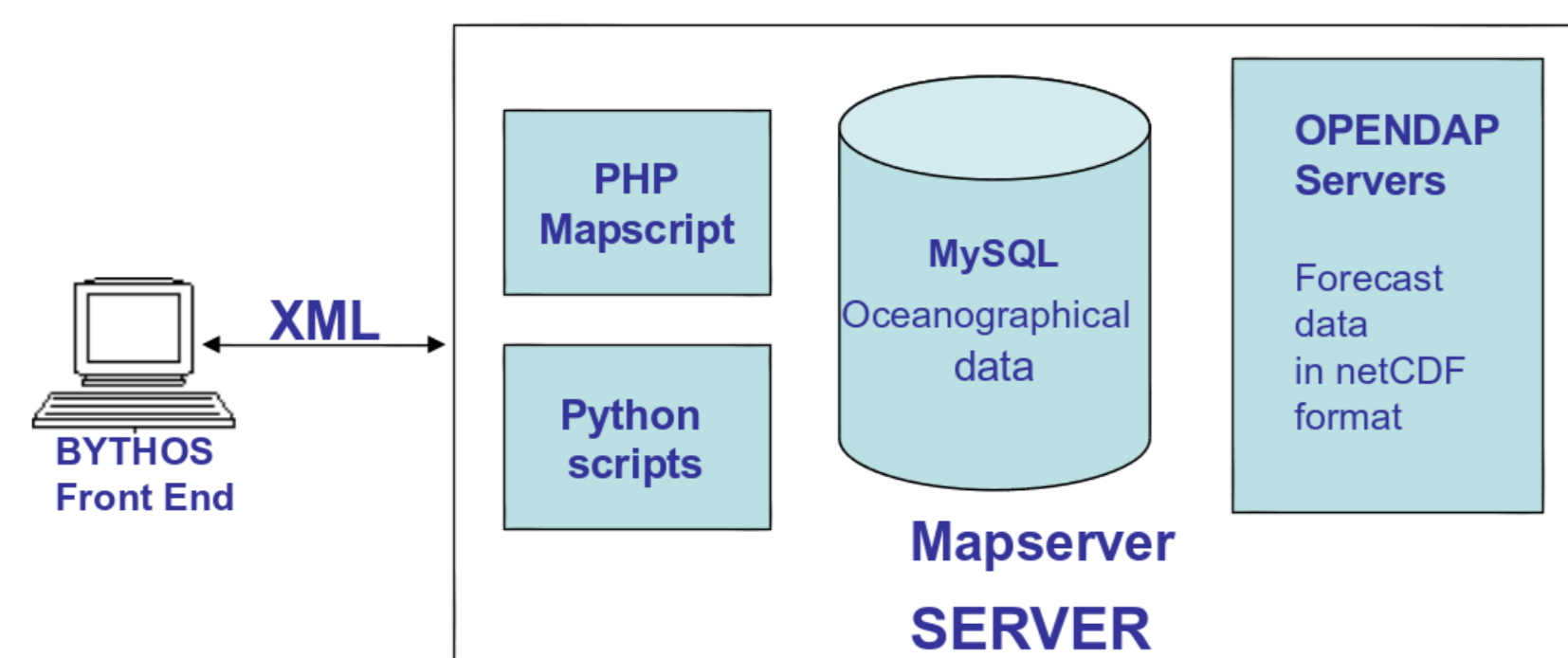# BYTHOS on-line visualization of ocean forecast

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BYTHOS STRUCTURE

Front End application

Presentation of data is achieved with the help of Flex Rich Internet application, used for the creation of Bythos front end. The front end is responsible for the search and retrieval of data from database, OPENDAP server and visualization through the map, currently served by MapServer.

Server Application

The software for data access and visualization was developed on the basis of client server architecture. Its server part includes an oceanographic database, a map service, php-modules providing interaction between server and client applications and python-modules processing netCDF forecast files.
MapServer was chosen to be a map service.
To operate the database, MySQL data management system was chosen.
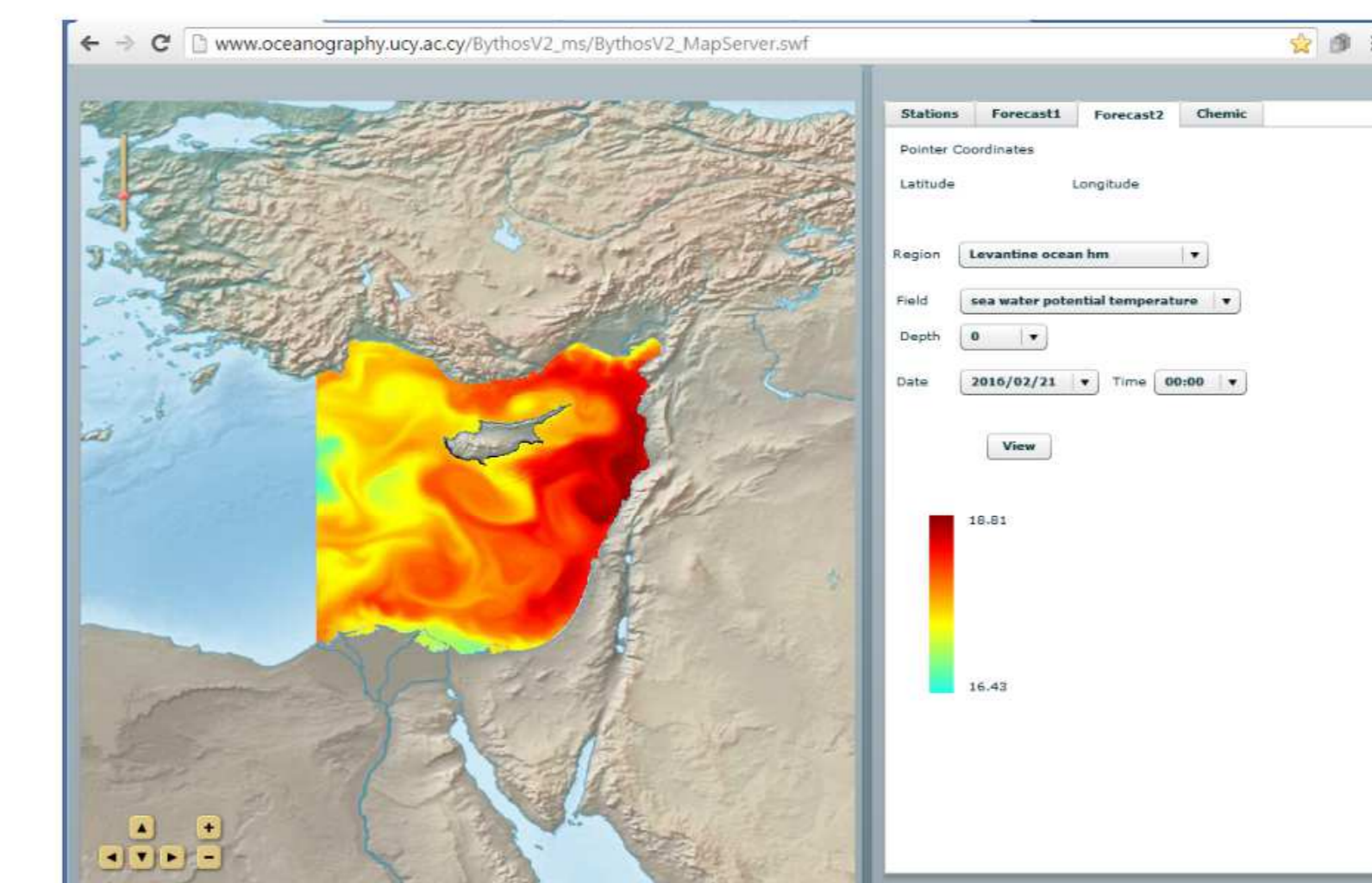
Data base access and visualization
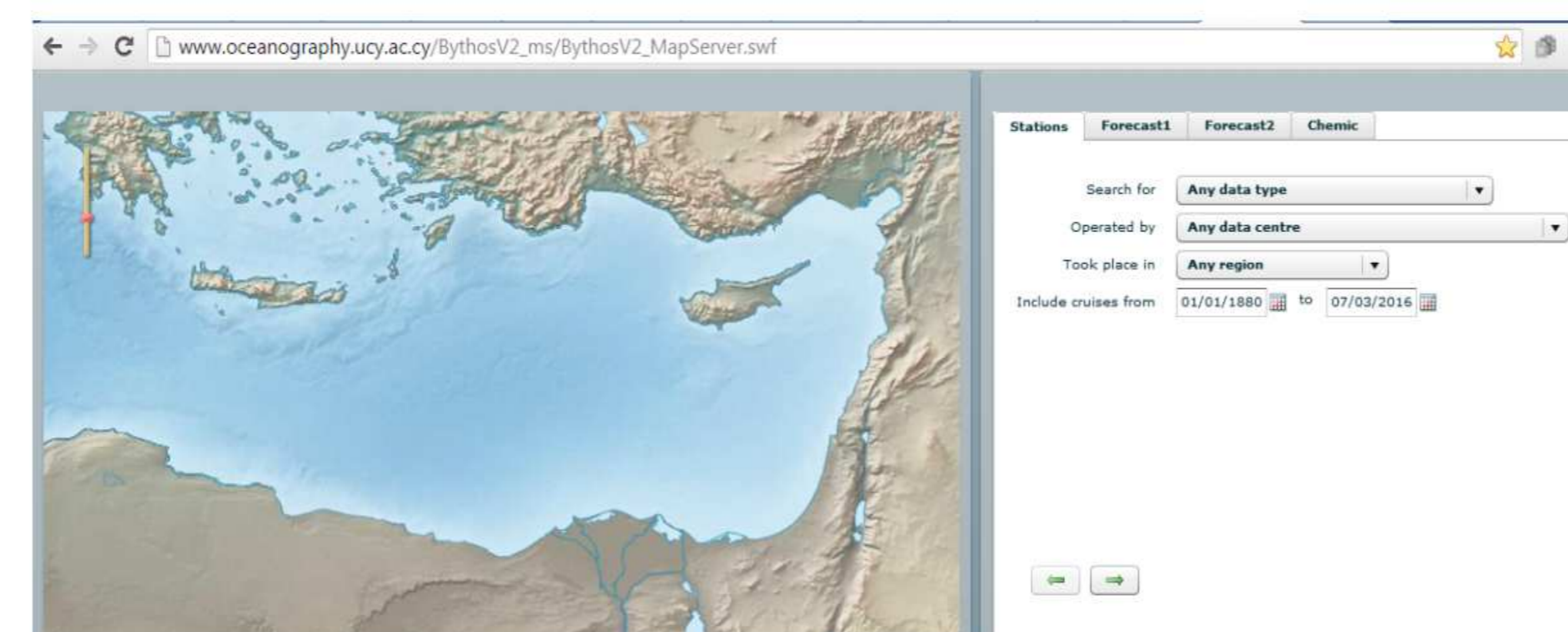
BYTHOS Front end - Search for data with type, center, region and date.

-allows the user to perform search and filtering of data based on the type of data, the data center providing the data, the region of interest and a date range.

Forecast data access and visualization

To access forecast map it is necessary to select Region, Field, Depth, Date and Time and click View. Here is a Sea surface water potential temperature map for the Levantine Basin. Then user can click at the map to see a profile.
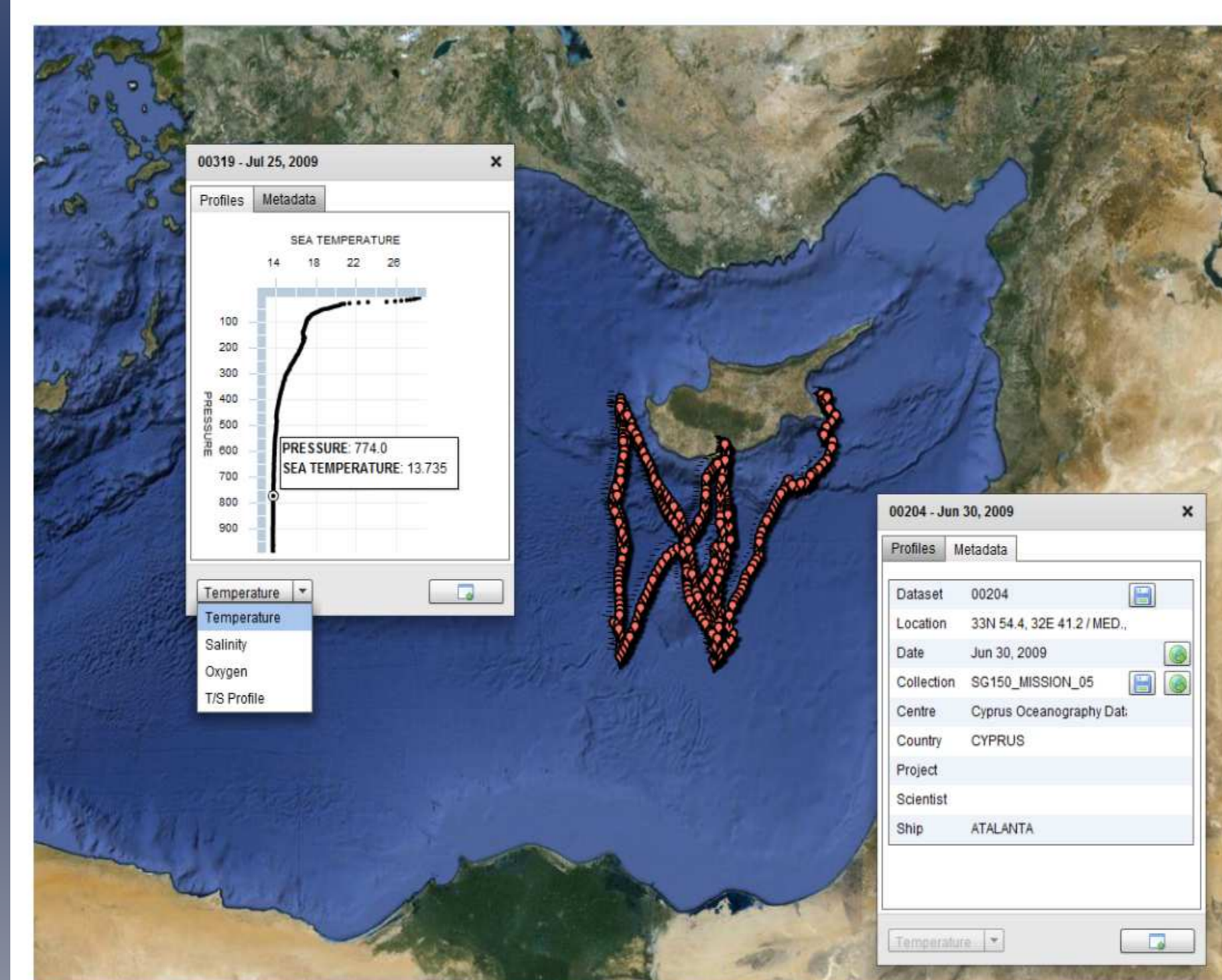
Data base access and visualization

Data visualization is achieved through the use of Mapserver and is performed in three steps.

-The first step allows the user to perform search and filtering of data based on the type of data, the data center providing the data, the region of interest and a date range.

-The second step shows to the user a list of data collections available based on the performed search. The user may then select one or more data collections to be plotted on the map.

-The third and final step is the visualization of the data collections on the map as points. For each point representing the geographical location, vertical profile for a given data set is plotted on a separated window.

On-line interactive capability of the system allows to view the values of the data versus depth. Metadata information is also available for each data set with ability to download the data set for a single location/station or the entire set of the data for a given cruise.

BYTHOS Front end – Example of vertical profile and metadata from a glider station.
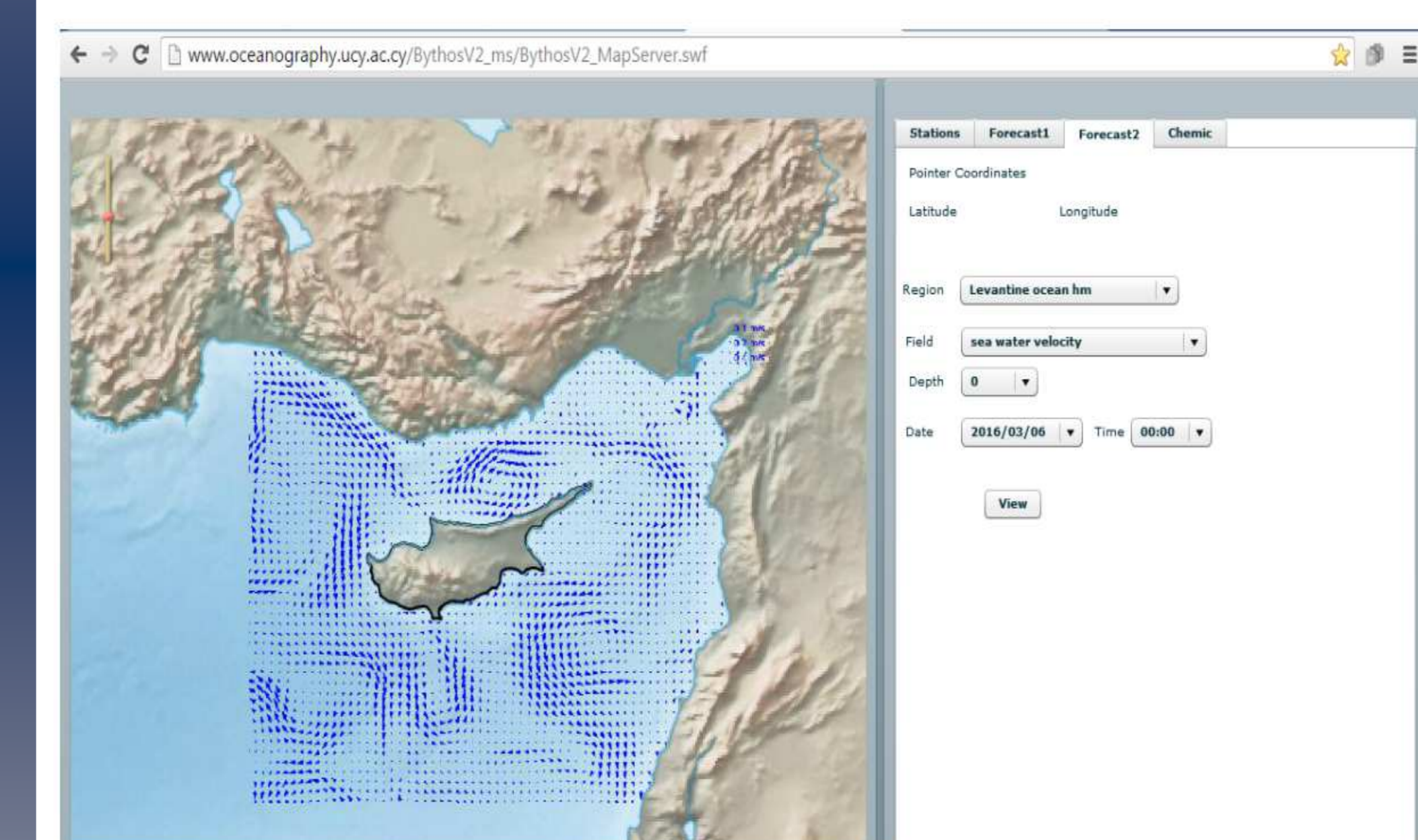
Sea surface velocity from CYCOFOS high resolution model, NE Levantine Basin.

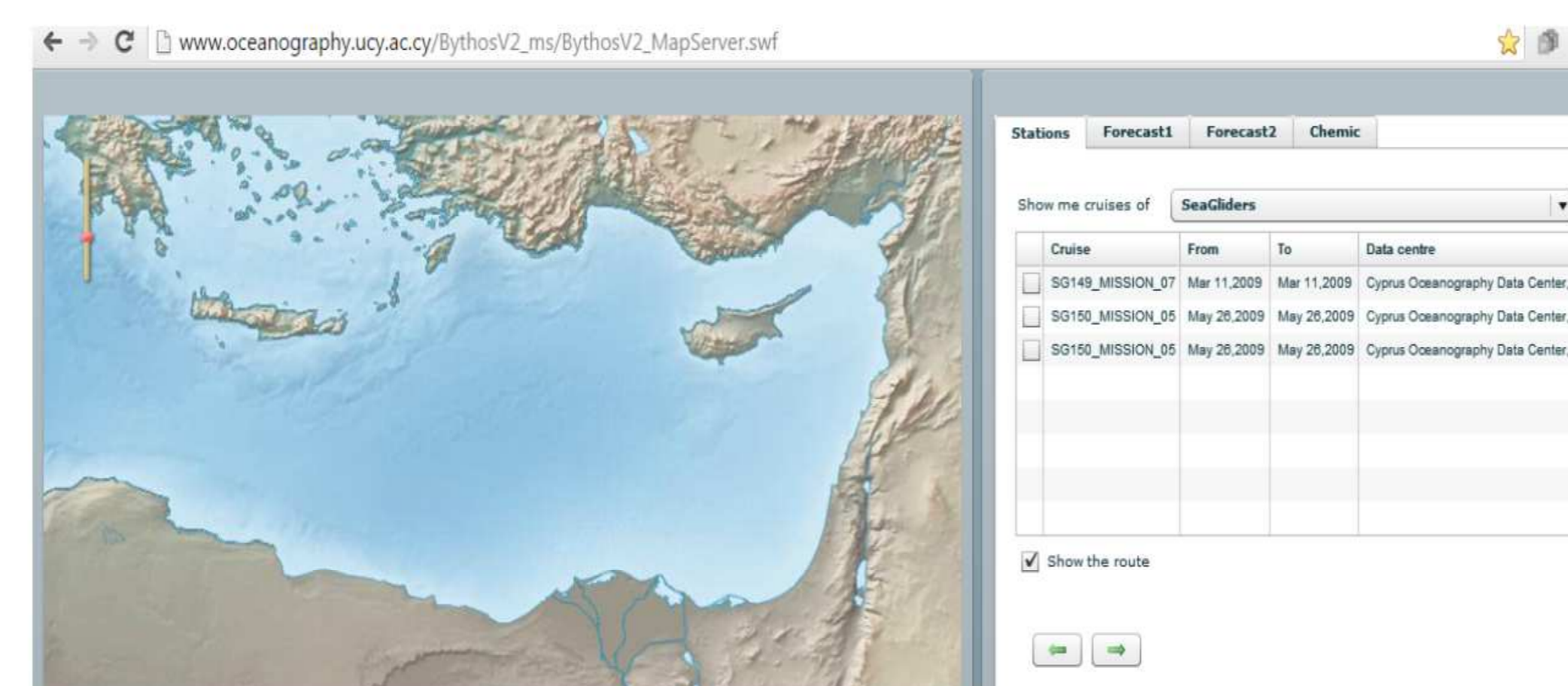## Forecast data access and visualization

At present BYTHOS provides access and visualization data which are obtained from the Cyprus Coastal Ocean Forecasting and Observing System (CYCOFOS). CYCOFOS provides a variety of operational predictions such as ultra high, high and medium resolution ocean forecasts in the Levantine Basin, offshore and coastal sea state forecasts in the Mediterranean and Black Sea, tide forecasting in the Mediterranean, ocean remote sensing in the Eastern Mediterranean and coastal and offshore monitoring.

As a rich internet application, BYTHOS enables scientists to search, visualize and download oceanographic data online and in real time. The recent improving of BYTHOS system is the extension with access and visualization of CYCOFOS data and overlay forecast fields and observing data. The CYCOFOS data are stored at OPENDAP Server in netCDF format. To search, process and visualize it the php and python scripts were developed. Data visualization is achieved through Mapserver.

The BYTHOS forecast access interface allows to search necessary forecasting field by recognizing type, parameter, region, level and time. Also it provides opportunity to overlay different forecast and observing data that can be used for complex analyze of sea basin aspects.

BYTHOS Front end – Results shown from search

-shows to the user a list of data collections available based on the performed search. The user may then select one or more data collections to be plotted on the map.

Sea surface velocity from CYCOFOS Aegean-Levantine model.

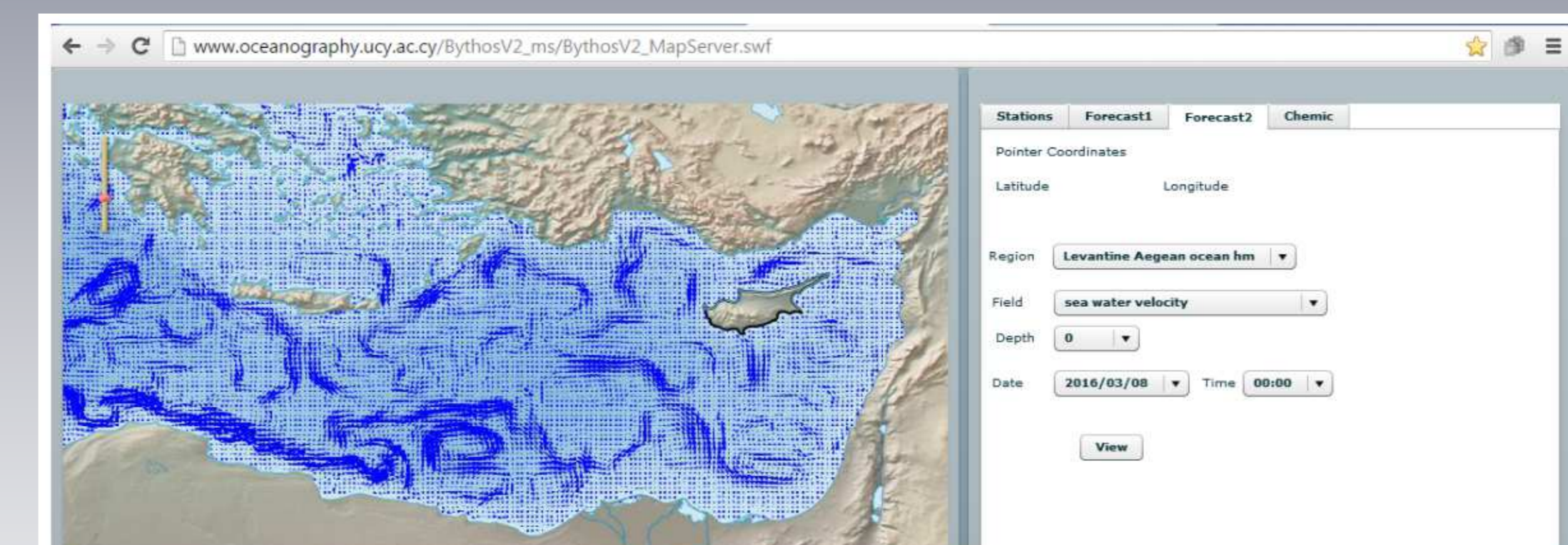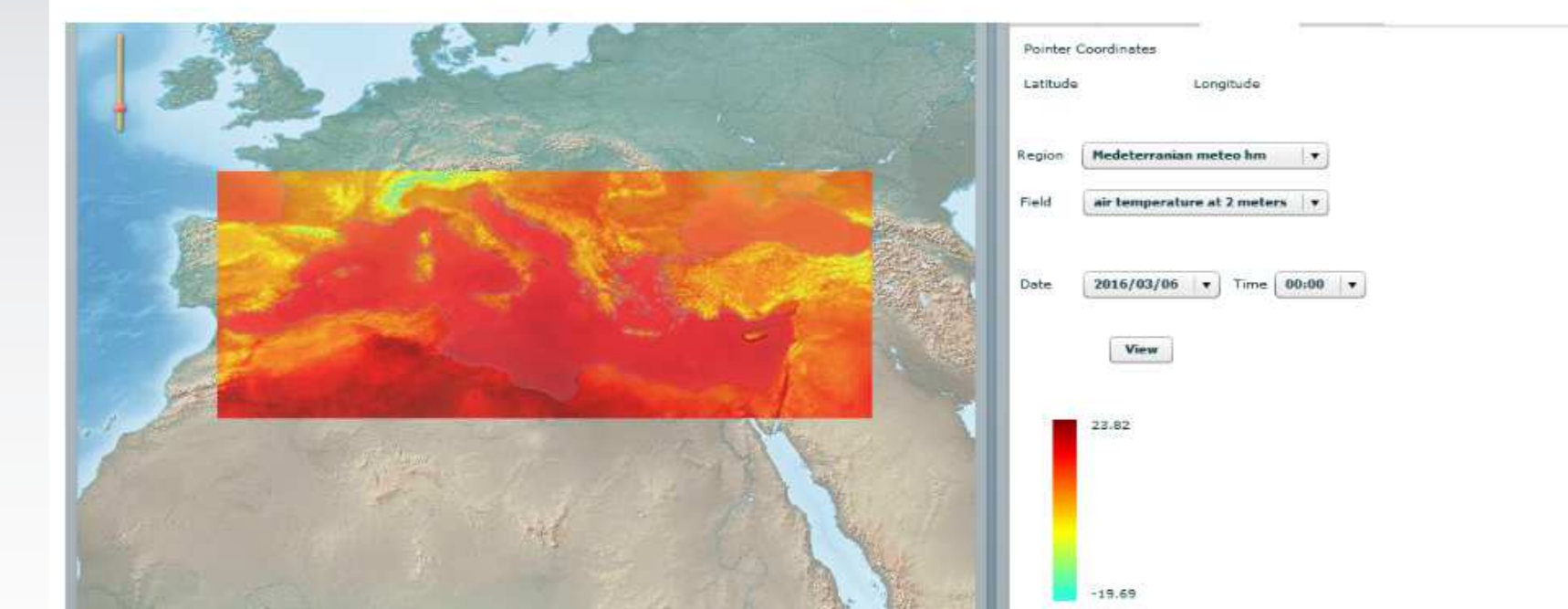Air temperature at 2m for the Mediterranean Sea from the SKIRON atmospheric model.

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[2]   Karaolia A., I. Constantinou, G. Zodiatis, D. Hayes, 2010. "Examples of online oceanographic data management in the Mediterranean and the Black Sea", Proceedings of the 5th International Conference on EuroGOOS, Coastal to Global Operational Oceanography: Achievements and Challenges, 354p, Exeter, UK, 20-22 May.
[4]   Zodiatis; G., Hayes, D., Stylianou, S., Constantinou, I., Karaolia, A., Koufou, E., Michael, S., and Zhuk,E., (2011). "Towards a new generation of BYTHOS system for data management in the Mediterranean and Black Sea", Geophysical Research Abstracts Vol. 13, EGU2011, 10411.