Project

Regional models for inter-comparison activities in WP9.5

Preliminary version!!

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DOCUMENT

RELEASE SHEET

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Approval			Sign	Date
Endorsement:			Sign	Date
Checked By:	Marina Tonani		Sign	Date
Distribution:				

CHANGE RECORD

Issue/ Rev	Date	Pages	Description of Change	Author	Checked By
V1	14.09.10	all	Draft version	Jenny Nilsson	Marina Tonani
V1	22.02.11	all	BALOP model description.	Jenny Nilsson	

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GLOSSARY AND ABBREVIATIONS

Please refer to the MyOcean Glossary (Error: Reference source not found).

Additional terms:

I MED-MFC V2 CALIBRATION/VALIDATION AND QUALITY

Overview

After the MyO WP9 Cal/Val meeting in Bologna 15-16 September 2009, an electronic questionnaire was sent to the collaborating institutes regarding the 14 regional ocean models that will participate in the model inter-comparison activities in the Med_MFC (cf. Tab. 1).

A detailed description of the V2 CalVal activities is provided in Section II. An overview of model domain overlaps and in-situ data distribution is given in Section II, and examples of diagnostics and possible inter-comparisons are presented in Section IV. Detailed summaries of the participating regional ocean forecasting systems are offered in Section V.

Table 1: List of partners in alphabetical order and the regional ocean forecasting systems.

	Institution	Country	Model
1	CNR-IAMC	Italy	SCRMFS
2	CNR-IAMC	Italy	WMRMFS
3	CSIC	Spain	BALOP
4	HCMR	Greece	POSEIDON
5	IASA-UAT	Greece	ALERMO
6	IFREMER	France	PREVIMER-MENOR
7	IMS-METU	Turkey	NLEV
8	INGV	Italy	AFS
9	IOLR	Israel	SELIPS
10	NIB-MBS	Slovenia	NAPOM
11	OC-UCY	Cyprus	CYCOFOS
12	PUERTOS	Spain	ESEOMED
13	UMT-IOI-POU	Malta	ROSARIO 9620

Objectives: ***Task 9.5.3 V2 Cal/Val system***

Cal/Val 2 –Create a network of regional ocean forecasting centers that produce real time information, which is passed to to the central Med_MFC operational center at INGV. Protocols developed for the MERSEA Classes will be applied in the NRT model validation and model inter-comparisons.

Description of Work (DoW) for WP9 during V2

The V2 system will be based upon a distributed MERSEA Class 1,2,3 and 4 evaluation protocol. The different model products will be intercompared following Class 1,2,3 standards and coincidental observational data for the different subregions. Each participating system will have to install an ftp server data dissemination protocol (or THREDDS-DODS) and develop software for the calculation of the Class 1,2,3 indices.

II DETAILED DESCRIPTION OF V2 CAL/VAL ACTIVITIES IN WP9

II.1 Introduction

One of the very fundamental questions a forecaster should ask him/herself is whether the results from the analysis/forecast are good enough or not. The answer is given by a combination of objective verification scores and user satisfaction. The infrastructure and the scores that are necessary in order to answer the forecaster's question will be provided within the Cal/Val system, that is now under development for MyOcean. In general, the verification scores evaluate three aspects of the analysis/forecast procedure:

Consistency: Verifying that the system outputs are consistent with the current knowledge of the ocean circulation and climatologies.

Quality: Quantifying the differences between the system best results (analyses) and the sea truth, as estimated from observations, preferably using independent (not assimilated) observations.

Performance (or ***Accuracy***): Quantifying the short term forecast capacity of each system, i.e. answering the questions: Do we perform better than persistency? Do we perform better than climatology?

This activity will result in 4 types of diagnostics called *Classes*; the definition and utility of the Class 1-4 metrics are described in subsection II.2.

II.2 Description of V2 activities

During the WP9-meeting in September 2009 it was suggested, in accordance with the DoW, that the V2 Cal/Val activities would involve computation of Class 1-3 diagnostics on a daily basis, and that the results would be made available online via the "CalVal web page": http://gnoo.bo.ingv.it/myocean/calval

However, production of all these diagnostics is presently unfeasible due to the excess storage needs, so it was suggested at the WP9-meeting in Rome 29-09-2010 that we would begin with producing Class 2 diagnostics. These would be calculated at the in-situ locations that are presently included in the Cal/Val V1 activities (Class 4 metrics). Model domain overlaps with the in-situ moorings will be detailed in Section III, and possible model inter-comparisons will be suggested in Section IV.

Producing Class 1 diagnostics imply daily downloading and processing of large volumes of regional (3D) model data, and at this point it is unclear how this activity would be realized. Further planning is needed.

The Class 3 diagnostics are related to parameters that can be calculated from model output fields such as heat or mass transports, hence values that not given directly by the modelled fields (i.e. temperature, salinity, sea level, current fields).

II.3 MERSEA Classes

II.3.1 Class 1 metrics

Class 1 metrics aim to provide a general overview of the ocean and sea ice dynamics supplied by the different systems.

- Ocean model variables are interpolated from native grids to the Med_MFC standard grid.

- Could also be used for performance assessment; i.e., comparing model forecast and hindcast (reanalysis) on the Class 1 grid.

- Ancillary information need to be provided. Ideally, climatologies should be provided for each Class 1 variable.

II.3.2 Class 2 metrics

Class 2 metrics are complementary tools to Class 1, and designed as virtual moorings or sections into the model domain.

- Class 2 virtual moorings should be located at in-situ mooring sites.

- Class 2 sections are recommended along existing XBT and glider sections.

- For consistency assessment, Class 2 section should be associated with similar values from climatologies (SeaDataNet).

- Class 2 sections should be privileged for model output inter-comparison at dedicated locations.

II.3.3 Class 3 metrics

Class3 diagnostics are designed to check the model (or system) behaviour through the physical point of view (e.g. mass and heat transports across straits). Furthermore, class 3 metrics are physical quantities computed using the ocean model variables that can not be derived from Class 1 or Class 2 metrics.

- Class 3 metrics need to be computed inline, during the model run, on the native grid, every time step.

- Typical Class 3 diagnostics are integrated quantities such as daily mass transport through chosen sections. NB, these sections can be located at Class 2 positions, hereby facilitating the accuracy assessment of model variables and local dynamics.

II.3.4 Class 4 metrics

Class 4 metrics are mainly devoted to model-observation comparisons. At present, independent is-situ observations (~ 70 different moorings + drifters and gliders) are downloaded operationally on a daily basis from the WP9.5-partners. These data are converted to common format and stored in a MySQL data base and thereafter used for NRT validation of Med-MFC-Currents (temperature, salinity, sea level and currents). This system was created during the V1 CalVal activities.

III MODEL DOMAIN OVERLAPS

The model domains in Fig. 1 are color-coded as: SCRMFS (green), WMRMFS (purple), BALOP (red), Poseidon (turquoise), Alermo (white), Previmer-MENOR (turquoise), NLEV (purple), AFS (red), Selips (red), Napom (yellow), Cycofos (yellow), Eseomed (white), Rosario9620 (white), and Med_MFC-Currents (orange).

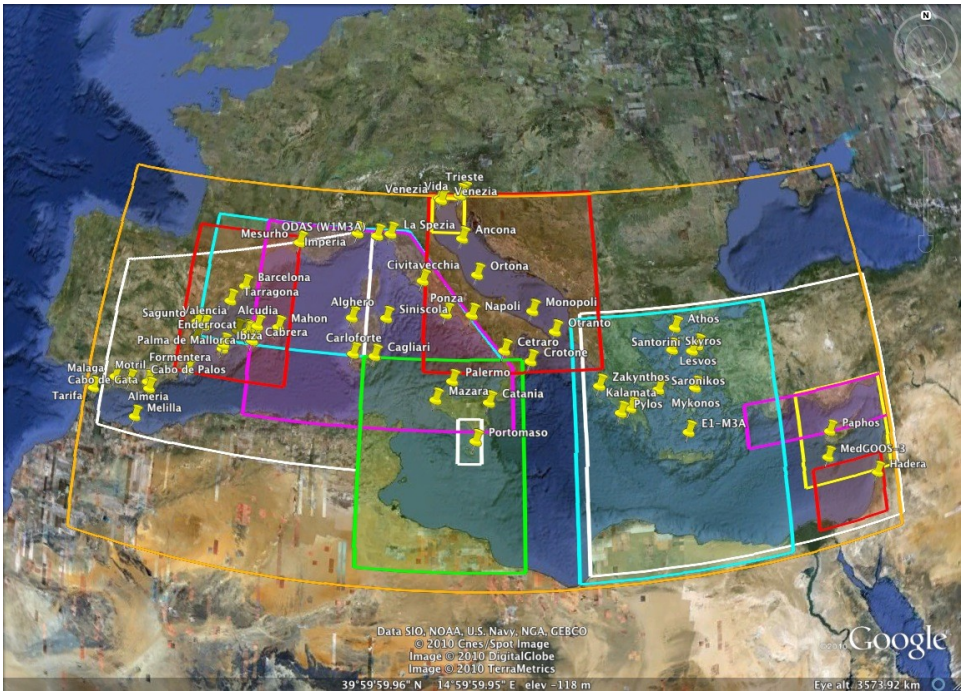


Figure 1: Regional model domain overlap with in-situ locations and the Med_MFC model domain.

The 13 sub-regions (cf. Fig. 2), that are applied in particular for the Med_MFC data assimilation, could be regarded as a starting point when new sub-regions (more suitable for the model validation activities) are to be defined. It could also be possible to have several sets of sub-regions, hereby allowing studies of processes on both larger and smaller scales in the Mediterranean basin. It could also be possible (and advisable) to use different sub-regions for biological and physical parameters. ***Suggestions are welcome!***

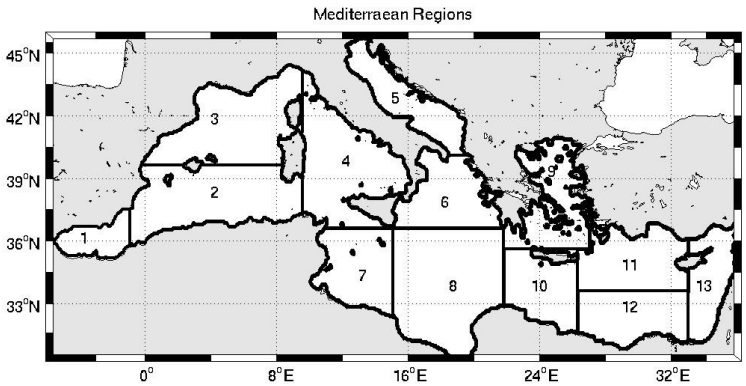


Figure 2: The standard 13 subregions in the Mediterranean Sea.

IV DIAGNOSTICS AND POSSIBLE INTER-COMPARISONS

IV.1 Sea level inter-comparisons

Table 2: Matches of sea level insitu locations (23) and model domains.

M1=SCRMFS, M2=WMRMFS, M3=BALOP, M4=Poseidon, M5=Alermo, M6=Previmer-MENOR, M7=NLEV, M8=AFS, M9=Selips, M10=Napom, M11=Cycofos, M12=Eseomed, and M13=Rosario9620.

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
Carloforte		×										×	
Imperia		×				×						×	
Napoli		×				×		×					
Otranto								×					
Trieste								×		×			
Venezia								×		×			
Paphos					×						×		
Alcudia		×	×			×						×	
Algeciras												×	
Almeria												×	
Barcelona			×			×						×	
Formentera			×									×	
Gandia			×									×	
Ibiza			×									×	
Mahon		×	×			×						×	
Malaga												×	
Melilla												×	
Motril												×	
P. d M.			×			×						×	
Sagunto			×									×	
Tarifa													
Valencia			×									×	
Portmaso	×												×

- For the Poseidon, NLEV, Selips models there are no sea-level matches. Should virtual SL mooring be inferred within these domains? Where? Suggestions?

IV.2 Temperature inter-comparisons

Table 3: Matches of temperature insitu locations (37) and model domains.
M1=SCRMFS, M2=WMRMFS, M3=BALOP, M4=Poseidon, M5=Alermo, M6=Previmer-MENOR, M7=NLEV, M8=AFS, M9=Selips, M10=Napom, M11=Cycofos, M12=Eseomed, and M13=Rosario9620.

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
ODAS		×				×							
Cabrera			×									×	
Enderrocat			×			×						×	
Athos				×	×								
E1M3A				×	×								
Kalamata				×	×								
Lesvos				×	×								
Mykonos				×	×								
Pylos				×	×								
Santorini				×	×								
Saronikos				×	×								
Skyros				×	×								
Zakynthos				×	×								
Mesurho		×	×			×						×	
Alghero		×				×						×	
Ancona								×					
Cagliari	×	×											
Catania	×	×											
Cetraro	×	×						×					

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
Civita-vecchia		×				×							
Crotone								×					
La Spezia		×				×							
Mazara	×	×											
Monopoli								×					
Ortona								×					
Palermo	×	×				×							
Ponza		×				×		×					
Siniscola		×											
Venezia								×		×			
Vida								×		×			
Medgoos-3					×				×		×		
Paphos					×						×		
C d Gata												×	
C d Palos												×	
Dragonera			×			×						×	
Tarragona			×			×						×	
Valencia			×			×						×	
Portomaso	×												×

- The NLEV model has no temperature matches. Should virtual T mooring be inferred for this domain Where? Suggestions?

- Vertical profiles are available for Athos, Cabrera*, E1M3A, Enderrocat, MedGOOS-3, ODAS and Pylos.

*Out of order since November 2010.

IV.3 Salinity inter-comparisons

Table 4: Matches of salinity insitu locations (20) and model domains.
M1=SCRMFS, M2=WMRMFS, M3=BALOP, M4=Poseidon, M5=Alermo, M6=Previmer-MENOR, M7=NLEV, M8=AFS, M9=Selips, M10=Napom, M11=Cycofos, M12=Eseomed, and M13=Rosario9620.

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
ODAS		×				×							
Cabrera			×									×	
Enderrocat			×			×						×	
Athos				×	×								
E1M3A				×	×								
Kalamata				×	×								
Lesvos				×	×								
Mykonos				×	×								
Pylos				×	×								
Santorini				×	×								
Saronikos				×	×								
Skyros				×	×								
Zakynthos				×	×								
Mesurho		×	×			×						×	
Vida								×		×			
Medgoos-3					×				×		×		
C d Gata												×	
C d Palos												×	
Tarragona			×			×						×	
Valencia			×			×						×	

- SCRMFS, NLEV and Rosario9620 have no salinity matches. Should virtual S mooring be inferred for these domains? Where?

- Vertical profiles are available for Athos, E1M3A, MedGOOS-3, ODAS and Pylos.

IV.4 Velocity inter-comparisons

Table 5: Matches of velocity insitu locations (10) and model domains.
M1=SCRMFS, M2=WMRMFS, M3=BALOP, M4=Poseidon, M5=Alermo, M6=Previmer-MENOR, M7=NLEV, M8=AFS, M9=Selips, M10=Napom, M11=Cycofos, M12=Eseomed, and M13=Rosario9620.

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
Saronikos				×	×								
Skyros				×	×								
Zakynthos				×	×								
Hadera					×				×				
Vida								×		×			
C d Gata												×	
C d Palos												×	
Dragonera			×			×						×	
Tarragona			×			×						×	
Valencia			×			×						×	

- The SCRMFS, WMRMFS, NLEV, CYCOFOS and Rosario9620 models have no velocity matches. Should virtual UV moorings be inferred for these domains? Where? Suggestions?

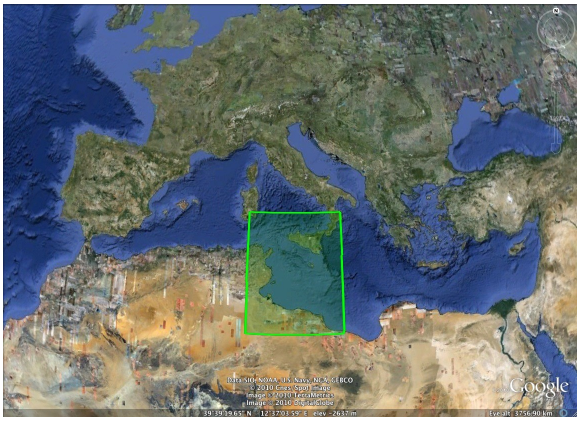
- Vertical profiles are available for Hadera and Vida.

V PARTICIPANTS IN THE REGIONAL MODEL INTER-COMPARISONS

V.1 CNR-IAMC

Contact person: Roberto Sorgente.
Name of forecasting system: SCRMFS.
Location: The Sicily Channel.

Brief overview of the system:
The Sicilian Channel Regional Model Forecasting System (SCRMFS) produces, daily, 5-day forecasts of the marine circulation (currents and other relevant oceanographic variables, such as salinity and temperature) through a nested eddy resolving numerical model implemented in the Sicilian Channel area.



Model variables:

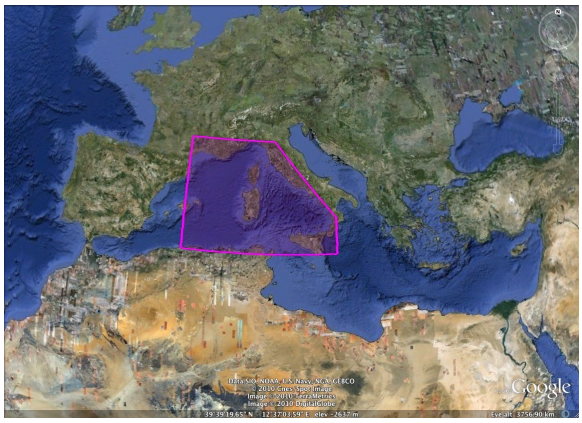
1. Temperature,C°.
2. Salinity, psu.
3. Free_surface_elevation, m.
4. Eastward_sea_water_velocity,ms^{-1}.

Lateral model boundaries:
LONI:9-00-00E, LONF: 17-00-00E,
LATI: 31-00-00N, LATF:39-30-00N.
Spatial resolution: 1/32°
Horizontal grid: Finite differences.
Vertical coverage: From 0 to 4000 meters.
Vertical grid: Sigma grid.
Number of vertical levels: 30.
Variable depth bottom layers: Yes.
Min/Max differences in vertical resolution: Min dz: 0.007 m, Max dz: 180 m.
Model time step: 120s.
Frequency of model output (averages/snapshots): 1 hour, saved as 24-h averages.
Length of forecast: 5 days.
Frequency of forecast release: Daily.
Starting time of forecasting production: 07:00:00 AM.
Time necessary to run the system: 5 hours.
Forecasts available for downloading: 12:00:00 PM.
Analyses: No.
Format: NetCDF.
Forecasting system operational since: 2004.
Access: Not yet.
Link: http://www.imc-it.org/progetti/mfstep/mfs_SCRMresults.htm

V.2 CNR-IAMC

Contact person: Antonio Olita.
Name of forecasting system: WMRMFS
Location: The Western Mediterranean Sea

Brief overview of the system:
The Western Mediterranean Regional Model Forecasting System (WMRMFS) produces daily 5-day forecast of marine circulation (currents and other relevant oceanographic variables, such as salinity and temperature) through a nested eddy resolving numerical model implemented in the Western Mediterranean area. The area includes Algerian Basin, Sardinian Sea and Channel, Ligurian Sea and Thyrrenian Sea.



Model variables:

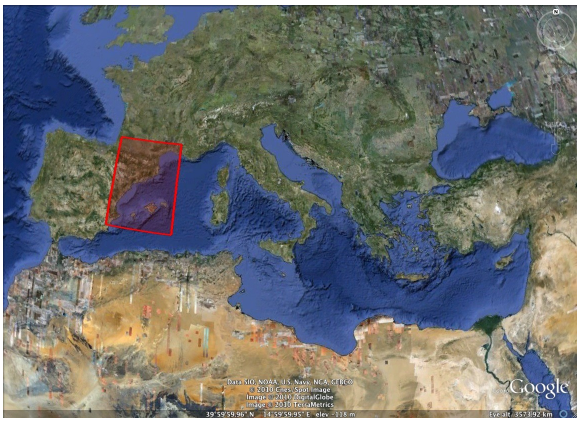
1. Temperature, C°
2. Salinity, psu
3. Eastward_sea_water_velocity, ms^{-1}
4. Northward_sea_water_velocity, ms^{-1}
5. Free_surface_elevation, m^{-1}

Lateral model boundaries:
LONI:3-00-00E, LONF:16-30-00E,
LATI: 36-42-00N, LATF:44-30-00 N.
Spatial resolution: 1/32°.
Horizontal grid: Finite differences.
Vertical coverage: From 0 to 4000 meters.
Vertical grid: Sigma grid.
Number of vertical levels: 30.
Variable depth bottom layers: Yes.
Min/Max differences in vertical resolution: Min dz: 0.007m, Max dz: 180m.
Model time step: 120 s.
Frequency of model output (averages/snapshots):
1hour, saved as 24-h averages.
Length of forecast: 5 days.
Frequency of forecast release: Daily.
Starting time of forecasting production: 03:00:00 AM.
Time necessary to run the system: 6 hours.
Forecasts available for downloading: 09:00:00 AM
Analyses: No.
Format: NetCDF.
Forecasting system operational since: 2006.
Access: Not yet.
Link:
http://www.sos-bocchedibonifacio.eu/index.php/Top-Content/western-mediterranean.html

V.3 CSIC

Contact person: Guillermo Vizoso.
Name of forecasting system: BALOP
Location: Balearic Islands.

Brief overview of the system:
The Imedea prediction system of the Balearic Sea is in operation since summer 2007. The system comprises Western Mediterranean basin scale forecasts of the Mediterranean Forecasting System (MFS) and ESEOO System, sub-basin scale high-resolution (1km) forecasts utilizing the Regional Ocean Modeling System (ROMS), and atmospheric forecasts of the Spanish National Institute of Meteorology (AEMET). The forecast range of both MFS and ROMS is four days starting one day prior to the actual date. ROMS is initialised (from a daily restart) and one-way nested in MFS and driven by AEMET atmospheric forcing. Presently, HOPS is capable to assimilate, using Optimum Interpolation, in near-real time temperature, salinity, and velocity data from IMEDEA and Puertos del Estado buoys (surface temperature, salinity and velocity) and IMEDEA gliders.
All forecasts are displayed on this web page and updated every day and the model NetCDF output is available through the Imedea THREDDS Data Server.



Model variables:
1. 3D U, V, W velocity;
2. 2D U, V velocity;
3. free surface;
4. T, S, fluxes

Lateral model boundaries: OBC from MFS
LONI: 1º W, LONF: 5º E, LATI: 38ºN, LATF: 44ºN
Spatial resolution: 1 km
Horizontal grid: Arakawa C-grid
Vertical coverage:
Vertical grid: terrain-following S-coordinate
Number of vertical levels: 30
Variable depth bottom layers: yes
Model time step: 180 s
Frequency of model output (averages/snapshots): Snapshots 3h
Length of forecast: 72 h (-24 -> 72h)
Frequency of forecast release: 1/day
Starting time of forecasting production: 6 AM
Time necessary to run the system: 90 min
Forecasts available for downloading: About 7.30 – 8.00 AM
Analyses: No
Format: NetCDF -CF
Forecasting system operational since: Pre-operational since summer 2009.
Link:
http://imedea.uib-csic.es/tmoos/modelos/index.php?seccion=modelos&op_modelo=roms
Thredds:
http://dataserver.imedea.uib-csic.es:8080/thredds/catalog/RomsPreOperational/Out/his/catalog.html

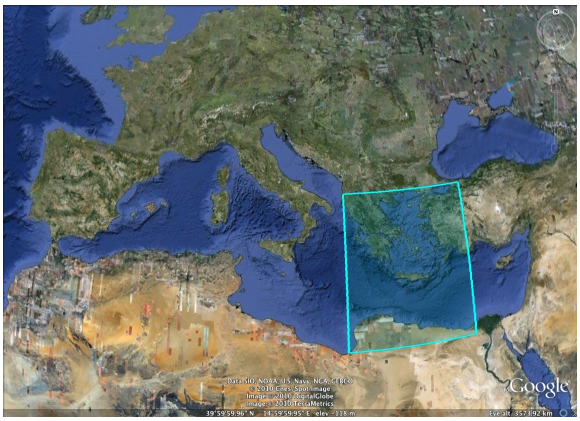
V.4 HCMR

Contact person: Gerasimos Korres.
Name of forecasting system: POSEIDON.
Location: The Aegan Sea.

Brief overview of the system:
The Aegean Sea hydrodynamic model is based on the Princeton Ocean model (POM) and was initially developed as part of the Poseidon-I system (Nittis et al., 2006 ; Korres et al., 2002). POM is a primitive equations free surface ocean model which operates under the hydrostatic and Boussinesq approximations. The model equations are written in sigma-coordinates and discretized using the centered second-order finite differences approximation in a staggered "Arakawa C-grid" with a numerical scheme that conserves mass and energy.
The model domain covers the geographical area 19.5°E – 30°E and 30.4°N – 41°N with a horizontal resolution of 1/30° and 24 sigma layers along the vertical with a logarithmic distribution near the surface and the bottom. The model includes parameterization of the main Greek rivers (Axios, Aliakmonas, Nestos, Evros) while the inflow/outflow at the Dardanelles is treated with open boundary techniques. The Aegean Sea model is forced with hourly surface fluxes of momentum, heat and water provided by the Poseidon - ETA high resolution (1/20°) regional atmospheric model issuing forecasts for 5 days ahead.
Currently there are three different versions of the Aegean Sea model:
Version V1: Boundary (daily) and initial conditions (weekly) from POSEIDON Mediterranean 1/10 x 1/10 model.

Version V2: Boundary (daily) and initial conditions (weekly) from MFS Med SYS2b 1/16 x 1/16 model.

Version V3: Boundary (daily) from MFS Med SYS2b 1/16 x 1/16 model. This version uses data assimilation based on local SEEK filter to produce model analysis on a weekly basis.



Model variables:
1. 3D temperature fields,
2. 3D salinity fields,
3. 3D circulation fields.
4. 2D surface elevation.

Lateral model boundaries:
19.5°E -30°E; 30.4°N-41°N.
Spatial resolution: 1/30°×1/30°.
One way nested with the Med. SYS2b model.
Horizontal grid: Orthogonal.
WGS84 geographical projection.
Vertical coverage: Minimum depth=25m, Maximum depth=4755m
Vertical grid: Sigma coordinates.
Number of vertical levels: 25 levels with logarithmic distribution near the surface and the bottom.
Variable depth bottom layers: Yes.
Min/Max differences in vertical resolution: Vertical resolution ranges from to 0.17m to 250m
Model time step: Internal time step: 360 sec. External time step: 5 sec.
Frequency of model output (averages/snapshots): Every 6 hours – snapshots.
Length of forecast: 5 days.
Frequency of forecast release: Daily.
Starting time of forecasting production:

System V1: System V2: 05:30, System V3: 12:30
Time necessary to run the system: Depends on system version. For model integration alone (5 days) is approximately 1h 10m. Analysis production (Version V3) requires 10 mins (on 28 procs). VIFOP package (for versions V1 & V2) requires XX.
Forecasts available for downloading: Yes.
Analyses: Weekly analysis available for system version V3.
Format: binary (can be transformed to netcdf).
Forecasting system operational since: Version V1 is operational since 10 Jan 2008. Version V2 is operational since 01 Jan 2008, Version V3 is operational since 10 Feb 2009.
Access: Not yet.
Link: http://poseidon.hcmr.gr/

V.5 IASA-UAT

Contact person: Anneta Mantziafou, Gkanasos Thanos.
Name of forecasting system: ALERMO.
Location: The Eastern Mediterranean Sea.

Brief overview of the system:
General information: ALERMO provides daily high resolution (2 km) 5-day forecast of temperature, salinity, current and sea level elevation for the Aegean and Levantine basins. The forecasting model is based on the POM model and nested in Mediterranean Ocean Forecast MFS-Sys2b.
Processing information: Each day we perform a simulation starting 7 days prior to the initial day of forecast (at day J-7). VIFOP is used to initialize the model from the Mediterranean OGCM analysis. Sea Level Anomaly is assimilated (SOFA) in filter mode using a daily assimilation cycle during the 7 days period whereas analyses of the Skiron atmospheric outputs are used for the surface boundary conditions. Then the obtained analysis field (at J0) constitutes the initial condition for the next 5-days forecast (days J0 to J5).

Model variables:
1. eastward_sea_water_velocity,m s-1,CF
2. northward_sea_water_velocity,m s-1,CF
3. sea_surface_height_above_sea_level,m,CF
4. sea_water_potential_temperature,K,CF
5. sea_water_salinity,1e-3,CF

Lateral model boundaries:
LONI:20.0E, LONF:36.4E,
LATI:30.7N, LATF: 41.2N.

Spatial resolution: 2 km.
Horizontal grid: Finite differences.
Vertical coverage: From 0 to 4500 meters.
Vertical grid: Sigma grid.
Number of vertical levels: 25.
Variable depth bottom layers: Yes.
Min/Max differences in vertical resolution: Min dz:0.024m, Max dz=280m.
Model time step: Internal= 270sec, external= 3 sec.
Frequency of model output (averages/snapshots): Daily averages.
Length of forecast: 5 days.
Frequency of forecast release: Daily.
Starting time of forecasting production: 12:00:00 AM.
Time necessary to run the system: 6.5 hours.
Forecasts available for downloading: 04:15:00 PM.
Analyses: No.
Format: NetCDF.
Forecasting system operational since: Since 2009-02-01.
Access: Not yet.
Link: http://www.oc.phys.uoa.gr/

V.6 IFREMER

Contact person: Pierre Garreau.
Name of forecasting system: PREVIMER-MENOR
Location: North-western Mediterranean Sea.

Brief overview of the system:
Menor is a configuration of a 3D primitives equations and free surface model providing temperature, salinity and velocities.Th e Model is forced by Meteorological model and river outputs. Southern boundary condition is provided by MOON/MFS OGCM. The model is eddy resolving. Statistics about sea surface temperature prediction is on progress.

Model variables:

1. Sea surface elevation
2. 3D U,V fields
3. 3D temperature fields
4. 3D salinity fields

Lateral model boundaries:
LONI: 0°00'00", LONF: 16°00'00"E,
LATI: 39°30'00"N, LATF: 44°30'00"N.
Only a southern ocean boundary.
Spatial resolution: 1.2 km.
Horizontal grid: Finite differences.
Vertical coverage: XXXXX.

Vertical grid: Sigma grid.
Number of vertical levels: 30.
Variable depth bottom layers: Yes.
Min/Max differences in vertical resolution: Min dz=0.1m Max dz=150m.
Model time step: 75s.
Frequency of model output (averages/snapshots): 3h snapshots.
Length of forecast: 7 days.
Frequency of forecast release: Daily
Starting time of forecasting production: 6h15 U.T.
Time necessary to run the system: 1 hour.
Forecasts available for downloading: 9h00 U.T.
Analyses: No.
Format: NetCDF.
Forecasting system operational since: 2005.
Access: Not yet.
Link: http://www.previmer.org/en

V.7 IMS-METU

Contact person: Emin Oszoy.
Name of forecasting system: Northern Levantine Sea Forecast System (NLEV).
Location: The Levantine.

Brief overview of the system:
The code has been updated to use pom2k options such as the advection schemes and the surface water fluxes. Surface water volume fluxes including hourly E-P and climatological fresh water from 6 rivers on the coast are specified as source/sink terms in mass and salt conservation. Assimilation of daily SST data has been added in this version. Some stability problems with river inputs forced us to leave this as an option, while a solution to the problem is being seeked. The forecasting system is presently going through a transition to the V3 system based on the ROMS, which we hope to complete soon.

Model variables:

1. baroclinic_eastward_sea_water_velocity,m s-1,CF
2. baroclinic_northward_sea_water_velocity,m s-1,CF
3. barotropic_eastward_sea_water_velocity,m s-1,CF
4. downward_eastward_momentum_flux_in_air,Pa,CF
5. downward_heat_flux_in_air,W m-2,CF
6. downward_northward_momentum_flux_in_air,Pa,CF
7. sea_surface_height_above_sea_level,m,CF
8. sea_water_salinity,1e-3,CF
9. sea_water_temperature,K,CF
10. surface_net_downward_shortwave_flux,W m-2,CF
11. barotropic_northward_sea_water_velocity,m s-1,CF

Lateral model boundaries:
LONI: 28.145E, LONF: 36.245E, LATI: 35.120N, LATF: 36.929N.

Spatial resolution: 1.35 km in both directions.
Horizontal grid: Finite differences.
Vertical coverage: From 0 to -5000 meters.
Vertical grid: Sigma grid.
Number of vertical levels: 30.
Variable depth bottom layers: No.
Min/Max differences in vertical resolution: min dz: 0.3m, max dz: 250m.
Model time step: 3s.
Frequency of model output (averages/snapshots): 3 hr snapshots.
Length of forecast: 5 days.
Frequency of forecast release: Daily.
Starting time of forecasting production: 7pm EEST
Time necessary to run the system: 10 hours.
Forecasts available for downloading: 11am EEST.
Analyses: Yes.
Format: NetCDF.
Forecasting system operational since: Since 2009-02-19.
Access: Not yet.
Link: http://144.122.146.136/klevant

V.8 INGV

Contact person: Antonio Guarnieri.
Name of forecasting system: Adriatic forecasting system (AFS).
Location: The Adriatic Sea.

Brief overview of the system:
The POM model has been implemented in the Adriatic Sea (this implementation is called AREG: Adriatic REGional model), and its domain encompasses the whole Adriatic basin and extends south of the Otranto channel into the northern Ionian Sea, where the only open boundary is located. Grid points located over the Thyrrenian Sea have been masked out. The AREG grid has a horizontal resolution of about 1/45° (about 2.2 km), on 31 σ-layers. The bottom topography was obtained from the U.S. Navy 1/60° bathymetric database DBDB1, by bilinear interpolation of the depth data into the model grid. All the depths shallower than 10 metres have been flattened to 10.

Model variables:
1. SSH, 3D T, S, U, V
2. Evaporation rate
3. net surface heat flux
4. sensible heat flux
5. short wave heat flux
6. long wave heat flux backward
7. latent heat of evaporation
8. 2D wind stress

Lateral model boundaries:
LONI: 12.20, LONF: 20.78E,

LATI: 39, LATF: 45.82N.
Spatial resolution: 1/45° (about 2.2 km).
Horizontal grid:
Vertical coverage: surface to 2350m.
Vertical grid: Sigma grid.
Number of vertical levels: 32 levels.
Variable depth bottom layers: No.
Min/Max differences in vertical resolution: Variable depending on bathymetry .
Model time step: Model time step: 400 s for internal time step, 4 for external.
Frequency of model output (averages/snapshots): Daily and hourly averages.
Length of forecast: 9 days.
Frequency of forecast release: Daily.
Starting time of forecasting production: Same as Med_MFC-Currents.
Time necessary to run the system: 5 minutes per simulated day.
Forecasts available for downloading: At 3 am.
Analyses: Yes. At 3 am.
Format: netCDF (CF 1.0 convention).
Forecasting system operational since: April 2005.
Access: Not yet.
Link: http://gnoo.bo.ingv.it/afs/dailysys_des.htm

V.9 IOLR

Contact person: Ron Goldman.
Name of forecasting system: SELIPS
Location: The Levantine Basin.

Brief overview of the system:
General information: SELIPS provide daily high resolution 4 day forecast of temperature, salinity, current and sea level elevation for the southeastern corner of the Levantine basin. The forecasting model is based on the POM model and nested in ALERMO.
Processing information:The Princeton ocean model (POM) is used to create a 4 day forecast starting from either a previous model run, or initial condition obtained from the ALREMO system and passed through a variational initialization process to minimize the effect of interpolation. The POM then runs using the ALERMO forecast datasets as open radiative boundary conditions for temperature, salinity, and currents. POM also requires fields of heat, momentum and freshwater flux at the surface, these are calculated from the SKIRON atmospheric forecast fields. In order to improve the model results data is being assimilated into the model: analysed fields of SST are obtained from GOS 1/16 deg SST from Lia and used to correct the atmospheric fluxes. Temperature and salinity observations made by ARGO floats and CTD cast are used to correct the model initial condition using a 3DVar software package named OceanVar.

Model variables:
1. Eastward_sea_water_velocity,ms-1,CF

2. Northward_sea_water_velocity,m s-1,CF
3. Sea_floor_depth_below_sea_level,m,CF
4. Sea_surface_height_above_sea_level,m,CF
5. Sea_water_potential_temperature,K,CF
6. Sea_water_salinity,1e-3,CF

Lateral model boundaries:
LONI: 31.5E, LONF: 35.44E,
LATI: 31.05N, LATF: 33.7N.
Spatial resolution: 0.95 km.
Horizontal grid: Finite differences.
Vertical coverage: From 0 to -2700 meters.
Vertical grid: Sigma grid.
Number of vertical levels: 27.
Variable depth bottom layers: No.
Min/Max differences in vertical resolution: Min dz:0.01m, Max dz:153m.
Model time step: External mode: 2sec, internal mode: 0.05s.
Frequency of model output (averages/snapshots): 3 hour snapshots. (or 6? it is not clear in the questionnaire)
Length of forecast: 96 hours.
Frequency of forecast release: Daily.
Starting time of forecasting production: 17:30 GMT.
Time necessary to run the system: 6.5 hours.
Forecasts available for downloading: 1:30 GMT.
Analyses: No.
Format: NetCDF.
Forecasting system operational since: Since 2008-12-02.
Access: Not yet.
Link: http://isramar.ocean.org.il/isramar2009/selips

V.10 NIB-MBS

Contact person: Boris Petelin.
Name of forecasting system: NAPOM
Location: The Adriatic sea.

Brief overview of the system:
- North Adriatic Princeton Ocean Model (NAPOM).
- Initial and boundary conditions from Adriatic Sea Forecasting System (INGV Bologna).
- Meteorological forcing from model ALADIN (The Environmental Agency of the Republic of Slovenia – ARSO).
- No quality/accuracy/calibration info produced yet.

Model variables:

1. Sea_surface_elevation, m
2. Eastward_sea_water_velocity, m s-1
3. Northward_sea_water_velocity, m s-1
4. Sea_temperature, degrees Celsius
5. Sea_salinity, PSU

Lateral model boundaries:
LONI: 12-12-00E, LONF: 13-54-36E,
LATI: 44-28-41N, LATF: 45-49-12N.
Spatial resolution: 600 m.
Horizontal grid: Finite differences.
Vertical coverage: from 2 to 57 meters.
Vertical grid: Sigma grid.
Number of vertical levels: 11.
Variable depth bottom layers: Yes.
Min/Max differences in vertical resolution: MIn dz: 0.12m, Max dz: 5.78m.
Model time step: dte = 9 seconds, dti = 90 seconds.
Frequency of model output (averages/snapshots): Hourly snapshots.
Length of forecast: 3 days.
Frequency of forecast release: Daily.
Starting time of forecasting production: 01:00:00 AM.
Time necessary to run the system: 30 minutes.
Forecasts available for downloading: at 10:00 AM.
Analyses: No.
Format: NetCDF.
Forecasting system operational since: It will be operational soon (said in January 2010).
Access: Not yet.
Link:

V.11 OC-UCY

Contact person: Daniel Hayes.
Name of forecasting system: Cyprus Coastal Observing and Forecasting System (CYCOFOS).
Location: The Levantine Basin.

Brief overview of the system:
General information: Operational forecast products, runs daily, 4.5 days forecast using U of Athens SKIRON high frequency meteorological forcing, hourly, 0.05 deg resolution and U of Athens ALERMO for ocean initialization.
Description of observation methods/instruments: Implementation of POM in Eastern Levantine Basin by the Cyprus Oceanography Center, University of Cyprus.
Quality / Accuracy / Calibration information: The CYCOFOS flow model periodically is validated using remote sensing and in-situ observations. For validations look at references (Zodiats et al. 2008).

Model variables:

1. Eastward_sea_water_velocity,m s-1,CF
2. Northward_sea_water_velocity,m s-1,CF
3. Sea_floor_depth_below_sea_level,m,CF
4. Sea_surface_height_above_geoid,m,CF
5. Sea_water_potential_temperature,K,CF
6. Sea_water_salinity,1e-3,CF

Lateral model boundaries:
LONI: 31.0E, LONF: 36.0E,
LATI: 33.0N, LATF: 37.0N.
Spatial resolution: 1 km.
Horizontal grid: Finite differences.
Vertical coverage: From 0 to -2700 meters.
Vertical grid: Sigma grid.
Number of vertical levels: 24.
Variable depth bottom layers: No.
Min/Max differences in vertical resolution:
Min dz: 1.838237E-03 sigma, Max dz: .0588 sigma.
Model time step: 2/120 seconds external/internal modes.
Frequency of model output (averages/snapshots):
6 and 24 hour averages, as well as daily snapshots.
Length of forecast: 4.5 days.
Frequency of forecast release: Daily.
Starting time of forecasting production: 13:20 GMT.
Time necessary to run the system: 2 hours.
Forecasts available for downloading: 15:20 GMT.
Analyses: No.
Format: NetCDF.
Forecasting system operational since: Since 2008-02-11.
Access: Not yet.
Link: http://www.oceanography.ucy.ac.cy/cycofos/bulletin.html

V.12 Puertos del Estado

Contact person: Marcos García.
Name of forecasting system: ESEOMED.
Location: The Western Mediterranean Sea.

Brief overview of the system:
3D rigid-lid baroclinic model; primitive eq solved with Finite differences and a Z-vertical coordinate.

Model variables:

1. 3D Currents
2. 3D Temperature
3. 3D Salinity

Lateral model boundaries:
LONI:-5E LONF: 9E, LATI: 35N LATF: 44.5N.
Spatial resolution: 1/20º x 1/20º.
Horizontal grid: Finite differences .
Vertical coverage: 6 to 2800 m.
Vertical grid: Z-vertical coordinate.
Number of vertical levels: 30.
Variable depth bottom layers: No.
Min/Max differences in vertical resolution: The ESEOMED grid has 32 non uniform vertical levels concentrated towards the surface, with the top layer thickness being 6 m and increasing smoothly to 346 m at the bottom.
Model time step: 180s.
Frequency of model output (averages/snapshots):
Hourly (availability: T-24h – T+72h). Daily means of 3-D fields of temperature, salinity and currents. Also provided hourly mean outputs for single level parameters (surface currents, SST and Sea Surface Height).
Length of forecast: 72 hours.
Frequency of forecast release: Daily.
Starting time of forecasting production: Run start time pending on availability of forcing data. Usually around 9:00 (am or pm?).
Time necessary to run the system: 1.5 hours.
Forecasts available for downloading: XXXXXX.
Analyses: Yes. 24 hour hindcast.
Format: NetCDF.
Forecasting system operational since: XXXXXX.
Access: Not yet.
Link: http://www.puertos.es

V.13 UMT-IOI-POU

Contact person: Aldo Drago.
Name of forecasting system: Rosario9620.
Location: The Strait of Sicily.

Brief overview of the system:

The ROSARIO Malta Shelf hydrodynamical forecasts utilise an eddy-resolving primitive equation sigma level shelf-scale numerical model. The domain cover the full shelf area around the Maltese Islands.The forecasts are nested to the SCRM-1/48 ° Sicilian Channel Regional Model (SCRM). At the free surface the model is driven by forecast fields from the SKIRON atmospheric forecast run by the University of Athens.The numerical code used in both of the above-mentioned forecasts is based on an application of the Princeton Ocean Model, POM (Blumberg and Mellor, 1987). The model runs with full atmospheric forcing and includes full thermohaline dynamics.

Model variables:

1. Temperature
2. Salinity
3. Barotropic velocity, ms-1, CF
4. Total velocity, ms-1, CF
5. Total heat flux
6. Evaporation – Precipitation

Lateral model boundaries:
LONI: 13.81E, LONF: 14.94E,
LATI: 35.43N, LATF: 37.21N.
Spatial resolution: 1/96°x1/96°.
Horizontal grid: Finite differences. Orthogonal grid, Mercator projection 172 grid points in latitude and 110 in longitude.
Vertical coverage: From 0 to 1100 meters.
Vertical grid: Sigma grid. Logarithmic distribution near the surface and bottom boundaries.
Number of vertical levels: 20 sigma layers (z also available on opendap).
Variable depth bottom layers: Yes, bottom following.
Min/Max differences in vertical resolution:
Min Sigma thickness: 0.00833, Max Sigma thickness: 0.0667.
Model time step: Internal Time Step: 90 seconds, External Time Step: 3 seconds.
Frequency of model output (averages/snapshots):
3-hour averages. Fields centred at 1.5hr, 4.5hr, 7.5hr, 10.5hr, 13:5hr, 16.5hr, 19.5hr and 22.5hr GMT.
Length of forecast: 4.5 days.
Frequency of forecast release: Daily.
Starting time of forecasting production: 13.5 hr .
Issued every day D and starting from 12H of Day D-1.
Time necessary to run the system: 1 hour.
Forecasts available for downloading: 0.00 GMT.
Analyses: No.
Format: NetCDF.
Forecasting system operational since: XXXXXX.
Access: Not yet.
Link: http://www.capemalta.net/MFSTEP/results0.html