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INGV - coordinator (Istituto Nazionale di Geofisica e Vulcanologia, ITALY)
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ENEA (Ente per le Nuove Tecnologie, l'Energia e l'Ambiente, ITALY)
NCMR (National Center for Marine Research, GREECE)
CLS (Collecte Localisation Satellites, FRANCE)
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, ITALY)
IFM-Kiel (Institut für Meereskunde an der Universität Kiel, GERMANY)
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CNRS.POCT (Centre national del la recherche Scientifique, Pole d'Oceanographie Cotiere de Toulouse, FRANCE)
UAT (University of Athens, GREECE)
IASA (Institute of Accelerating Systems and Applications, GREECE)
IMBC (Institute of Marine Biology of Crete, GREECE)
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CNR-IST (Consiglio Nazionale delle Ricerche, Istituto Sperimentale Talassografico – Messina, ITALY)
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Ulg (Université de Liège, BELGIUM)
IMS (Institute of Marine Sciences, Middle East Technical University, TURKEY)
MHI (Marine Hydrophysical Institute, UKRAINE)
NIOZ (Stichting Nederlands Instituut voor Onderzoek der Zee, NETHERLAND)
IcoD (Euro-Mediterranean Centre on Insular Coastal Dynamics, University of Malta, MALTA)
CNR-ISSIA (Consiglio Nazionale delle Ricerche, Istituto per l'Automazione, ITALY)
AUTh (Aristotle University of Thessaloniki, GREECE)
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AQS mare (Ambiente Qualità Sicurezza mare, ITALY)
DISA-UNITUS (Dipartimento di Scienze Ambientali, Università della Tuscia, ITALY)
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ADFA (Australian Defence Force Academy, AUSTRALIA)

Scientific coordinator: Prof. Nadia Pinardi (INGV, Italy)
e-mail:n.pinardi@ambra.unibo.it

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MFSTEP
Mediterranean Forecasting System:
Toward Environmental Predictions

The **MFSTEP Project** aims at further developing an operational forecasting system for the Mediterranean Sea based upon three main components:
a) the near real time observing system;
b) the numerical forecasting systems at basin scale and in the regional areas;
c) the forecast products dissemination/exploitation system.
The problems to be solved belong to three major categories:
1) Technology developments, connected to the new instrumentation for real time monitoring and the provision of protocols for data dissemination, comprehensive of telecommunication technology and quality control procedures;
2) Scientific developments, connected to the improvement of forecasting numerical models, the design and implementation of data assimilation schemes at different spatial scales, the ecosystem modelling validation/calibration at the coastal and basin scales and the development of data assimilation techniques for biochemical data;
3) Exploitation developments, consisting of software interfaces between forecast products and oil spill modelling, general contaminant dispersion models, relocatable emergency systems, search and rescue models and fish stock observing systems.

MFSTEP project components and WorkPackages

Project Management

WP14 - Data Management
(Resp. IFREMER)

WP15 - Project Management
(Resp. INGV)

The **Observing system** component is built upon the experience of the Initial Observing System for the World Ocean.
It consists of

1) a Voluntary Observing Ship (VOS) system developed with innovative technology to be real time, cost-effective, multidisciplinary and environmentally safe;

2) a moored buoy system designed to serve the real time validation of the basin scale models and the calibration of the ecosystem modelling components;

3) a satellite real time data analysis system using several available and soon to be available satellite observations of the sea surface topography, temperature and colour;

4) a high space-time resolution network of autonomous subsurface profiling floats (Array for Real-Time Geostrophic Oceanography-ARGO);

5) a basin scale glider autonomous vehicle experiment;

6) an Observing System Simulation Experiment (OSSE) activity;

7) a real time data management and delayed mode archiving system.

Objective 1
Improve and expand the existing real time large scale monitoring system *(www.cineca.it/mfspp)*

Objective 2
Add new observing system components in terms of biochemical measurements and new automated technology

WP1 - The Voluntary Observing Ship (VOS) upgrade and extension
(Resp. ENEA)

WP2 - The Mediterranean Multisensor Moored Array-M3A system upgrade and extension
(Resp. NCMR)

WP3 - The Near Real Time satellite data extension
(Resp. CLS)

WP4 - The subsurface profiling float system –MedARGO
(Resp. OGS)

WP5 - New technology for basin wide monitoring: GLIDERS
(Resp. IFM-Kiel)

WP6 - The Observing System Simulation Experiment (OSSE)
(Resp. CNR-ITT)

The **Modelling system** component is composed of:

1) the development of optimal estimation techniques for basin scale and shelf areas forecasts;

2) the 10 days basin scale forecasting at approximately 6 km resolution with initialisation from all available real time data;

3) the 3 days regional forecasting systems (3 km resolution) in four regions: North-Western Mediterranean, Sicilian Strait, Adriatic Sea and Levantine-Aegean Sea (the Adriatic Sea forecasting activities are sponsored by an italian national project - *www.ingv.it/adricosm*);

4) the real time acquisition of operational weather forecasts for the basin scale (40 km resolution and 10 days forecasts), for the regional scales (10 km resolution and 3 days forecasts) and for the shelf scales (4 km resolution and 3 days hindcasts);

5) the development of three dimensional ecosystem models coupled to the forecasting hydrodynamic models and the implementation and test of data assimilation techniques for biochemical variables.

Objective 3
Improve the 10 days basin scale forecast system and demonstrate the feasibility of real time three days forecasts in regional seas

Objective 4
Develop the asynchronous ocean-atmosphere coupling with high resolution atmospheric forcing over regional and shelf areas

Objective 5
Implement the three dimensional ecosystem models coupled to the forecasting system for future predictions of biochemical elements variability

WP7 - Multivariate estimation tools for the basin and regional scales
(Resp. CNRS-POCT)

WP8 - Forecasting at the basin scale
(Resp. INGV)

WP9 - Forecasting at the regional scale and modelling at the shelf scale
(Resp. UAT)

WP10 - Atmospheric forcing and air-sea interaction studies
(Resp. IASA)

WP11 - Nesting ecosystem models from basin to shelf scale
(Resp. UNIBO)

WP12 - Data assimilation for biochemical observations
(Resp. IMBC)

The **end-users component** considers the exploitation of the nowcasting/forecasting products and it develops the near real time interfaces for:

1) oil spill models;

2) floating objects search operations;

3) contaminant fate predictions;

4) relocatable systems for emergency intervention at sea;

5) pelagic fish stock assessment and management in the open sea and Adriatic shelf areas;

6) further dissemination of MFSTEP products through a User oriented Visualisation Tool (UVT);

In addition, an economic value analysis is carried out on the users and the applications developed in the project.

Objective 6
Consolidate the dissemination of forecasts to a wide user community and develop applications with end-users

WP13 - Exploitation of MFSTEP products
(Resp. DFMR)