

RSCy: “Fifth International Conference on Remote Sensing and Geoinformation of Environment”, 20-23 March, 2017 - Cyprus



## Operational use of open satellite data for marine water quality monitoring

Panagiotis Symeonidis, Theodoros Vakkas

# > About GET



GeoInformatics



Open Data



Business Intelligence



Environment

We give value to Geospatial Information

# > Objective



The purpose of this project was to develop an **operational platform** for **marine water quality monitoring** using **near real time satellite** data.

The platform utilizes **free** and **open** satellite data available from different data sources like **COPERNICUS**, the European Earth Observation Initiative, or **NASA**, from different satellites (TERRA, AQUA, GOES, METOP, MSG, NPP) and instruments (MODIS, VIIRS, AVHRR, AATSR, AMSR-E, TMI).

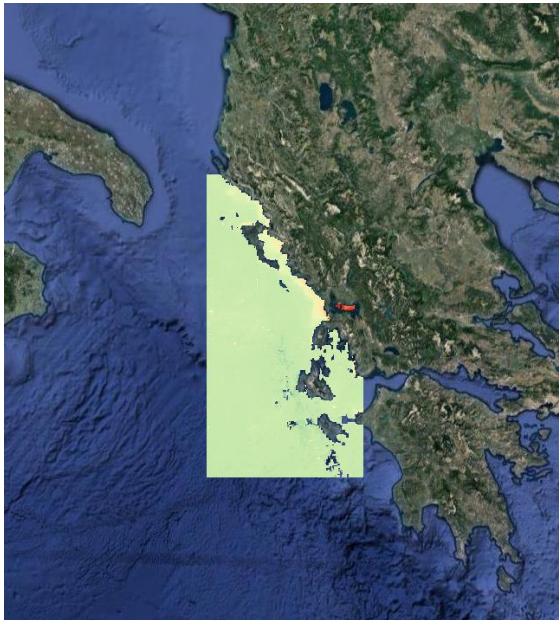
Developed for the IPA **Greece-Albania** Cross-Border Programme:  
“SA.I.MO.N.: SAtellite Near Real Time MOnitoring Network of the eutrophication risk for the marine waters over the Greek-Albanian crossborder area”



# > Study Area



Ionian Sea

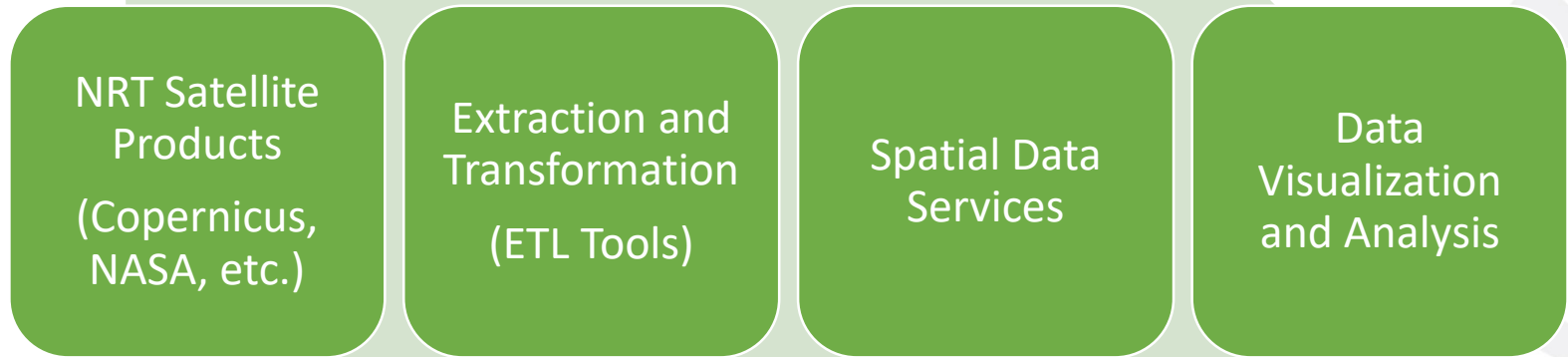


Can be extended to:

Mediterranean and Black Sea



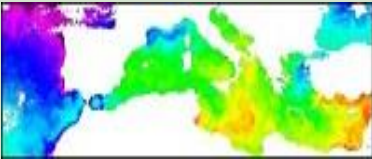
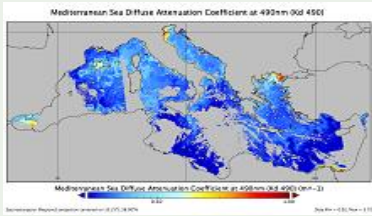
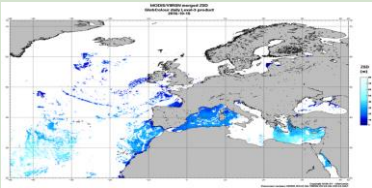
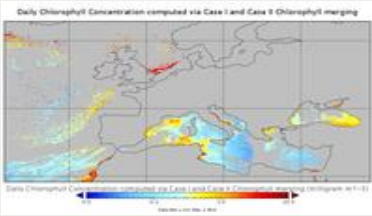

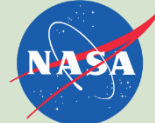

# > Methods





# > Datasets



Parameter	Source	Satellite Sensor	Coverage
SST	Copernicus, NASA JPL	AVHRR, SEVIRI, MODIS, AATSR, AMSR-E, TMI	
kd490	Copernicus	MODIS, VIIRS	
ZSD	ESA	MODIS, VIIRS	
Chlorophyll	Copernicus	MODIS, VIIRS	
Data sources:	 European Space Agency		 Europe's eyes on Earth

# > The Copernicus Open Data Service



- Access to **OPEN Earth Observation** Data including:
  - Satellite images and products
  - Model data
  - In-situ measurements
- With 6 different **themes** it provides information on:
  - Land
  - **Marine**
  - Atmosphere
  - Emergency Management
  - Climate Change
  - Security
- Services: FTP, WMS, Sub-setting

## Marine Environment Monitoring Service

**COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE**  
Providing PRODUCTS and SERVICES for all marine applications

Search terms  OK

ABOUT US | BENEFITS | NEWS | SCIENCE & LEARNING | TRAINING | SERVICES PORTFOLIO

ACCESS TO PRODUCTS  
Search and download your datasets!

SELECT your:

AREA  
PARAMETERS  
TIME COVERAGE  
OBSERVATIONS/MODELS

PDF CATALOGUE | OBSERVATIONS OVERVIEW  
ONLINE CATALOGUE | MODELS OVERVIEW

GLOBAL OCEAN  
ARCTIC OCEAN  
BALTIC SEA  
EUROPEAN NORTH WEST SHELF SEAS  
IBERIA-BISCAY-IRELAND REGIONAL SEAS  
MEDITERRANEAN SEA  
BLACK SEA

2019 13 OCT

**SHORT-CUT TO SERVICES**

- REGISTER NOW!
- VALIDATION STATISTICS
- ONLINE TUTORIALS
- COLLABORATIVE FORUM

**LATEST NEWS FLASH**  
CMEMS 4716  
Infrastructure Maintenance on Monday, 17 October 2016  
INFORMATION

ALL NEWS FLASH

## Marine Products Catalogue

ONLINE CATALOGUE

CATALOGUE PDF

FIRST VISIT?

MY CART 0

Found 6 products matching your criteria.

KEYWORD SEARCH  SEARCH

**YOUR SEARCH**

NEW SEARCH

**AREA**

- ☐ All areas
- ☐ Global Ocean (1)
- ☐ Arctic Ocean (1)
- ☐ Baltic Sea (2)
- ☐ European North-West Shelf Seas (3)
- ☐ Iberia-Biscay-Ireland Regional Seas (3)
- ☒ Mediterranean Sea (6)
- ☐ Black Sea (3)

**PARAMETER**

- ☒ All parameters
- ☐ Ocean Temperature (2)
- ☐ Ocean Salinity (0)
- ☐ Ocean Currents (0)
- ☐ Sea Ice (0)
- ☐ Sea Level (0)
- ☐ Winds (1)
- ☐ Ocean Optics (1)

**MEDITERRANEAN SEA SURFACE CHLOROPHYLL CONCENTRATION FROM SATELLITE OBSERVATIONS**

Satellite-observation, Ocean-chlorophyll, Near-real-time, Mediterranean-sea

OCEANCOLOUR\_MED\_CHL\_L3\_NRT\_OBSERVATIONS\_009\_040

For the Mediterranean Sea - Surface Chlorophyll (mg m<sup>-3</sup>, 1 km resolution) is operationally produced using regional ocean color algorithms. The Group for Satellite Oceanography (GOS-ISAC) of the Italian National Research Council (CNR), in Rome, uses an updated version of the algorithm reported in Santoleri et al. (2008) for case 1 waters for near real time and delayed time data from MODIS-Aqua and NPP-VIIRS sensors.

**EUROPEAN SEA SURFACE CHLOROPHYLL CONCENTRATION FROM MULTI SATELLITE OBSERVATIONS**

Satellite-observation, Ocean-chlorophyll, Near-real-time, North-west-shelf-seas, Black-sea, Iberia-biscay-irish-seas, Mediterranean-sea

OCEANCOLOUR\_EUR\_CHL\_L3\_NRT\_OBSERVATIONS\_009\_050

This product is operationally produced by merging the daily CHL regional products over the Atlantic Ocean, the Baltic Sea, the Black Sea, and the Mediterranean Sea. Single CHL daily images are the Case I - Case II products, which are produced accounting for bio-optical differences in these two types of water.

# > GLOBCOLOUR



- **GlobColour** program began in 2005 as an **ESA** program **Data User Element (DUE)** in order to provide continuous monitoring of sea (as **level 3**, gridded data).
- In the program were involved both **ESA** and **NASA**.
- Since 2008, the GlobColour program serves more than 600 users worldwide providing **real-time and archive** data.
- Data is available from the portal: <http://hermes.acri.fr>

- Many parameters:  
**Biochemical, atmospheric, surface, seabed**
- **Global** coverage with **4km** resolution and for **European** regions with **1km** resolution
- **Daily, weekly and monthly** products
- **Merged** satellite products

The screenshot displays the GlobColour portal interface. At the top, the ACRI logo and navigation links (Home, GlobColour products, OSS2015 demonstration products, FTP Access, About GlobColour, Product user guide, Contact-us) are visible. The main header features the Hermes logo. Below the header is a large satellite image of a coastal area. The central part of the interface shows a world map with a selection tool. To the right of the map is a configuration panel with the following sections:

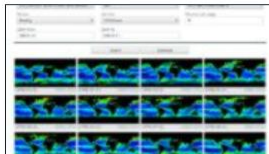
- Area:** Radio buttons for Global (selected), Europe, Sinusoidal (L3b), and Plate carrée (L3m).
- Resolution:** Checkboxes for 4 km (checked), 25 km, and 100 km.
- Date or period:** Date range from 01/09/1997 to 21/03/2017.
- Binning period:** Checkboxes for daily (checked), 8-days, and monthly.
- Sensor type:** Checkboxes for merged (checked), meris, modis, seawifs, and viirs.
- Select product parameters:** A section with a 'Check/Uncheck All' checkbox and various parameter checkboxes:
  - Biochemical:** CHL1 (checked), CHL2, TSM, PIC, POC, NFLH.
  - Atmospheric Optical:** WVCS, T865, A865, T443, A443, T550, A550, CF, ABSD.
  - Ocean Surface Optical:** NRRS412, NRRS443, NRRS469, NRRS490, NRRS510, NRRS531, NRRS547, NRRS551, NRRS555, NRRS560, NRRS620, NRRS645.



# > OceanColor Web



- **OceanColor Web** is the Earth Observation repository of the marine environment of **NASA**. The web portal can be found at: <http://oceancolor.gsfc.nasa.gov>
- The portal provides **archive** and **near real-time** data from various missions (MODIS TERRA, MODIS AQUA, VIIRS SNPP, SEaWiFS, CZCS, MERIS, OCTS) and for various analysis and processing levels (L1, L2, L3, L4).



## Composite Browser

Access a range of products composited in different periods. Data can be searched by time ranges, periods, products & wavelengths. Version one datasets available now.



## OPeNDAP

A freely available framework that simplifies all aspects of scientific data networking, making local data available to remote locations regardless of storage format.



## Web GIS Portal

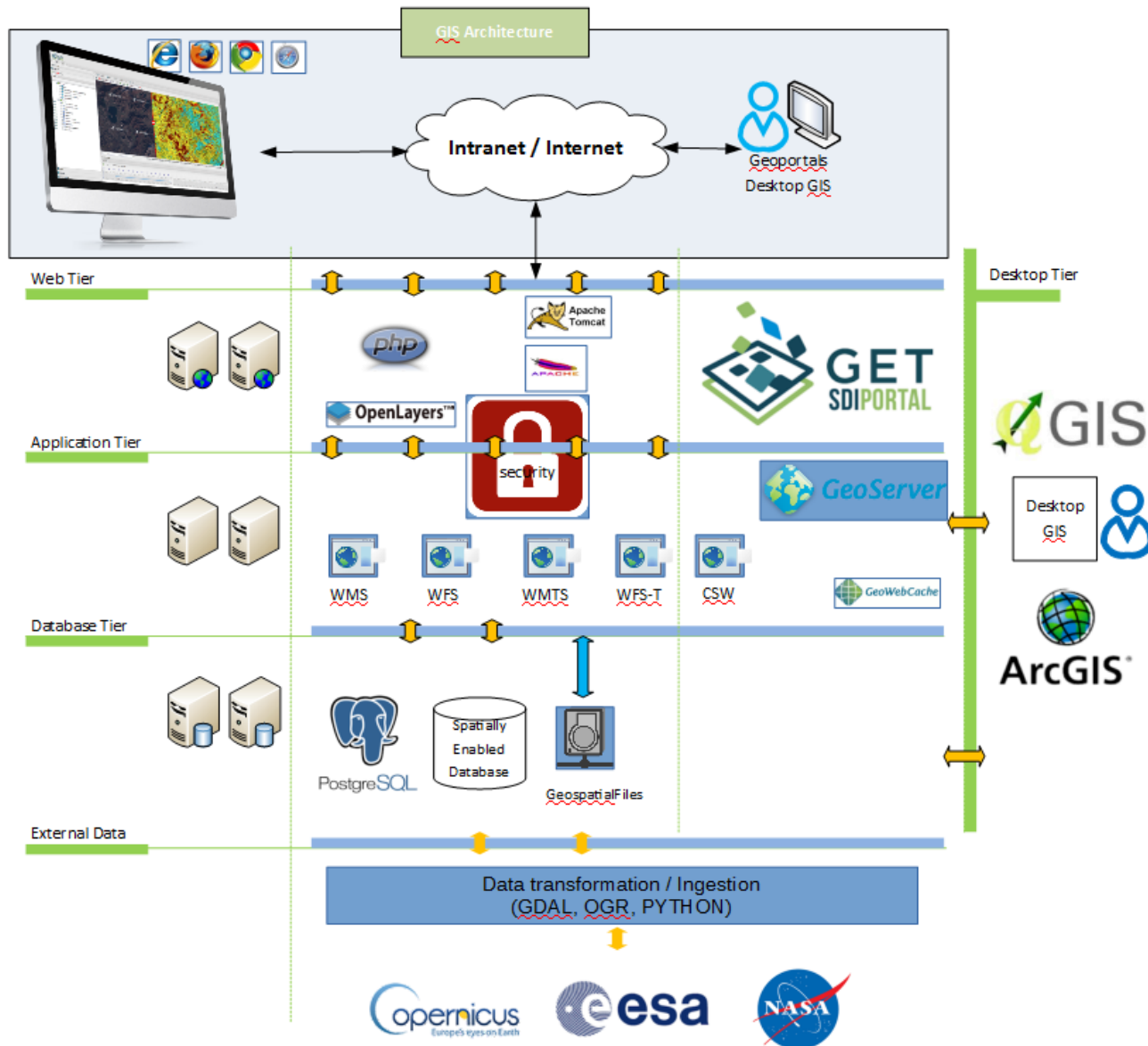
View, manipulate & analyse data. Version one datasets available now.



## FTP

Download large sets of data easily. Version one datasets available now.

# > The platform: Architecture



# > The platform: Functionalities



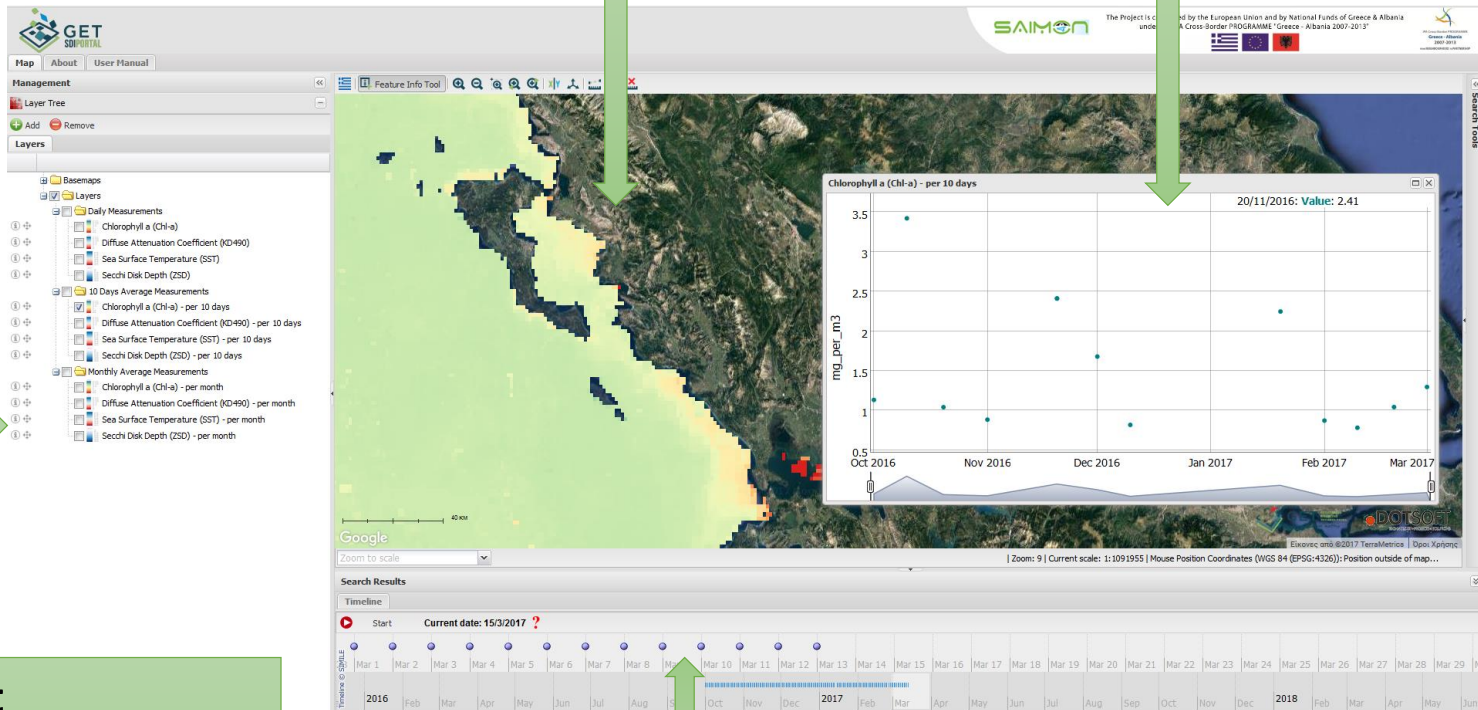
- Web Map interface for data visualization and analysis (based on the **GET SDI PORTAL**)
- Access to data using standard **OGC web services**: WMS, WCS
- **Satellite** products available as map overlays (daily, 10 days, monthly averages)
- Ability to add data from **external data sources** using OGC services
- Raster datasets are styled using **SLD**
- Time enabled **rasters**
- Time series chart using point info tool

# User Interface



## Interactive Map

## Time series chart



## Layer List

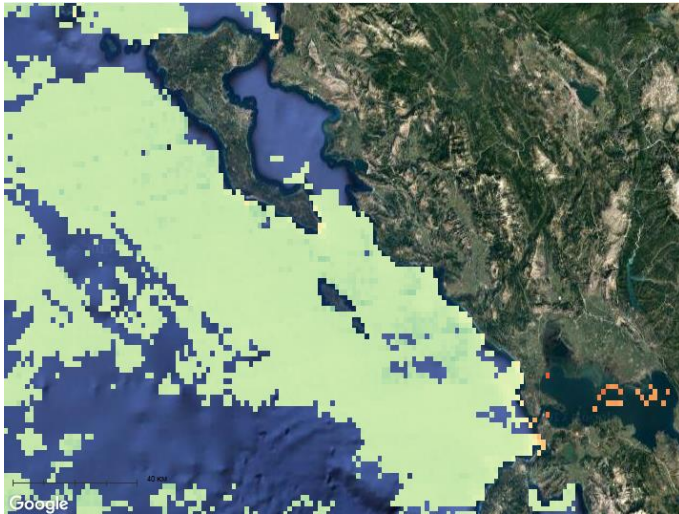
- Base Maps
- Overlays
- Layer actions
- Add external data

## Time

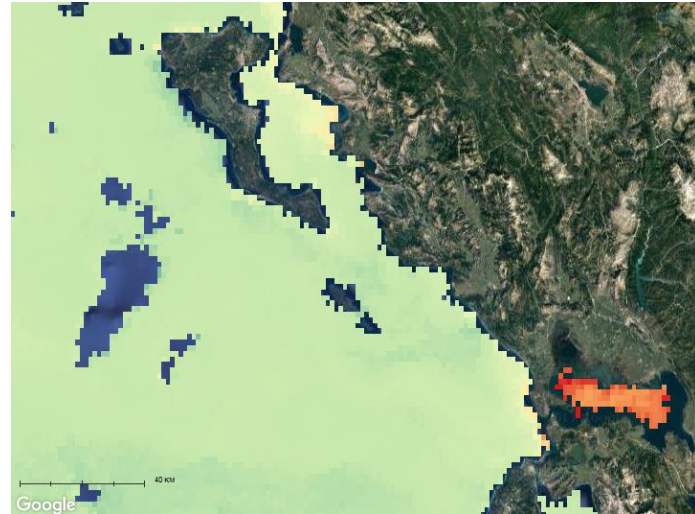
- Selection of date
- Data animation



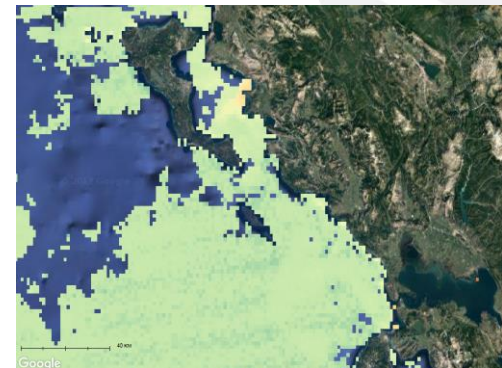
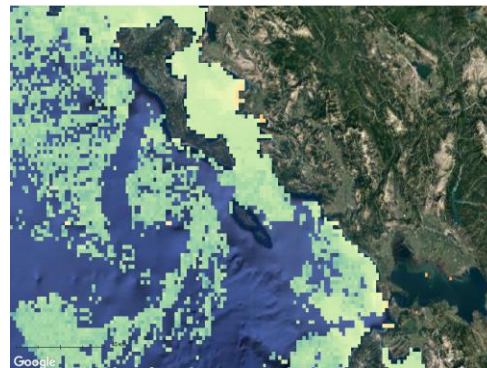
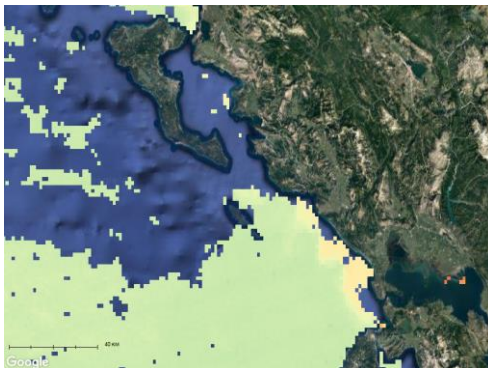
# > Results



Chlorophyll-a (VIIRS)



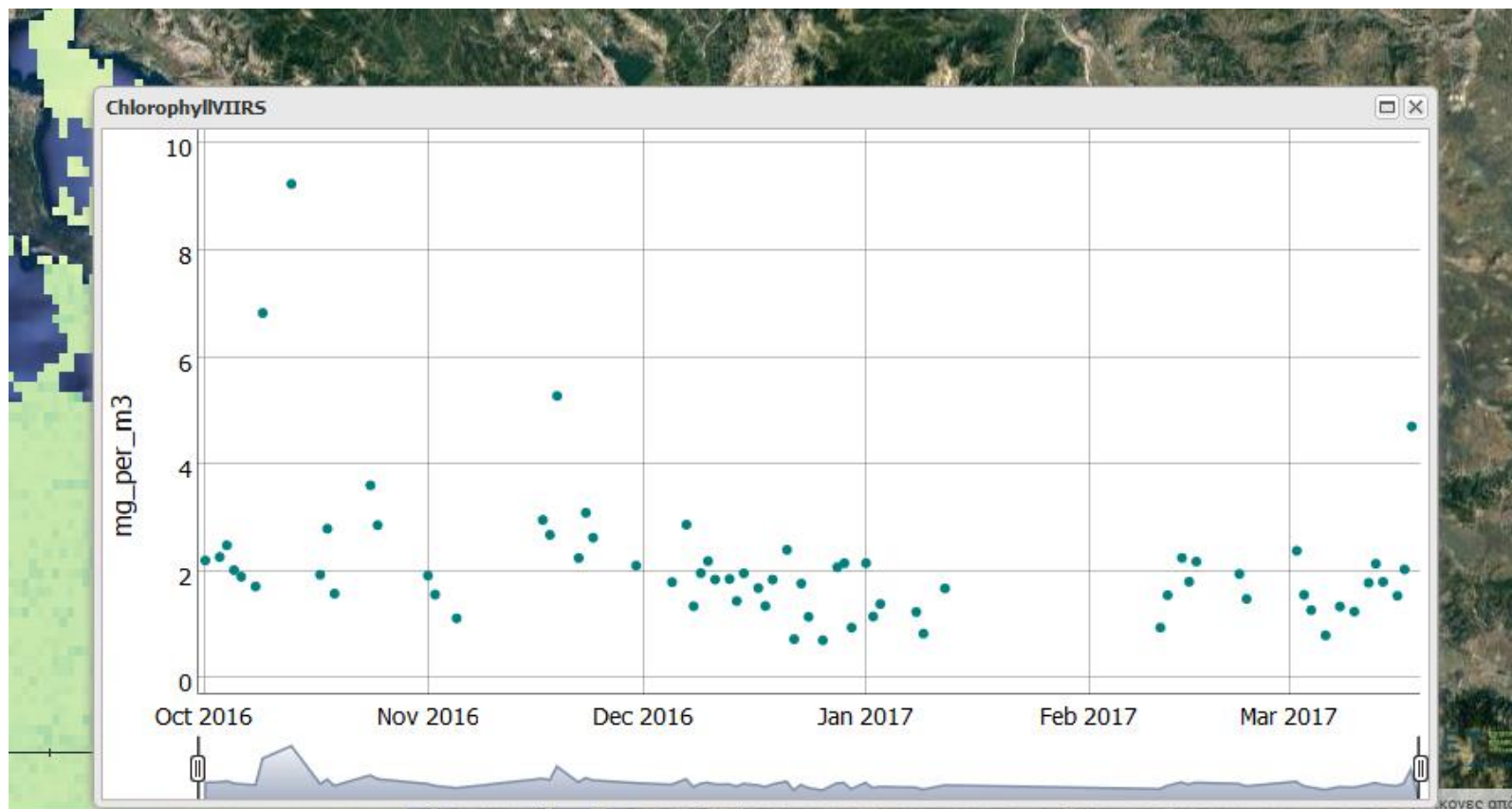
Chlorophyll-a (MODIS)



Chlorophyll-a concentration during different days



# > Results



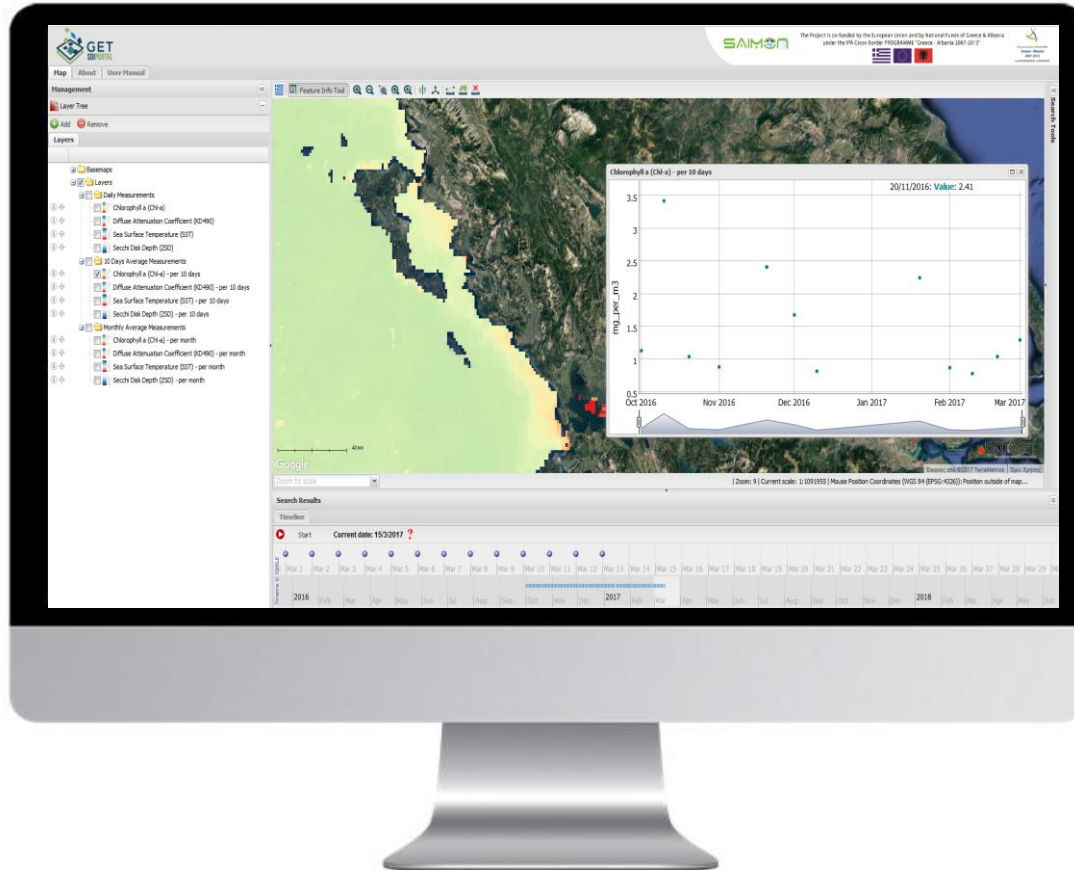
## > Next Steps



- Provide additional parameters (sea physics, biogeochemistry, in-situ measurements)
- Provide access to **forecast** data
- Increase **spatial resolution** using **Sentinel** data products
- Integration with **Sentinel HUB** service
- Develop **alert** mechanism for areas that observed values exceed limits
- Provide additional spatial **analysis** tools like cross section or additional services like WCPS
- Extend area of service. **Cloud** platform installation.



# > LIVE DEMO



<http://saimon.getopendata.gr/>

 Thank you!



## **GEOSPATIAL ENABLING TECHNOLOGIES**

43 Poseidonos Av. & Chrysostomou Smyrnis Str.  
Moschato – 18344, Attica, Greece

**T** +30 210 6664192

**F** +30 210 6663979

**E** [contact@getmap.gr](mailto:contact@getmap.gr)

 /getmapgr

 Geospatial Enabling Technologies

[www.getmap.eu](http://www.getmap.eu)