# The Black Sea Training System.

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A Supporting Programme for Capacity Building in the Black Sea Region towards Operational Status of Oceanographic Services


# The Black Sea Training System

*Alexander Kubryakov[1], Gennady Korotaev[1], Viktor Dorofeyev[1], Temel Oguz[2]*

[1]Marine Hydrophysical Institute, Ukraine;
[2]Institute of Marine Sciences, Turkey

Exeter, 2008
20-22 May

The system of training course on operational oceanography in the Black Sea for young scientists has been developed in the framework of the ASCABOS FP6 project by the ASCABOS WP3 team.

The courses consist of scientific lectures on methods of operational oceanography and practical exercises.

**The lectures include:**

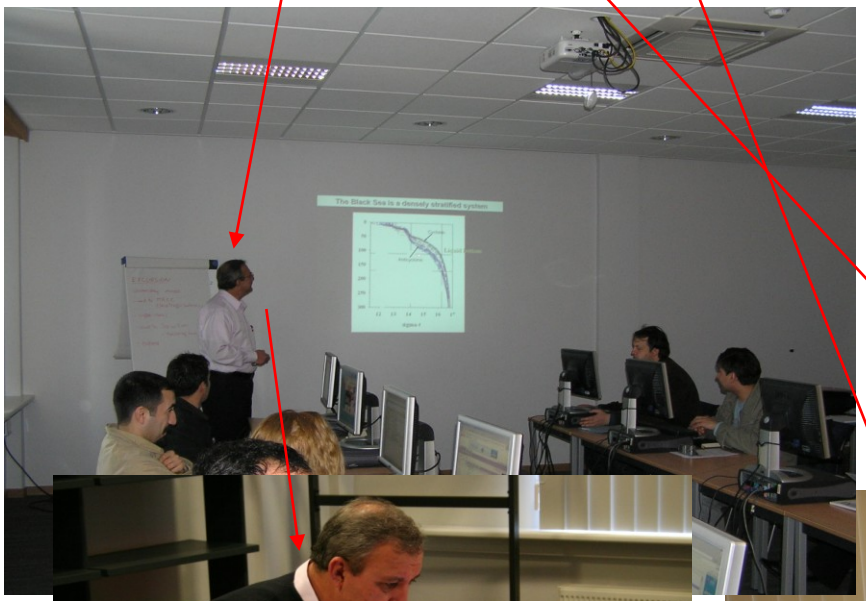
- Bases of dynamics of the Black Sea and remote sensing of the ocean;
- Modelling of the Black Sea ecosystem;
- Data and metadata management;
- Methods of operational oceanography;
- Principal, scientific functioning of selected numerical models;

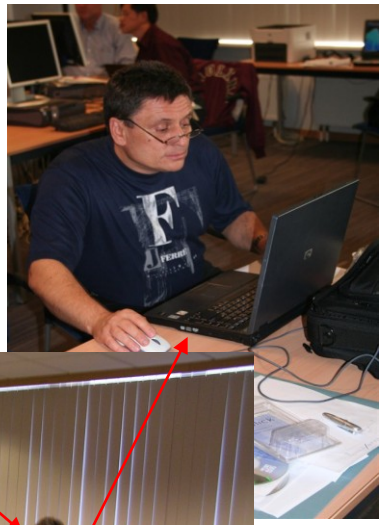
## PARTICIPANTS :

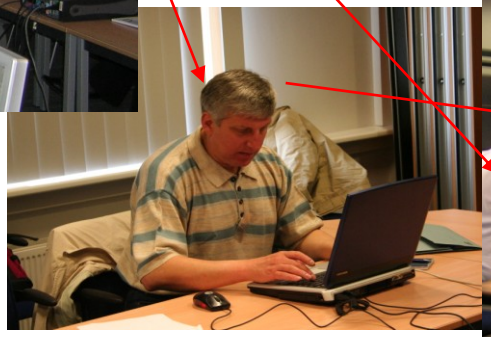
**The group included two integrated parts of scientists: experts and trainee modelers, and marine data managers from the IODE .**

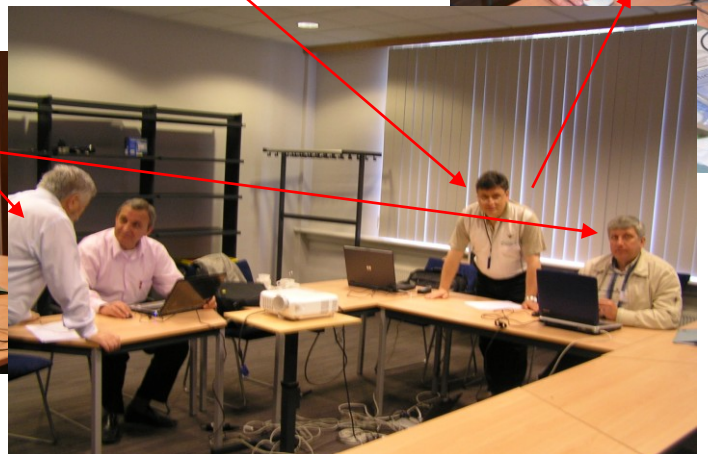
## Trainers:

| Name | Country, organization |
|---|---|
| Prof. Gennady Korotaev | Ukraine, MHI |
| Prof. Temel Oguz | Turkey, IMS |
| Dr. Alexander Kubryakov | Ukraine, MHI |
| Dr. Viktor Dorofeyev | Ukraine, MHI |
| Dr. Vladimir Vladimirov | IOC Project Office for IODE |









Modeling trainees were selected on the basis of having lead responsibilities at a forecasting or operational modeling center/network, plus a general knowledge of the way numerical prediction models work.

Their home position and responsibility should be appropriate for the potential and subsequent implementation of operational, numerical models for prediction of the coastal circulation, pollution dispersion, etc. They should also declare intention/willingness to engage in operational oceanography activities at their national and regional levels, both in terms of lecturing others, as well as assisting with implementations of models and data managements.

Two training courses have been held in Ostende, Belgium :

9 – 14 October 2006 and

23 - 28 April 2007

The IOC Project Office for IODE provided excellent support to these training courses, through the arrangement of rooms, computers, equipments, transportation, lunches, coffee/tea etc.

# The list of participants and lecturers of the last courses:

## Trainees:

| # | Name | Sex | Country |
|---|---|---|---|
| 1 | Nikolay Valchev | M | Bulgaria |
| 2 | Vasko Galabov | M | Bulgaria |
| 3 | Diana Kvaratskhelia | F | Georgia |
| 4 | Marina Kordzakhia | F | Georgia |
| 5 | Razvan Mateescu | M | Romania |
| 6 | Maria-Ionela Tomescu-Chivu | F | Romania |
| 7 | Petr Mikheev | M | Russia |
| 8 | Murat Gündüz | M | Turkey |
| 9 | Onur Kerimoglu | M | Turkey |
| 10 | Dmytro Alekseev | M | Ukraine |
| 11 | Daria Iarova | F | Ukraine |

## Trainers:

| **Name** | **Country, organization** |
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| Prof. Gennady Korotaev | Ukraine, MHI |
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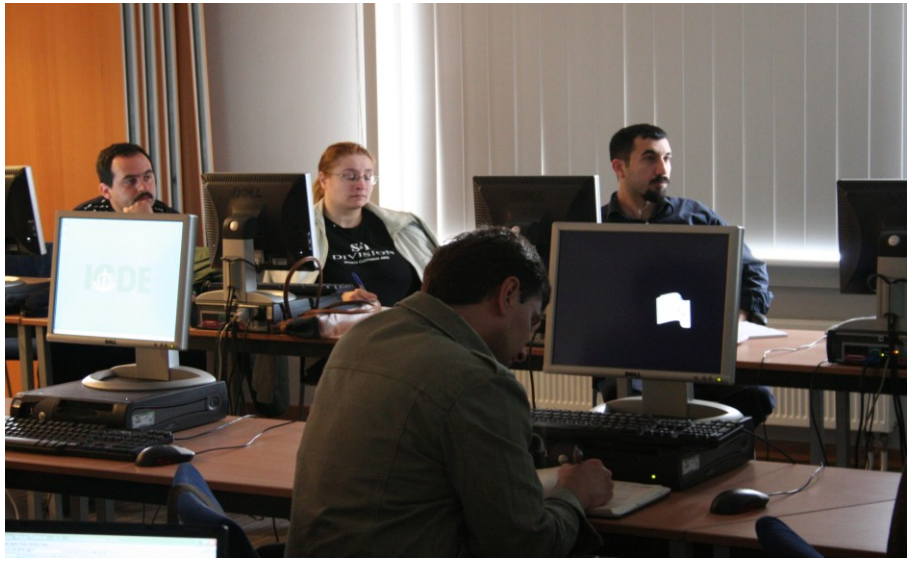
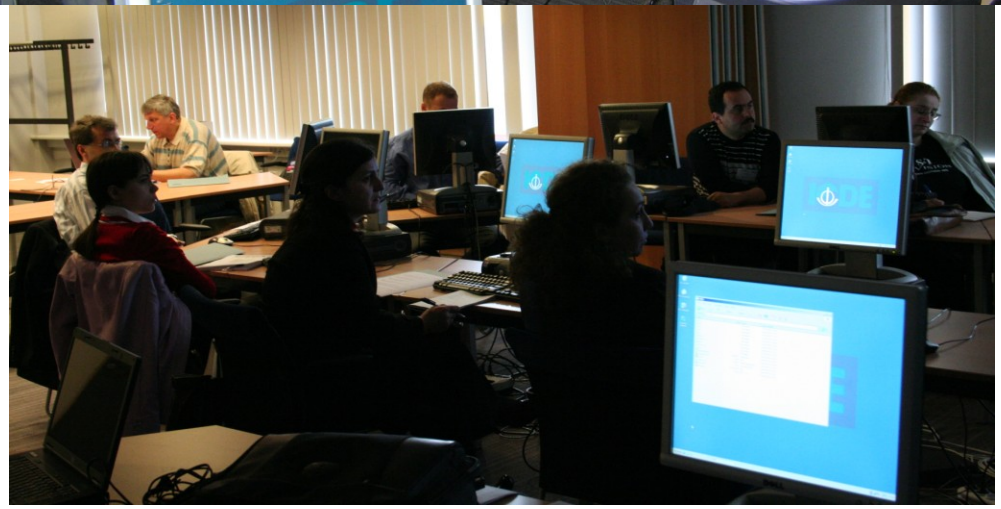
Tranees:





The practical exercises were been carried out after scientific lectures.

**Objective:**

-practical training on the preparation of the model initialization arrays, surface and boundary conditions, information for data assimilation.
-practical training on the model runs simulating the operational functioning of the nowcasting and forecasting system and presentation of the model outputs.
-selection of the model geometry (coast line, bottom topography, grid steps, vertical levels);
-operational runs of the model for regional nowcasting and forecasting;
-operational runs of the ecological model;
-presentation of the model outputs;

The user guide was prepared for the trainees:

**Short user guide for modeling of the Black Sea circulation.**

**I. Description of models and data.**

1. The Black Sea circulation all-basin and regional models.
2. Data.

**II. The basin scale model.**

1. Installation.
2. Preparation of initial data files.
3. Boundary conditions and assimilated data
4. Setting the management parameters.
5. Running.
6. Running from the “restart” file.
7. Visualization of the output files.

**III. The regional nested fine grid model.**

1. The domain of coastal zone.
2. Installation.
3. Initial and boundary data files.
4. Setting of management parameters.
5. Running.
6. Visualization of output results.

**IV. Installation and using software for visualization of modeling results**.

1. GrADS.
2. Golden Software.

The practical exercises include three types of training closely associated with each other: the work with data, with models and with visualization software. The work with data consists of necessary data retrieval and preparation of the data for model initialization, boundary conditions and assimilation. The data enter archived hydrology, bottom topography, meteorology, satellite sea surface temperature and satellite altimetry.

The work with models includes installation of two circulation POM–version models (basin scale model and nested grid fine resolution model) and simple ecological model, setting of models management parameters and runs of models in different modes (nowcasting/forecasting, with/without data assimilation).

The third part of training consists of installation of software to visualize, to figure and to analyze of input and output model data. The user guide has been prepared for the trainees.

**During practical training workshop there were carried out the following:**

- Two numerical models based on Princeton ocean model (POM): the basin scale model of the Black Sea circulation and fine resolution regional model) were installed by trainees in the Fortran environment.

- The initial fields of sea temperature, salinity, sea level and current velocity created earlier in z-coordinates were transformed by trainees with a help of a special program to sigma-coordinates.

- The first run of the POM Basin Scale model was carried out without assimilation of satellite sea level and surface temperature (SST). After setting all necessary management parameters .

- The results of calculations – fields of temperature, salinity, velocity at various levels from the bottom to 2.5 m level – were visualized with a help of the GrADS software.

- Next run of the POM Basin Scale model was carried out with assimilation of sea level altimetry and SST. All necessary modifications were made by trainees.

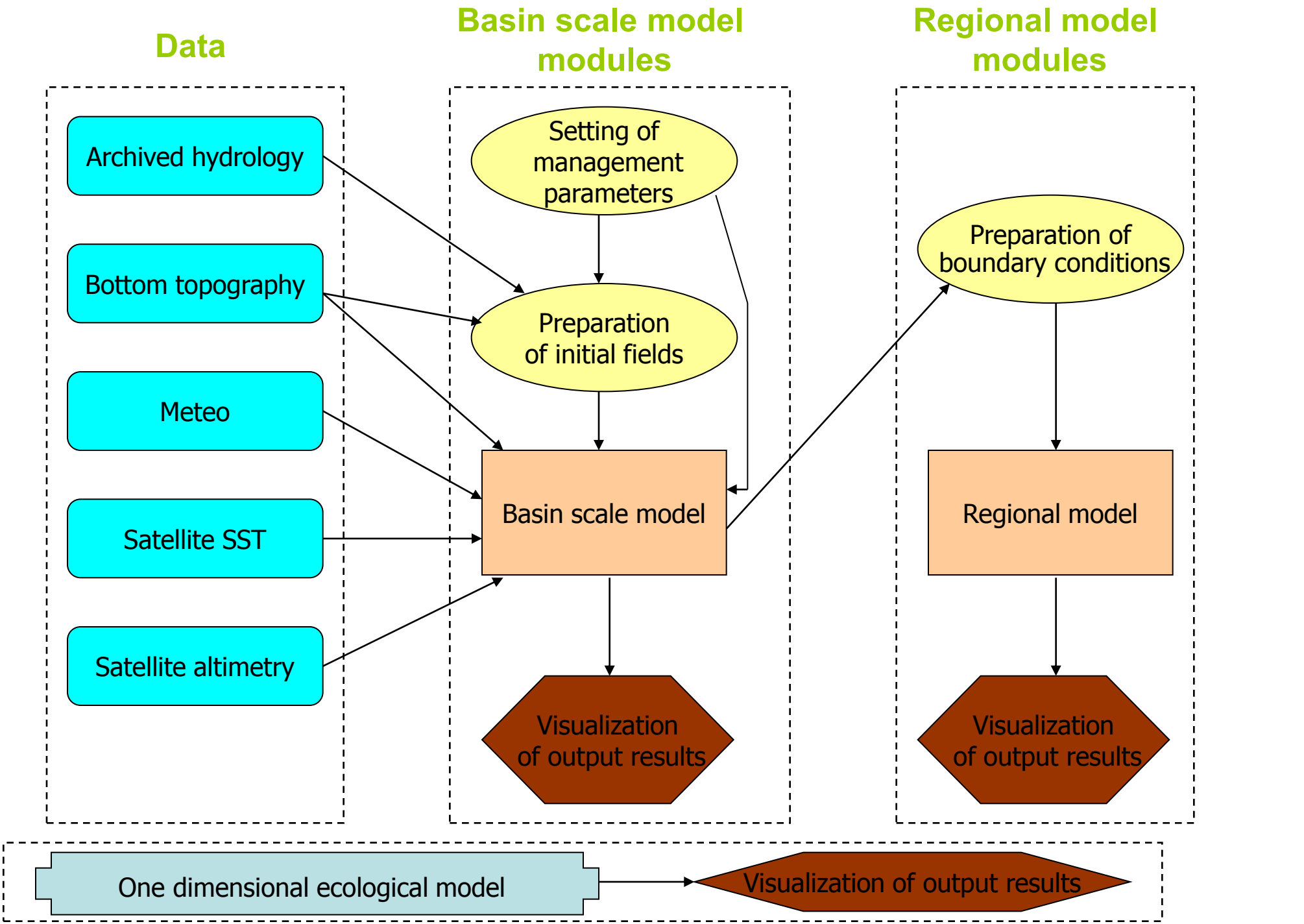
- All the obtained results were analyzed with the help of the GrADS system. Trainees compared the results of two runs of the large scale model.

- The basin scale model the 5-days run was carried out in order to calculate initial and boundary conditions (at the open boundary) for the fine resolution regional model. All these data (wind stress, heat and salt fluxes on the sea surface and hydrodynamical fields) were recorded into the appropriate file, which then were used during the run of the nested model. Firstly the trainees run the nested model for the same region. Then participants of the courses chose the region they wanted, prepared initial and boundary conditions by running the basin scale model and after that run the nested regional model for their regions.

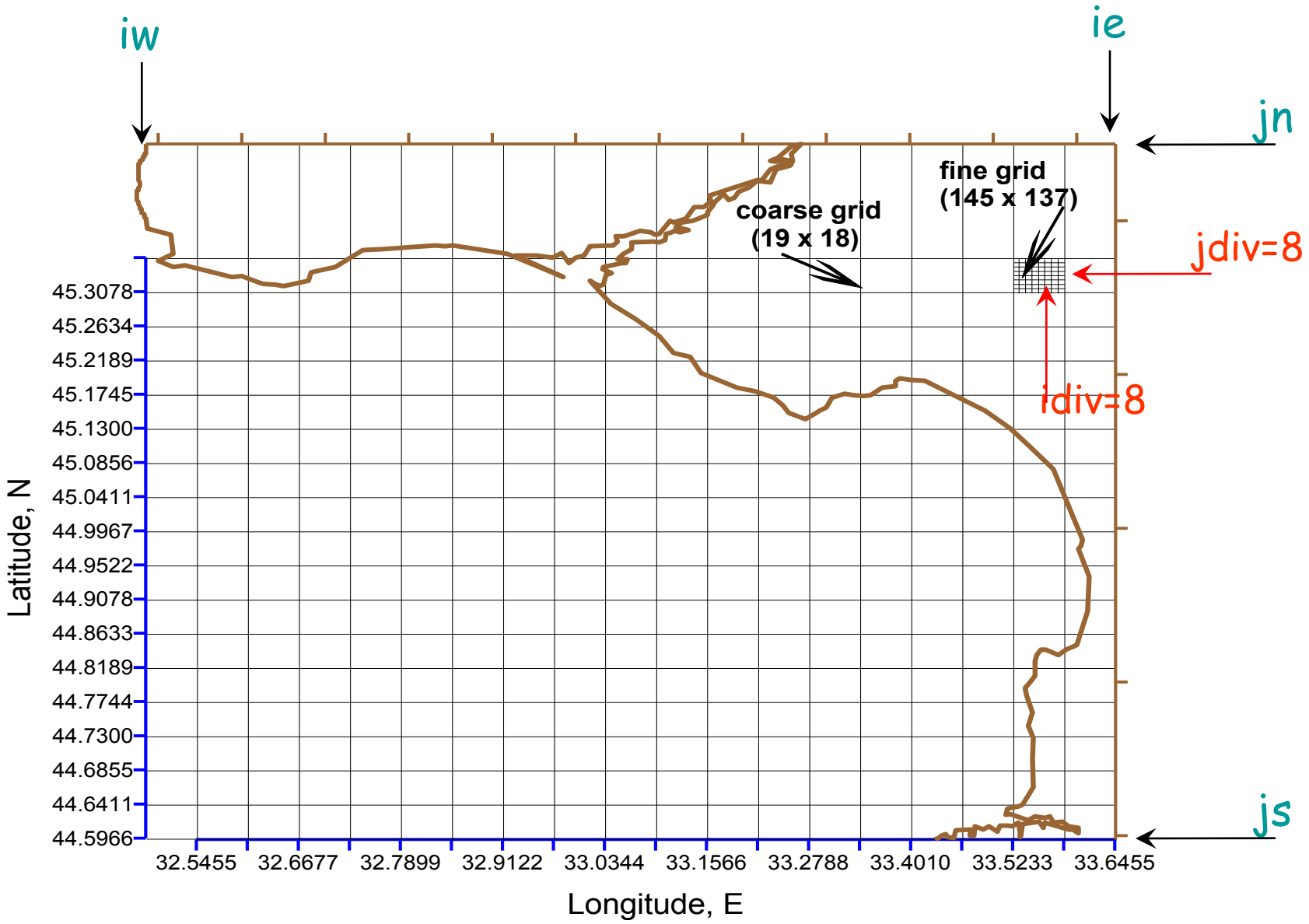
- The one dimensional ecological model run was carried out for period of ten years.

- Installation of the visualization software GrADS.

- Every trainee prepared a short report concerning the work was done.


Data
Basin scale model modules
Regional model modules
Archived hydrology
Bottom topography
Meteo
Satellite SST
Satellite altimetry
Setting of management parameters
Preparation of initial fields
Basin scale model
Visualization of output results
Preparation of boundary conditions
Regional model
Visualization of output results
One dimensional ecological model
Visualization of output results

# Examples:

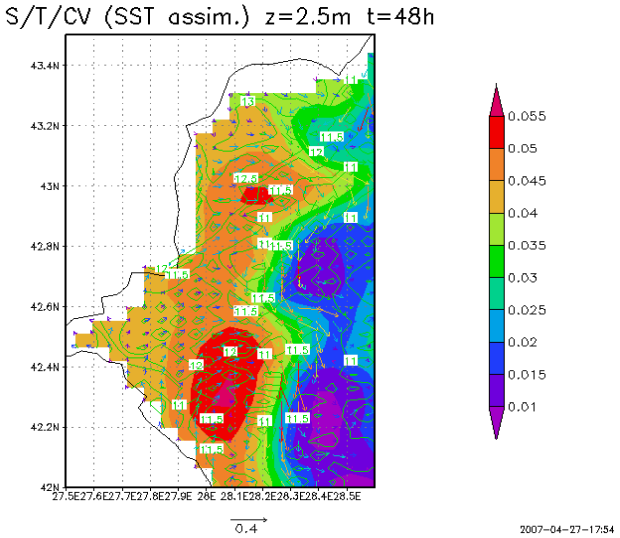


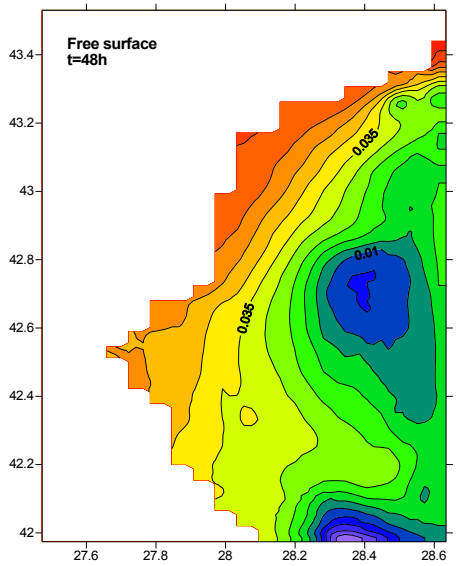

Simulation region

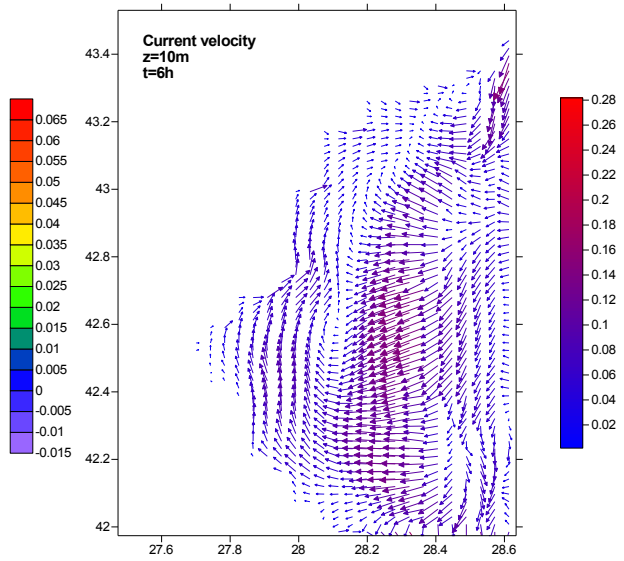
During practical part of training course there were made some short presentations about introduction to the GrADS system, and principles of nesting modeling.

Every trainee prepared a short report concerning the work was done.
Examples:

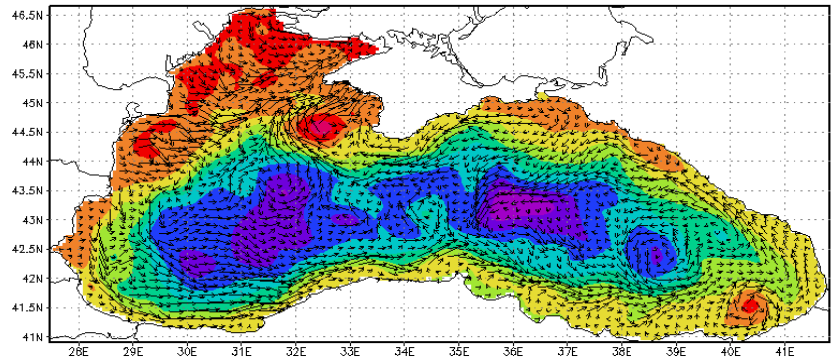
From Nikolay Valchev report:



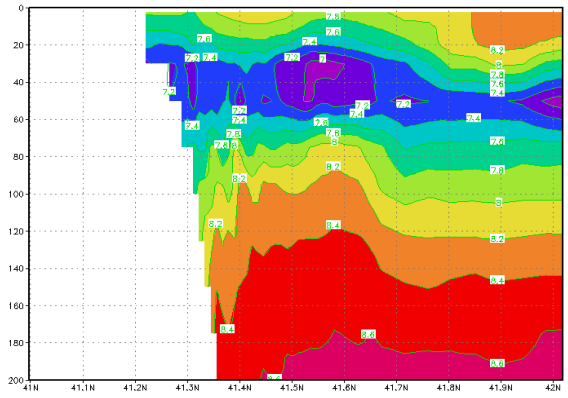




**Conclusion**
The formation of eddy in the Bulgarian shelf is much better visible with the POM small scale realization and with assimilation of SST .



# From Onur Kerimoglu & Murat Gunduz report:



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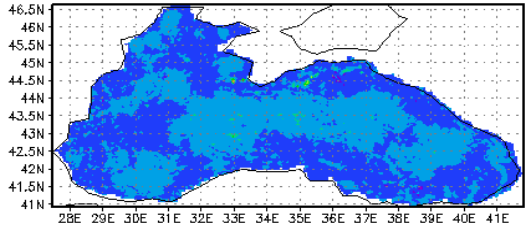


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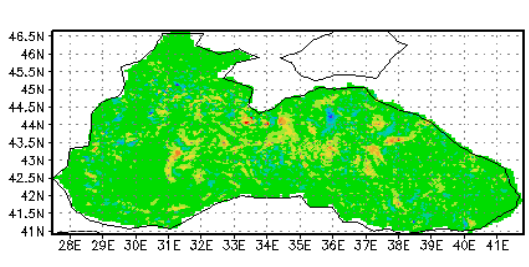


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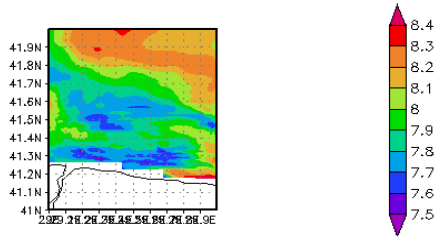


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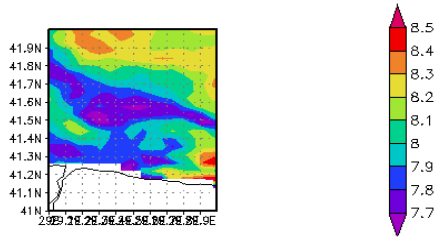


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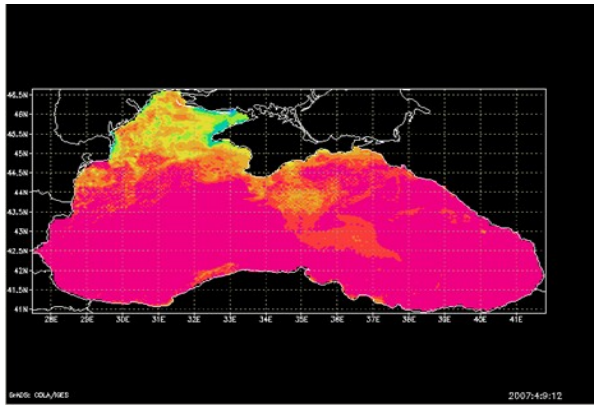
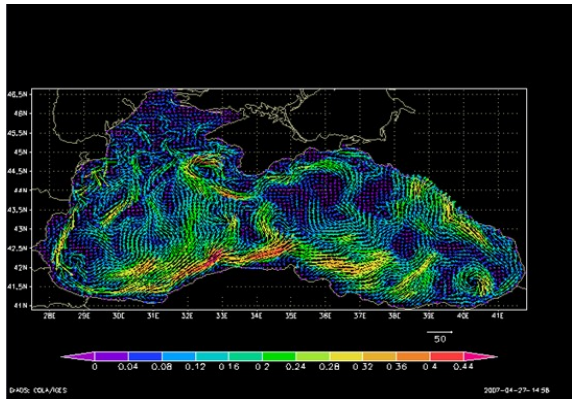
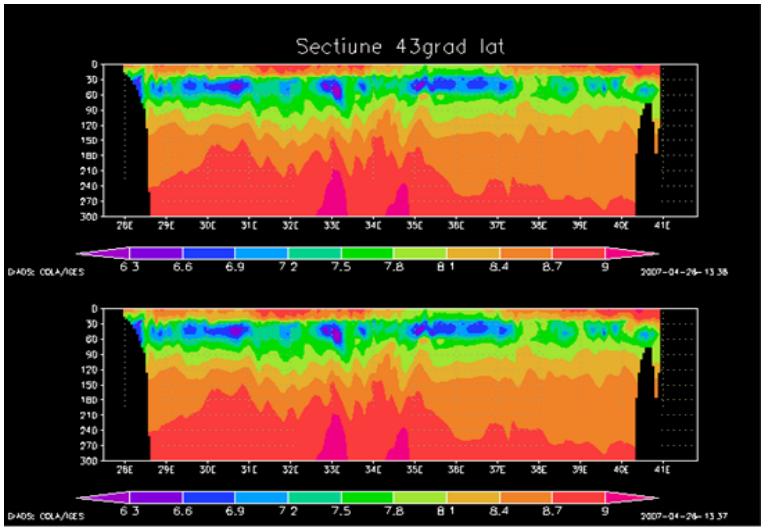
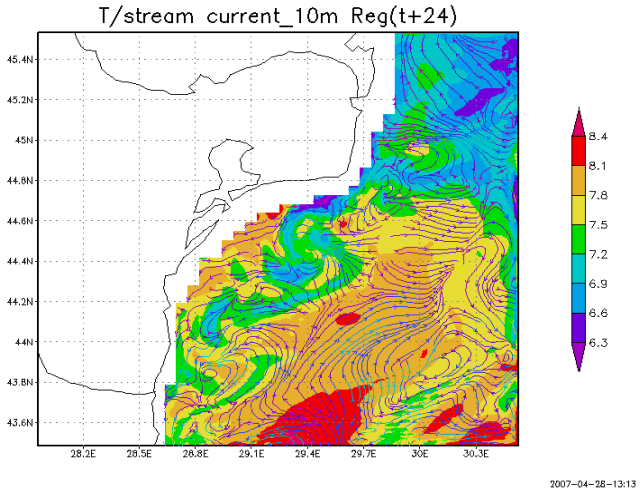
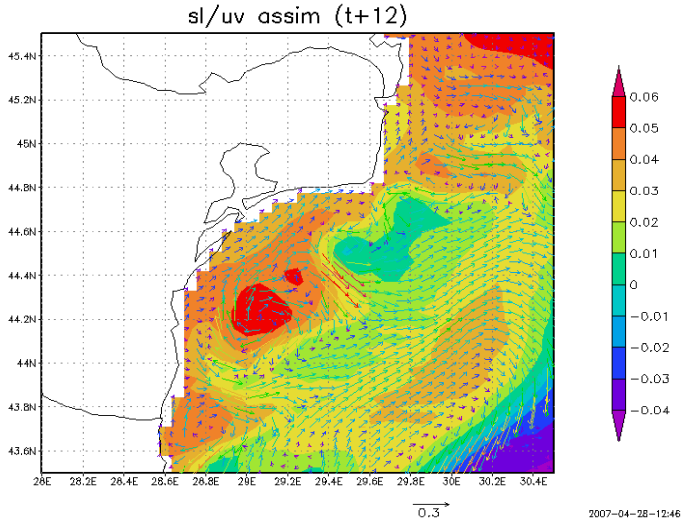
From Maria-Ionela Tomescu-Chivu and Razvan-Doru Mateescu report:



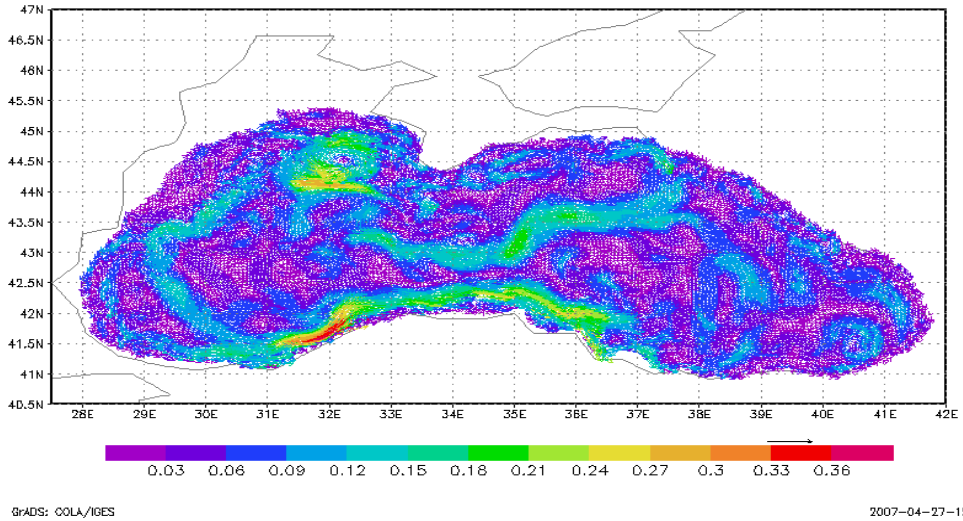


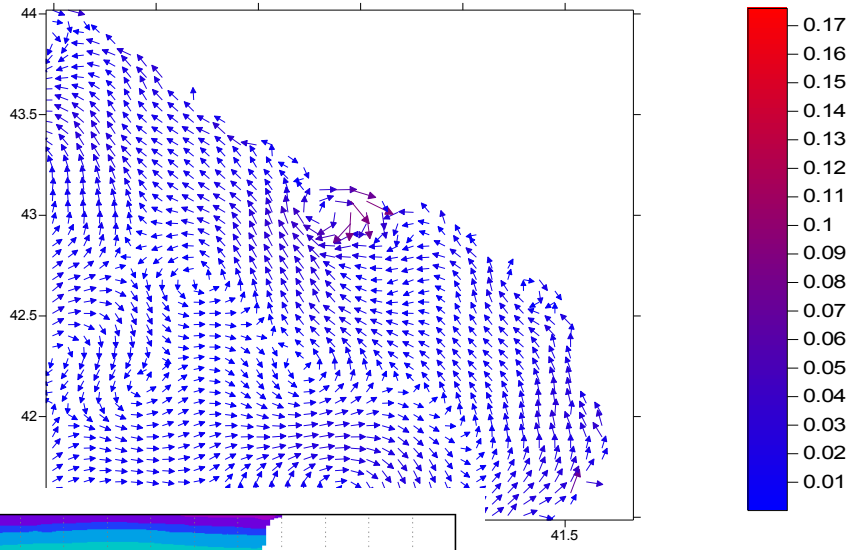


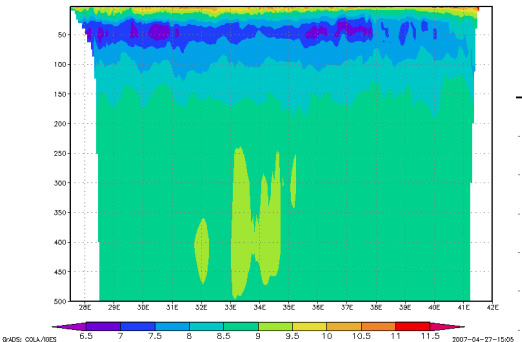



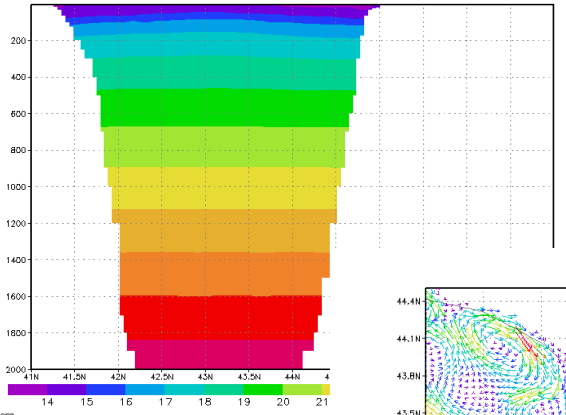



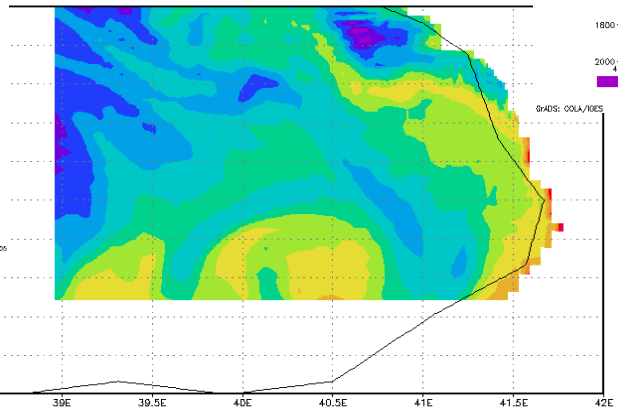
From Marina Kordzakhia and Diana Kvaratskhelia reports:

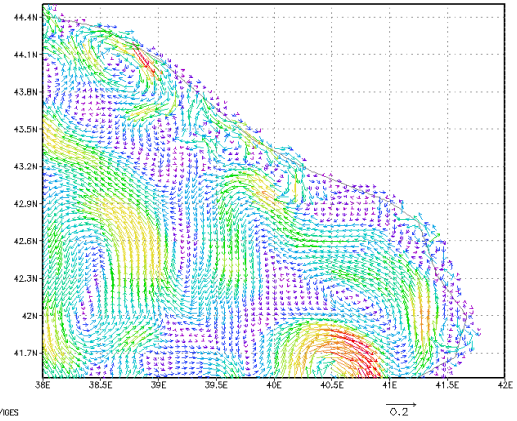


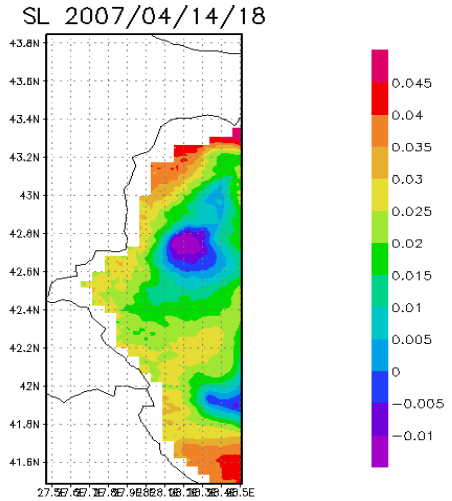



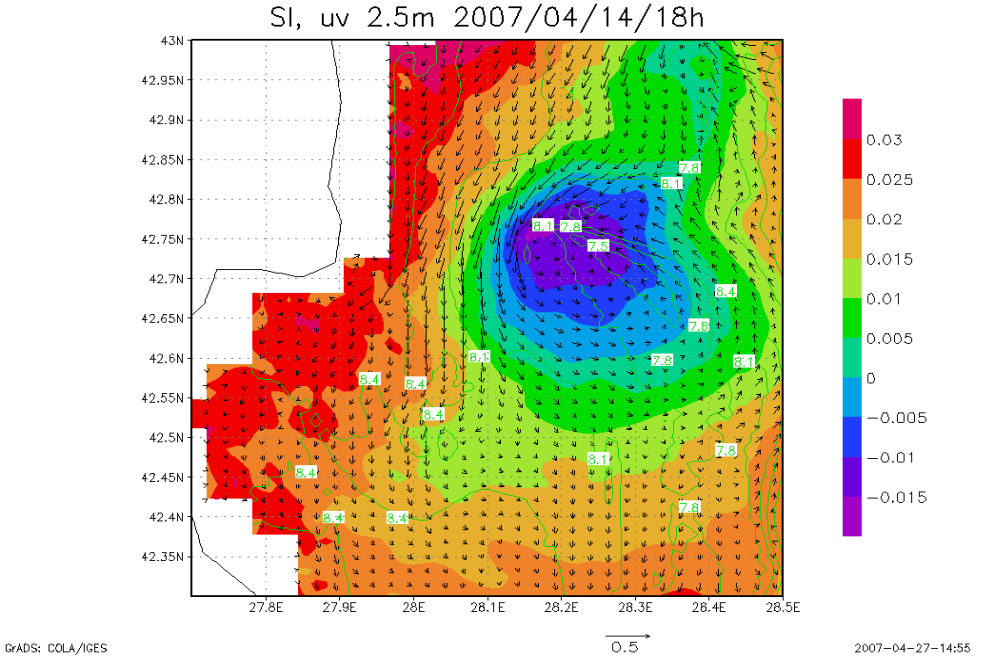



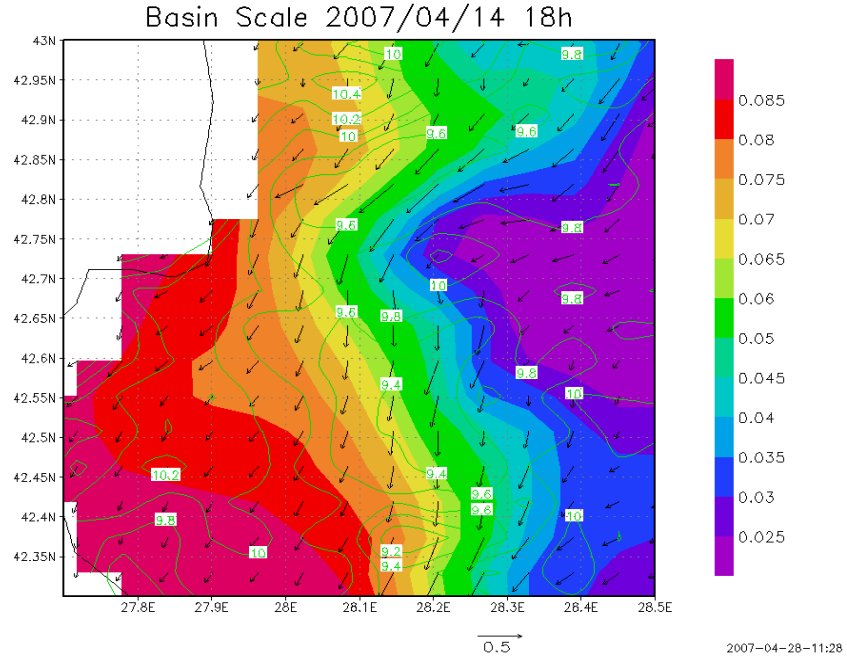



From Vasco Galabov report:



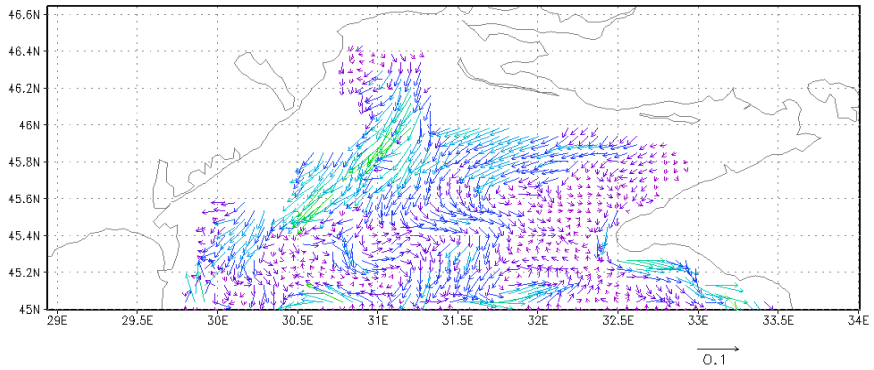




The comparison shows how the large scale- low resolution model is not able to simulate such a small scale features like the edie  simulated by the regional model.

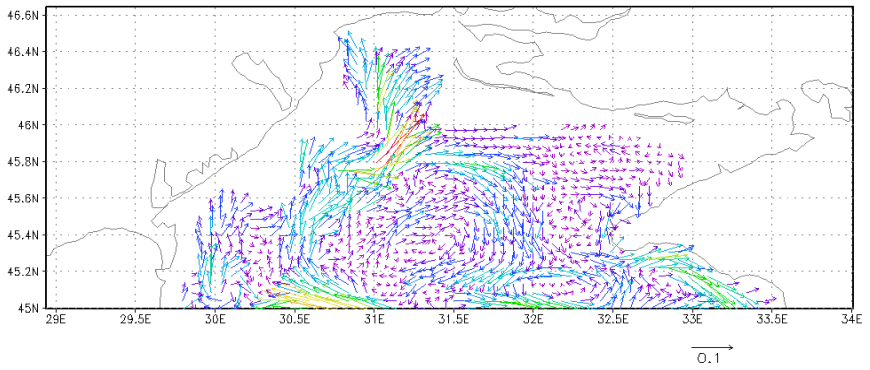
# The second day of simulation. Velocity fields on the horizon of 40 m.

From Dmitry Alekseev report:

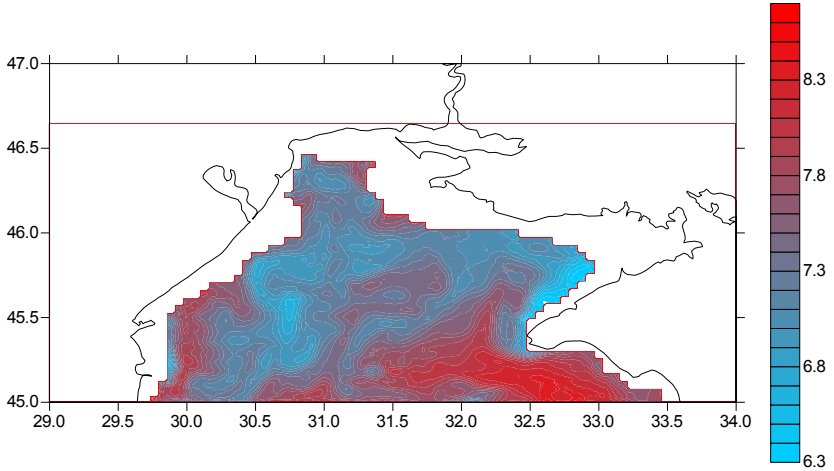
Global model



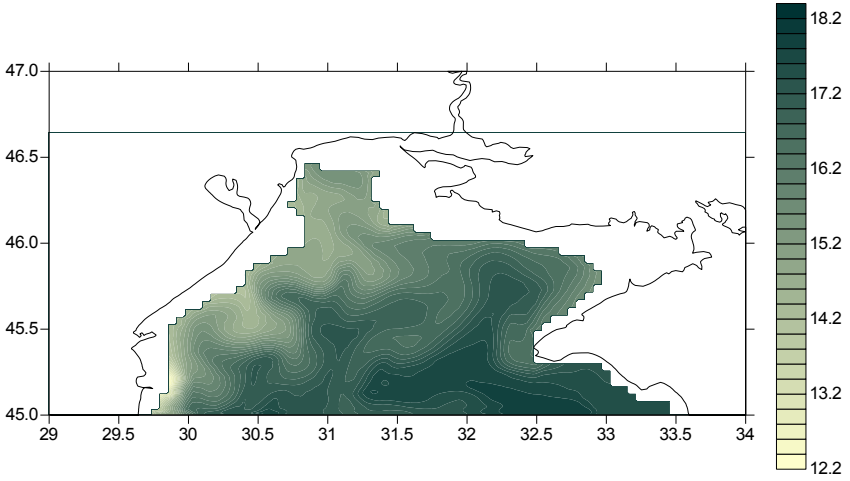

Regional model



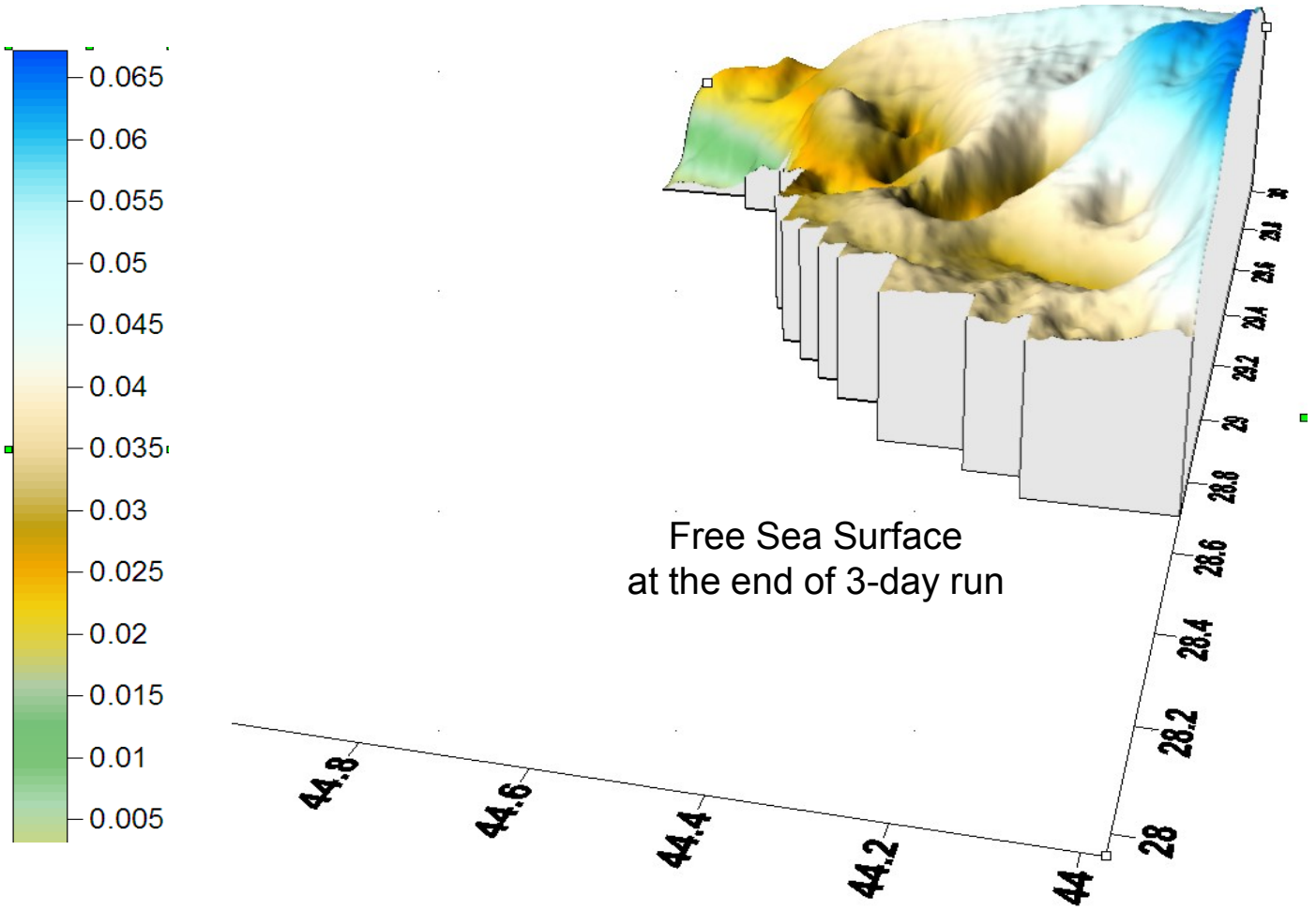

Temperature




Salinity



From Daria Yarova report:




Free Sea Surface
at the end of 3-day run

The trainees filled the special questionnaires helping to evaluate the overall training programme impact.

During closing of courses the special certificates were been given to each of trainees.

# Certificates:

**THE IOC INTERNATIONAL OCEANOGRAPHIC DATA AND INFORMATION EXCHANGE PROGRAMME**

**and**

**THE ASCABOS PROJECT**

Herewith certify that

**Diana KVARATSKHELIA**
Georgia

attended and successfully completed the

**ASCABOS Training**

Ostend, Belgium
23 -28 April 2007

TRAINERS

Gennady KOROTAEV
Temel OGUZ
Alexander KUBRYAKOV
Víktor DOROFEYEV

Vladimir VLADYMYROV
Head

IOC Project Office for IODE

**THE IOC INTERNATIONAL OCEANOGRAPHIC DATA AND INFORMATION EXCHANGE PROGRAMME**

**and**

**THE ASCABOS PROJECT**

Herewith certify that

**Razvan MATEESCU**
Romania

attended and successfully completed the

**ASCABOS Training**

Oostende, Belgium
23 -28 April 2007

TRAINERS

Gennady KOROTAEV
Temel OGUZ
Alexander KUBRYAKOV
Víktor DOROFEYEV

Vladimir VLADYMYROV
Head

IOC Project Office for IODE

# Certificates:

THE IOC INTERNATIONAL OCEANOGRAPHIC DATA AND INFORMATION EXCHANGE PROGRAMME

and

THE ASCABOS PROJECT



Herewith certify that

**Onur KERIMOGLU**
Turkey

attended and successfully completed the

**ASCABOS Training**

Oostende, Belgium
23 -28 April 2007

TRAINERS

Gennady KOROTAEV
Temel OGUZ
Alexander KUBRYAKOV
Víktor DOROFEYEV

Vladimir VLADYMYROV
Head

IOC Project Office for IODE

---

THE IOC INTERNATIONAL OCEANOGRAPHIC DATA AND INFORMATION EXCHANGE PROGRAMME

and

THE ASCABOS PROJECT



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Georgia

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Víktor DOROFEYEV

Vladimir VLADYMYROV
Head

IOC Project Office for IODE

---

THE IOC INTERNATIONAL OCEANOGRAPHIC DATA AND INFORMATION EXCHANGE PROGRAMME

and

THE ASCABOS PROJECT



Herewith certify that

**Razvan MATEESCU**
Romania

attended and successfully completed the

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Oostende, Belgium
23 -28 April 2007

TRAINERS

Gennady KOROTAEV
Temel OGUZ
Alexander KUBRYAKOV
Víktor DOROFEYEV

Vladimir VLADYMYROV
Head

IOC Project Office for IODE

---

THE IOC INTERNATIONAL OCEANOGRAPHIC DATA AND INFORMATION EXCHANGE PROGRAMME

and

THE ASCABOS PROJECT



Herewith certify that

**Nicolay VALCHEV**
Bulgaria

attended and successfully completed the

**ASCABOS Training**

Oostende, Belgium
23 -28 April 2007

TRAINERS

Gennady KOROTAEV
Temel OGUZ
Alexander KUBRYAKOV
Víktor DOROFEYEV

Vladimir VLADYMYROV
Head

IOC Project Office for IODE

# *Training course on the dynamics of the Black Sea coastal zone was held in Shkorpilovtsi, Bulgaria, 3-7 September 2007*

**Programme of the training course**

**Day 1. Introduction**

1.1. Introduction to the training course.
1.2. Introduction to oceanography of the Black Sea coastal zone.
1.3. Definitions and the main dynamical processes in the coastal zone of the Black Sea.
1.4. Environmental challenges in the Black Sea coastal zone.
1.5. Seminar and exercise – Introduction of oceanographic resources on the Black Sea in the Internet

. **Day 2. Dynamical processes in the Black Sea coastal zone.**

2.1. Sediment transport. Nearshore morphodynamics and coastal erosion.
2.2. Seminar and exercise – Dynamical models in the coastal area

.**Day 3. Sea level variability, waves and storm surges in the coastal zone**

3.1. Background information about sea waves. Sea waves forecasting and hindcasting.
3.2. Seminar and exercise

.**Day 4. Remote sensing of the Black Sea coastal zone. Part 1.**

4.1. Use of satellite ocean color sensors. Basic radiometric quantities; atmosphere and seawater optical properties.
Processes affecting the top-of-the-atmosphere radiance measured by a satellite sensor.
Atmospheric correction of satellite ocean color data.
Spectral water-leaving radiance and its dependence on the seawater constituents.
4.2. Passive remote sensing of the ocean. Satellite infrared imagery of the sea surface.
4.3. Seminar and exercise – Acquisition, archiving, and processing of satellite ocean color data

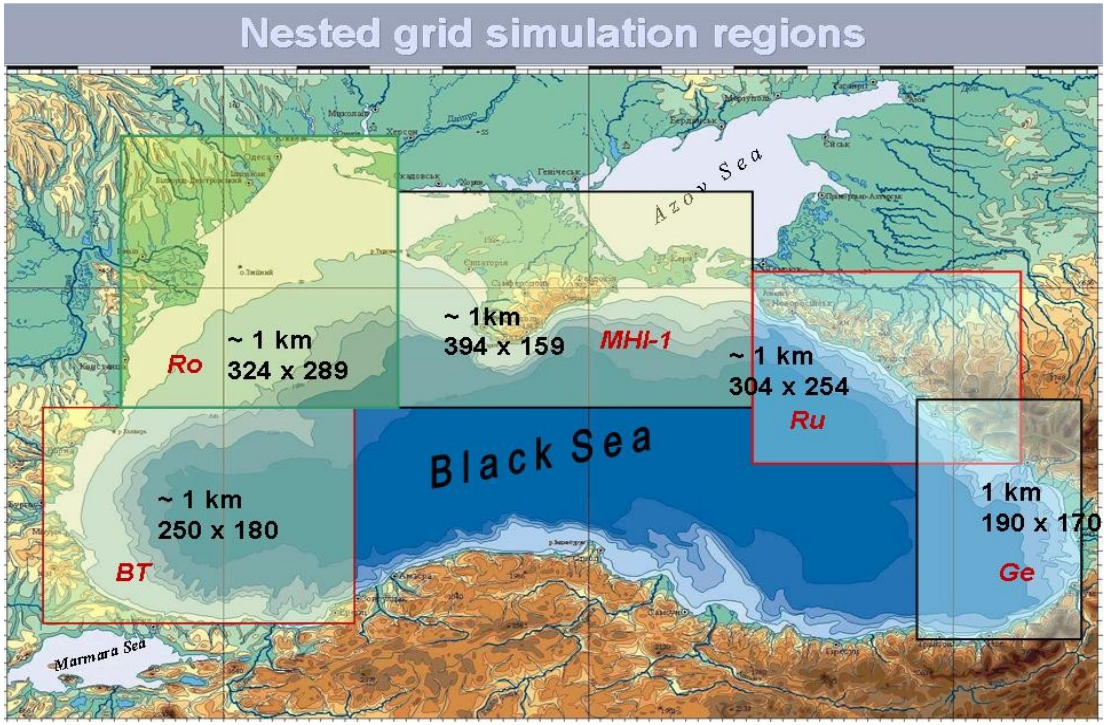
.**Day 5. Remote sensing of the Black Sea coastal zone. Part 2.**

5.1. Bio-optical algorithms and their characteristic features for the Black Sea waters.
Satellite ocean color sensors: requirements, operational aspects, data distribution and accessibility.
Algorithm validation: requirements, instrumentation and implementation.
Application of satellite ocean color data to study and monitor the Black Sea: the up-to-date results and future prospects.
5.2. Active remote sensing of the ocean. Satellite altimetry of the sea surface height. Satellite scatterometer for the sea surface winds.
Synthetic aperture radar imagery of the sea surface.
5.3. Seminar and exercise – Satellite remote sensing data processing and analysis for the Black Sea regional monitoring.

**Day 6. Field training & Test.**

ECOOP

Two training courses on operational use of regional models have been held in Sevastopol, Crimea :
9 – 14 October 2008 and
23 - 28 April 2008



# The Black Sea Training System

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## Abstract

The system of training course on operational oceanography in the Black Sea for young scientists has been developed in the framework of the ASCABOS FP6 project.

The courses consist of scientific lectures on methods of operational oceanography and practical exercises.

The practical exercises include three types of training closely associated with each other: the work with data, with models and with visualization software. The work with data consists of necessary data retrieval and preparation of the data for model initialization, boundary conditions and assimilation. The data enter archived hydrology, bottom topography, meteorology, satellite sea surface temperature and satellite altimetry.

The work with models includes installation of two circulation POM–version models (basin scale model and nested grid fine resolution model) and simple ecological model, setting of models management parameters and runs of models in different modes (nowcasting/forecasting, with/without data assimilation). The third part of training consists of installation of software to visualize, to figure and to analyze of input and output model data. The user guide has been prepared for the trainees.

To select applicants the necessary criteria have been developed which includes having lead responsibilities at a forecasting or operational modeling center/network and a general knowledge of the way numerical prediction models work of potential trainees.

Two training courses on the basis of developed Training System have been held in Ostende, Belgium with support of the IOC Project Office for IODE.

The trainees filled the special questionnaires helping to evaluate the overall training programme impact. During closing of courses the special certificates were been given to each of trainees.