



"The Operational Oceanography of IOC (for Group II)"

Viorel MALCIU

NATIONAL INSTITUTE FOR MARINE RESEARCH AND DEVELOPMENT "GRIGORE ANTIPA"



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> 20 – 22 March 2012 Varna, BULGARIA

National Institute for Marine Research and Development "Grigore Antipa" (NIMRD)

established in 1970 to continue the tradition of the Romanian marine research initiated by Emil Racovita, Grigore Antipa and Ioan Borcea at the beginning of XX- th century

emerged from the fusion of :

Marine Zoological Station "Prof. Ioan Borcea" Agigea; Marine Fisheries Research Station "Dr. Grigore Antipa" Constanta;

Institute of Biology "Traian Savulescu"/Marine branch Constanta;

Oceanographic Station Constanta;

Laboratory of Marine Sedimentology Bucharest.

National Institute for Marine Research and Development "Grigore Antipa" (NIMRD)

MAIN OBJECTIVES:

Fundamental, applied and technological research on: Oceanography Marine and coastal engineering Ecology Environmental protection Management of marine living resources

To fulfil (according to the Governmental Law 686/1999):

National and international requirements of the Romanian Economical Exclusive Zone (about 24,000 km2) at the Black Sea;

Obligations assumed by Romania as a part of international conventions in those fields.

National Institute for Marine Research and Development "Grigore Antipa" (NIMRD)

SPECIFIC OBJECTIVES:

NIMRD "Grigore Antipa" is technical operator of the national network for physical, chemical and biological monitoring of national marine and coastal waters and of the surveillance of coastal erosion

The basic research fields include: marine hydrology, marine physics, marine chemistry, marine biochemistry, sedimentology, coastal morpho-dynamics, marine biology, microbiology, marine living resources, coastal engineering and technology, ecological protection.





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NECESITY OF THE ROMANIAN INTEGRATED MARINE MONITORING SYSTEM

 as Contracting Party of the Convention for the Protection of the Black Sea Against Pollution (Bucharest Convention), Romania has established and carries on a program of water pollution monitoring and assessment of the transitional national coastal and marine areas (Article XV 4);

 as member of European Union, Romania has the obligation to harmonize and implement European legislation: Water Framework Directive, Directive of bathing waters, Directive for mollusks recovery areas, Marine Strategy Framework Directive (2008/56/CE);

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DESCRIPTION OF MARINE INTEGRATED MONITORING SYSTEM

SUBSYSTEMS:

1. Physical, chemical and biological monitoring ;

2. Water and sediments monitoring in designed areas for mollusks harvest / growth;

3. Monitoring and control of dangerous substances in dredged sediments from ports and maritime shipping channels;

- 4. Monitoring of ballast waters;
- 5. Monitoring of coastal erosion;
- 6. Monitoring of the biological diversity, inclusive marine mammals populations;
- 7. Monitoring of dolphins' accidental catches and stranding;

8.Monitoring of the bathing waters and beaches quality (collaboration with Sanitary Directorate);

9. Monitoring of extreme marine phenomena (extreme surges, tsunamis);

10. Monitoring of accidental oil pollution (when needed);

PARAMETERS AND STATIONS FOR PHYSICAL, CHEMICAL AND BIOLOGICAL MONITORING

The ecological status of the Romanian Black Sea transitional, coastal and marine waters is assessed on the basis of the physical, chemical, biological and hydromorphological indicators recommended by the Water Framework Directive and Marine Strategy Framework Directive:

PHYSICAL AND CHEMICAL PARAMETERS:

-annual and seasonal temperature regime, sea currents velocity, wave exposure, turbidity ;

-spatial and temporal distribution of salinity;

-spatial and temporal distribution of nutrients (P-PO4, N-NO2, N-NO3, N-NH4, N total, T total, Si-SiO4), dissolved oxygen and saturability, BOD5, total organic carbon (TOC), chlorophyll a, total suspended matter, pH;

STRUCTURE AND GRANULOMETRIC COMPOSITION OF SEDIMENTS;

CONTAMINATION INDICATORS (in water, sediments, biota):

- total petroleum hydrocarbons (TPH), heavy metals, organo-chlorinated pesticides, polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs);

BIOLOGICAL INDICATORS

phytoplankton (species, seasonal and geographical variability);
macrozoobentos (species composition, biomass and annual/seasonal variability));
-zooplankton (species, seasonal and geographical variability);
macro-algae (species composition, biomass and annual/seasonal variability);
information on the structure of fish populations, including the abundance, distribution and age/size structure of the populations.

MICROBIOLOGICAL INDICATORS - microbial pathogens;







NIMRD monitoring programme of the transitional, coastal and marine waters from the Romanian Black Sea area is based on the analysis of water, sediment and biota samples, collected from a network of 44 stations located between Sulina and Vama Veche (research vessel "Steaua de Mare 1", 6-12 times/year).

The stations network includes the survey of all water typologies included in Water Framework Directive and Marine Strategy Directive, as follows:

- MARINE TRANSITIONAL WATERS - 12 stations (Sulina, Mila9, Sf.Gheorghe, Portita, Gura Buhaz – up to 20 m depth),

 COASTAL WATERS - 21 stations (East Constanta, Cazino Mamaia, Constanta North, Constanta South, Eforie, Costinesti, Mangalia, Vama Veche, up to 20 m depth) and

MARINE WATERS - 11 stations (30 – 50 m depths).

All measurements are provided in the Acreditated Measurements Laboratory through ISO 17025.

European projects to ensure oceanographic and environmental data

- CE/PC6: Pan European infrastructure for Ocean & Marine Data Management (SEADATANET), 2006 – 2011;
- **CE/PC6**: Southern European seas: Assessing and modeling ecosystem changes (SESAME), 2006 2010;
- CE /PC7 : European COastal- shelf sea OPerational Observing and Forecasting System (ECOOP), 2007 – 2010;
- **CE/PC7** : Upgrade Black Sea Scene (UBSS), 2009 2011;
- CE/PC7 European Marine Observation and data Network (EMODNET)– Lot No. 3 - Chemistry 2009 - 2012
- CE/PC 7: MyOCEAN 1 and MyOCEAN 2, 2009 2015
- ESA (European Space Agency): Ocean Color Application for the Western Black Sea, 2010 - 2014

1. <u>DEPARTMENT FOR OCEANOGRAPHY, MARINE AND COASTAL</u> ENGINEERING

Physical Oceanography Laboratory

Chemical Oceanography Laboratory

Marine Technology Laboratory

Coastal Engineering Laboratory

2. NATIONAL OCEANOGRAPHIC AND ENVIRONMENTAL DATA CENTER

While the Department is responsible for physical, chemical and operational oceanography, the National Center is responsible for data archiving, data QC, data dissemination.

Operational oceanography

Romania is a member of Intergovernmental Oceanographic Commission (IOC/UNESCO) before 1961 and in this quality, contributed through NIMRD "Grigore Antipa" to the development of the IOC's two Programs, GOOS and IODE. This participation became more substantial since 2003, by attending three international programes funded by EU: ARENA, ASCABOS and ECOOP and another one, MyOCEAN, which was accepted by EU this year. This participation presents some advantages and contributes to the development of the national oceanography due to:

- attending the Consortiums which include most prodigious institutes and universities, facilitating the oceanographic data and information exchange;
- approaching the general problems: climatic changes, hazard mitigation, tsunami warning, etc.
- multidisciplinary approach of the scientific research; end – user oriented product.

<u>Operational oceanography</u> is defined as systematic measurements of the sea water parameters and data transmission in real or near – real time.

Important outputs are:

<u>nowcast</u>, (very short time forecast, 0 – 12 hours) which provides the most accurate sea state description, including marine living resources;

<u>forecast</u>, (short and medium time forecast, 1 - 7 days) which provides the continuous sea state forecast;

hindcast, which compiles long time series, describing the former sea state, time series which indicate trends and regime changes.

The recorded data are Datele înregistrate are transmitted to specialized acquisition centers, where high power computers use numerical models and generate the products. Such an examples of final products could be:

- warnings (coastal flooding, damages due to storms or freezing phenomena, algal blooms, contaminants and so on;

- electronic navigation charts with improved routes;

- forecast of the primary productivity, seasonal or annual;

- Marine cuurrents, climatic variability of the marine area;

Final products are timely distributed to the responsible governmental agencies and to economic entities interested in such a products.



<u>A Regional Capacity Building and Networking Programme to Upgrade</u> Monitoring and Forecasting <u>Activity in the Black Sea Basin (ARENA)</u> First Black Sea GOOS Project ARENA

An European Union (EU) funded project under Energy, Environment and Sustainable Development fifth framework.

ARENA is an operational oceanography oriented project aiming regional capacity building in close collaboration with the regional and other relevant organisations.

Second Black Sea GOOS Project: (2006 – 2008)



Objectives:

Co-ordination of a flexible and operative infrastructure for data and information exchange between key Black Sea scientific institutions to serve reliably observing and predicting the sea state and the ecosystem state.

Build the scientific capacity of human resources in the Black Sea region aimed at further development, maintenance and improvement of an operational observing and forecasting system through especially designed educational and training program.

Continuously collecting and updating of the historical databases and metadata bases and extending the access of the end-users to these information sources by development of a Black Sea information system, that will contain all available metadata, compiled in the past (after validation), and efficient updating mechanisms by the Internet.

To organize a cost-effective VOS pilot program, applying modern technologies and developments for data collection, transmission, storage, use and dissemination.

ECOOP European COastal-shelf sea OPerational observing and forecasting system





Basin-Scale Circulation Model











MyOcean, a project

for ocean monitoring and forecasting in Europe

MyOcean will deliver regular and systematic reference information on the state of the oceans



Physical state of the ocean, and primary ecosystem Global ocean, and main European basins and seas Large and basin scale ; mesoscale physics Hindcast, Nowcast, Forecast Data, Assimilation and Models

The MyOcean team

Lead by Mercator Ocean

60 partners, 28 countries

All European maritime countries

A core group of ~ 15 partners: the European GODAE partners



MyOcean network involving all European maritime countries Partners networking 28 countries for user's requirements

NIMRD existing Infrastructure for the Integrated Monitoring System

Operational oceanography:

Tsunami Early Warning System, Sea level, Sea surface temperature (SST), Air pressure



Sea Level online record sample (s) sent to the IOC Sea Level Monitoring facilities

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Existing operational oceanography: sea currents and waves in the coastal area







For sea current and waves monitoring in the coastal area, three Acoustic Doppler Current Profilers ADCP Workhorse Sentinel 600 Hz are used in fixed, underwater measurements locations or in oceanographic cruises. Data are used for oceanographic forecast as well





Acoustic Doppler Current Profiler Workhorse Sentinel 600 Hz. There was designed and setup a public information system concerning Black Sea marine information in the Constanta area, with development capacities, at the NIMRD's headquarters in within ECOOP and MyOCEAN projects.

Sampling location:
Constanța
φ: 44° 14' 08.25''N
λ: 028° 37' 41.13''E

Physical parameters in water: 09.09.2011:08:30 EEST

Level 10 cm

Temperature 21.9 °C

salinity 15.89 PSU



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Existing operational oceanography: oceanographic

18.5

17,4

16.3

15.1

2.92

1.38

-0.2

-1.8

forecast http://www.rmri.ro/RMRI/Forecasts/ForecastsRO.html



Oceanographic forecast Dayly updates

(On the site of Ministry of Environment and Forests)





"OC-Aeronet station for the monitoring of ocean colour in the Western Black Sea"

The project aims at providing support for the maintenance and operation of an autonomous above-water radiometer on an oil platform in front of the Romanian coast. This system will produce data which will be used for the continuous assessment of the atmospheric correction process of current satellite ocean colors sensors (with the highest priority for MERIS).

The approved project must be considered in relation to an already approved project within the framework of ESA and ROSA coordinated activities, and with the collaboration of JRC, which aims at carrying out dedicated bio-optical cruises in the Romanian waters influenced by the Danube discharges.

Operational deep sea oceanography

Romanian operational oceanographic system is supposed to answer to:

• Global Monitoring and Environment Security (GMES), having as a main component an integrated system for ocean monitoring and crises management;

• Marine Strategy Framework Directive – water quality monitoring, biodiversity protection, marine living resources protection, environment information system;

• INSPIRE (Infrastructure for Spatial Information in the European Community), the component for waters - WISE (Water Information System for Europe) – coordination of data and information exchange;

• European Maritime Strategy – Green Book regarding Maritime Policies where one can find the need for a European network for observation and data regarding marine environment.

NEW SEAWATCH SYSTEM FOR OCEANOGRAPHIC FORECAST (draft project to be submitted to INNOVATION NORWAY)



-Data and information distribution.

Autonomous oceanographic buoys

List of the parameters provided by the oceanographic buoys

Parameters	Group						
Air pressure	X						
Air temperature	X						
Wind speed	X						
Wind direction	Physical						
Wave height	Physical Contraction of the second se						
Total disposable mass	Biologic						
PAR (Photosynthetic disposable mass)	Biologic						
Humidity	Physical						
Waves period	Physical						
Direction and speed of the surface current	Physical						
Sea surface temperature and salinity	Physical						
Radioactivity	Chimic						
Light attenuation	Physical and biological						
Hydrocarbons	Chimical						
Oxygen	Chimical and biological						
pH	Chimical and biological						
Chlorophyll	Biological						
Nutrients	Chimical and biological						

RIVERWATCH system

The RIVERWATCH system is an integrated, real-time, monitoring and information system providing forecasting, warning and decision support which can improve the resource/emergency management capabilities of river basin authorities, government agencies, industry and others responsible for water supply, power generation, agriculture, waterway transport, waste disposal, public health and water quality.

Main applications of RIVERWATCH include:

Boundary conditions for modeling, forecast Pollution control Flood early warning Irrigation scheduling/operation River navigation Water allocation and drought management Integrated river basin management



Thank you for your attention!