

# The CYCOFOS new Web GIS

Elena Zhuk, Marine Hydrophysical Institute, Russian Academy of Sciences (Russia),  
[alenixx@gmail.com](mailto:alenixx@gmail.com)

George Zodiatis, ORION Research (Cyprus), [oceanosgeos@gmail.com](mailto:oceanosgeos@gmail.com)

## CYCOFOS forecasting models

The Cyprus coastal ocean forecasting system, known as CYCOFOS provides operational hydrodynamical and sea state forecasts in the Mediterranean and the Black Sea since early 2002 (Zodiatis et al. 2003; 2008). Recently, it has been improved with the implementation of new hydrodynamic and wave models with the objective of targeting larger and higher resolution domains, at sub-regional and regional scales (Zodiatis et al. 2018a; 2018b). For the new CYCOFOS hydrodynamic modeling system a novel parallel version of the POM-Princeton Ocean Model has been implemented. The new CYCOFOS hydrodynamical model covers the entire Eastern Mediterranean with a resolution of 2 km and the Levantine Basin with 600 m, nested in the Copernicus Marine Environmental Monitoring Service of the Mediterranean Forecasting Center-CMEMS Med MFC, see Table 1 for the CYCOFOS hydrodynamical models configuration.

The new ECMWF wave model WAM CY46R1 (Ardhuin et al. 2010) implemented recently for CYCOFOS, covers the Mediterranean and the Black Sea using the SKIRON winds and provides hourly wave forecast on a daily base, see Table 1 for the CYCOFOS WAM configuration.

Both, hydrodynamical and wave models were validated against remote sensing SST, ARGO floats T/S profiles, in-situ wave time series and with parent models (Zodiatis et al. 2018).

CYCOFOS hydrodynamical models	Eastern Mediterranean	Levantine Basin	CYCOFOS wave model	Mediterranean & Black Sea
Model's domain	29N – 47N, 6W – 42E	31N – 37 N, 30E-36E	Model's domain	29N – 47N, 6W – 42E
Horizontal Resolution	2 km	600m	Horizontal Resolution	0.05 x 0.05 degrees
Vertical layers	30 sigma layers	30 sigma layers	Frequencies	25, range 0.0417 - 0.54764 Hz logarithmically spaced)
Initial/lateral boundaries	CMEMS Med MFC or NOAA	CYCOFOS East Med.	Directions and time steps	24 (equally spaced) 120 sec
Surface fluxes	SKIRON or ECMWF	SKIRON or ECMWF	Surface fluxes	SKIRON wind
Forecasting details	Daily: 6 hourly for 5 days	Daily: 6 hourly for 5 days	Forecasting details	Daily: hourly for 5 days

Table 1. The new CYCOFOS models configuration.

## CYCOFOS WEB GIS

The CYCOFOS Web GIS provides access and visualization of the forecasting sea currents, temperature, salinity, waves and winds data from the CYCOFOS modelling systems. The CYCOFOS WEB GIS <http://cycofos.orioncyprus.org/> was developed at the base of client-server architecture. CYCOFOS WEB GIS server provides the archiving of the CYCOFOS forecasting data from a dedicated ftp. Daily run python scripts extracting and preparing the forecasting parameters for visualization (Figure 1).

The CYCOFOS Web GIS User Interface was developed using jQuery and openLayers tools and provides the selection of the parameter and its visualisation. To access the CYCOFOS forecasting data it is necessary to select the region: Levantine Basin, East Mediterranean, Mediterranean Sea (includes the

Black Sea) and the forecasting parameters, such as waves, currents, temperature, salinity, hour, date and water depth.

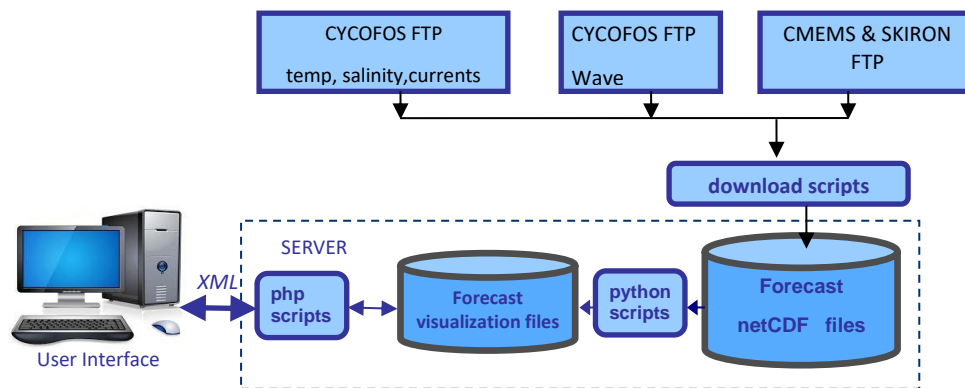


Figure 1: CYCOFOS WEB GIS structure

The selected CYCOFOS forecasting parameter is presented as a map (Figure 2). The CYCOFOS forecasting data are used also for the HERMES WEB GIS <http://hermes.orioncyprus.org/> providing data in the coastal areas of the North Aegean, SE Cyprus, Albania and Bulgaria and in addition will be used for the Black Sea WEB GIS, which is developed at the Marine Hydrophysical Institute, Russian Academy of Sciences.

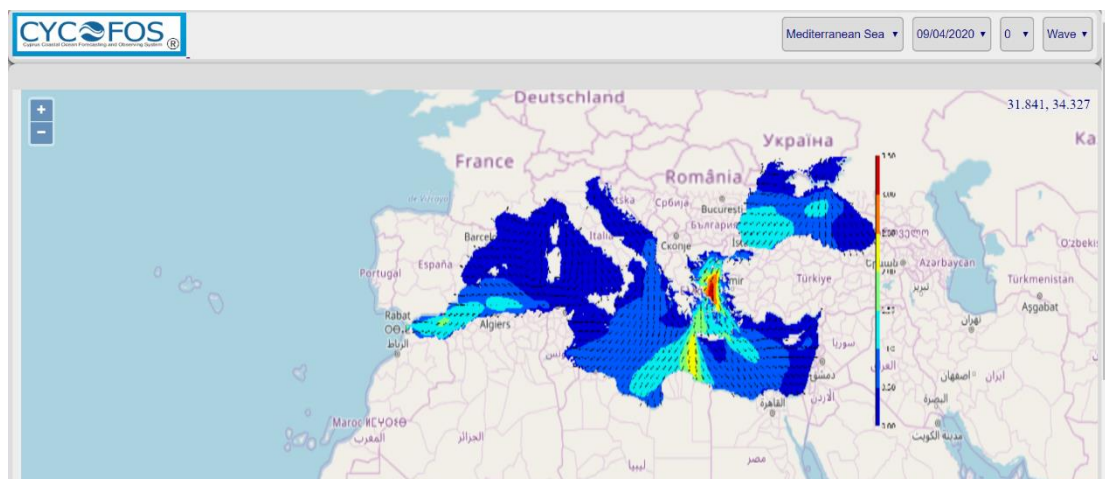


Figure 2: CYCOFOS WEB GIS User Interface : example of the waves visualisation.

Some modules were developed in the framework of the state task on theme No. 0827-2019-0002 “Operative Oceanology”.

## References

- Ardhuin F. et al. (2010), Semiempirical Dissipation Source Functions for Ocean Waves. Part I: Definition, Calibration, and Validation, *Journal of Physical Oceanography*, Vol. 40, pp. 1917-1941.
- Zodiatis et al. (2018b). Downscaling the Copernicus marine service in the Eastern Mediterranean. OM14A: Advances in Coastal Ocean Modeling, Prediction, and Ocean Observing System Evaluation. AGU, Ocean Science meeting, 11-16 February 2018, Portland, Oregon.
- Zodiatis et al. (2018a). Downscaling the Copernicus CMEMS Med-MFC in the Eastern Mediterranean: The new CYCOFOS forecasting systems at regional and sub-regional scales. *Proceedings of the 8th EuroGOOS International Conference “Operational Oceanography serving Sustainable Marine Development*, 3-5 October 2017, Bergen, Norway”, 305-310pp.
- Zodiatis et al. (2008), Operational ocean forecasting in the Eastern Mediterranean: implementation and evaluation, *Ocean Science*, 4, 31-47.
- Zodiatis et al. (2003). High resolution nested model for the Cyprus, NE Levantine Basin, eastern Mediterranean Sea : implementation and climatological runs, *Annales Geophysicae*, 21, 221-236.