**Spain**
MB20	**National Centre for Marine Sciences**	**NCMS**	**Member**	**Lebanon**
MB21	**Institute of Oceanography and Fisheries**	**IOR**	**Member**	**Croatia**
MB22	**Intergovernmental Oceanographic Commission**	**IOC/ UNESCO**	**Member**	**International**
P23	***Dept. of Oceanography, Faculty of Science***	***UA/DO***	***Participant to the network***	***Egypt***
MB24	**Institut Français de Recherche pour l'Exploitation de la Mer**	**IFREMER**	**Member**	**France**
MB25	**Agenzia Nazionale per la Protezione dell'Ambiente**	**ANPA**	**Member**	**Italy**
MB26	**High Institute of Marine Research, Tishreen University**	**HIMR**	**Member**	**Syria**
MB27	**National Institute of Oceanography and Fisheries**	**NIOF**	**Member**	**Egypt**
P28	***Department of Environmental Studies Environment General Authorities***	***EGA***	***Participant to the network***	***Libyan Arab Jamahiria***
MB29	**Al-Azhar University of Gaza**	**ALA**	**Member**	**Palestine Authority**
MB30	**Institute of Hydrometeorology**	**IHM**	**Member**	**Albania**
MB31	**Institute for Marine Biology**	**IMB**	**Member**	**Yugoslavia**

3.2 Overview of the MAMA planned activities

The activities are organised into nine workpackages that are linked to each other at several stages. Workpackage 0 concerns the project co-ordination. WP1 to 8 are described briefly below :

WP1 MAMA-NOW

Within this workpackage a stocktaking and identification exercise of the situation in the Mediterranean will be carried out with regard to:

- present capabilities in terms of research institutions;
- availability of technological infrastructures and equipment;
- human resources and funding capability.

This will be done both in conjunction with authorities on a national level in each individual country and as well as with international organisations operating in the Mediterranean.

WP2 MAMA-OBS – OBSERVING SYSTEM

A scientific assessment of existing ocean observing systems in the Mediterranean at regional, coastal and national scales will take place in order to design scientifically proven and cost effective real time coastal data acquisition systems, fully integrated to the basin scale system.

WP3 MAMA-CAP/BUILD, CAPACITY BUILDING

This workpackage will contribute to develop the basic technical and scientific expertise required to participate in the GOOS. This WP proposes a scheme of visiting S&T personnel of MAMA members at specialised centres in the MAMA consortium. The aim is to transfer expertise within the network, involving in the enabling experience all Mediterranean countries, on an equal opportunity basis.

WP4 MAMA-MODEL

The state-of-the-art of ocean numerical modelling will be assessed. An initial modelling system for the Mediterranean shelf and coast areas will be planned by integrating the experience in modelling carried out in RTD projects, such as the Mediterranean Forecasting System Pilot Project (MFSPP). Work will include the implementation of high-resolution circulation models in key shelf/coastal areas not yet covered by the MFSPP and will also ensure an effective transfer of know-how and modelling experiences to new partners.

WP5 MAMA-NET

Design and test, through a pilot implementation, the basis of a Mediterranean 'virtual data and information centre' in the form of an internet-based inter-agency networking system for the exchange of data and information. The aim is to initiate a proto-type data and information management system that supports an end-to-end process starting from the data/meta-data flow and merging between operational agencies, through the processing, integration and enhancement stages, and up to the viewing and exploitation by users. All the MAMA participants will be empowered with know-how and tools for the management of operational data and information, and for access and use of the MAMA virtual centre and other on-line related services. A marine data and information management (MDIM) workshop will provide guidelines for such an information system.

WP6 MAMA - WWW

The MAMA WWW will act as a reference point in the Mediterranean by having links to national and institutional web sites and operational ocean forecasting programmes. The aim of MAMA WWW is to encourage regional interaction and to highlight the benefits of operational forecasting to potential users whilst raising public awareness. The dissemination of results on the WWW will also serve to enhance information exchange. A web-based regional directory, MeDir, will produce a searchable database of marine agencies, institutions and professionals and their activities on operational forecasting in the Mediterranean.

WP7 MAMA - AWARE

A campaign will be undertaken throughout the duration of the project to promote awareness on MedGOOS and the benefits of ocean forecasting in the Mediterranean. The campaign will address a full hierarchy of stakeholders, such as governmental agencies and authorities, policy-makers, marine scientific community, marine industries, services

sector, and the public at large. The main aim is to secure greater support and commitments from various governments.

WP8 MAMA - DISS & PROD, DISSEMINATION & PRODUCTS

This workpackage will address the use of data for the management of marine resources at short term. User-friendly interfaces for viewing forecast results and 3D data will be developed. Links will be established with the end-user community in order to identify their needs and priorities. This will be achieved mainly through the development of web-based demonstration tools. One of these will provide guidance and information on Integrated Coastal Zone Management and on protection from coastal erosion. A dedicated pilot exercise for the coastal zone will merge in situ and satellite data providing information on the current trends of the coastal marine environment.

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