

# **INTRODUCTION TO ODYSSEA PROJECT, ITS PLATFORM AND MODELS CONTRIBUTION TO BWM CONVENTION IMPLEMENTATION**

**Webinar on the implementation of the International Convention for the Control and Management of Ships' Ballast Water and Sediments in the Mediterranean region**

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# What is ODYSSEA



ODYSSEA is a Mediterranean-focused research project funded by EU Research and Innovation Program Horizon 2020

- 28 partners from 14 countries (6 non-EU)
- 8.398 Meuros budget
- 54 months duration
- Starting date 1<sup>st</sup> June 2017
- Ending date 30<sup>th</sup> November 2021
- 932 PMs in total
- 118 researchers involved
- 7 Advisory Board Members

# Horizon 2020



Horizon 2020 is the biggest EU Research and Innovation program ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract.

Achievements: scientific breakthroughs, discoveries and world-firsts by taking great ideas **from the lab to the market.**

# The EU Blue Growth Strategy



ODYSSEA

- Long term strategy to support sustainable growth in the **MARINE** and **MARITIME** sectors as a whole.
- Leads to achieving the Europe 2020 Strategy for Smart, Inclusive and Sustainable Growth.
- Recognizes that seas and oceans have great potential for innovation and growth.
- Considers the blue economy as a driver for Europe's welfare and prosperity.
- **KEY ISSUES: Jobs and Sustainability**



# Marine Open Data



ODYSSEA



EMODnet



European Marine  
Observation and  
Data Network



EGO



OneGeology

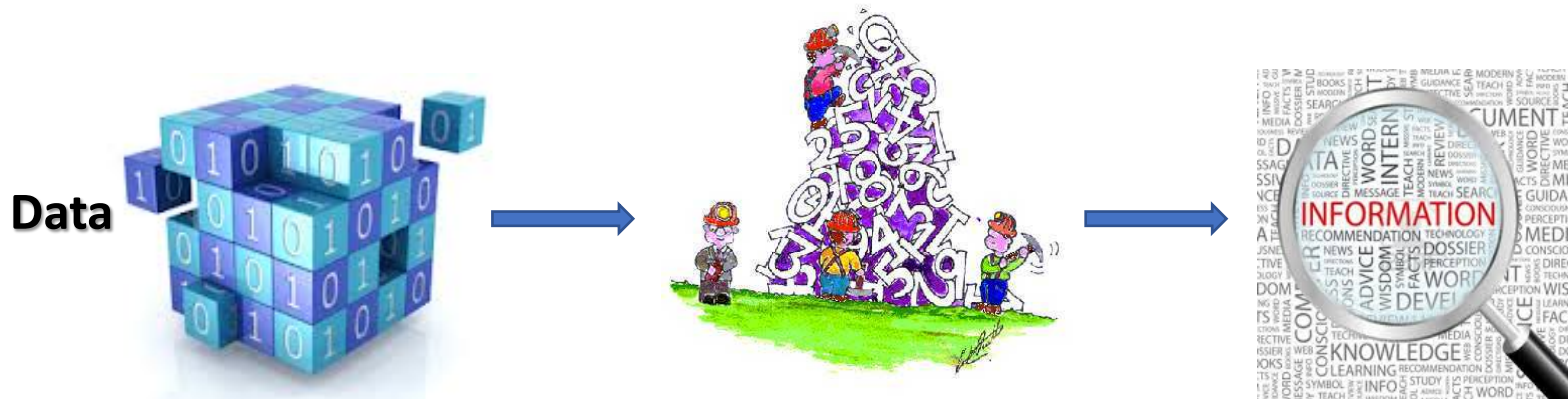


British Oceanographic  
Data Centre

NATURAL ENVIRONMENT RESEARCH COUNCIL



# Data to Information

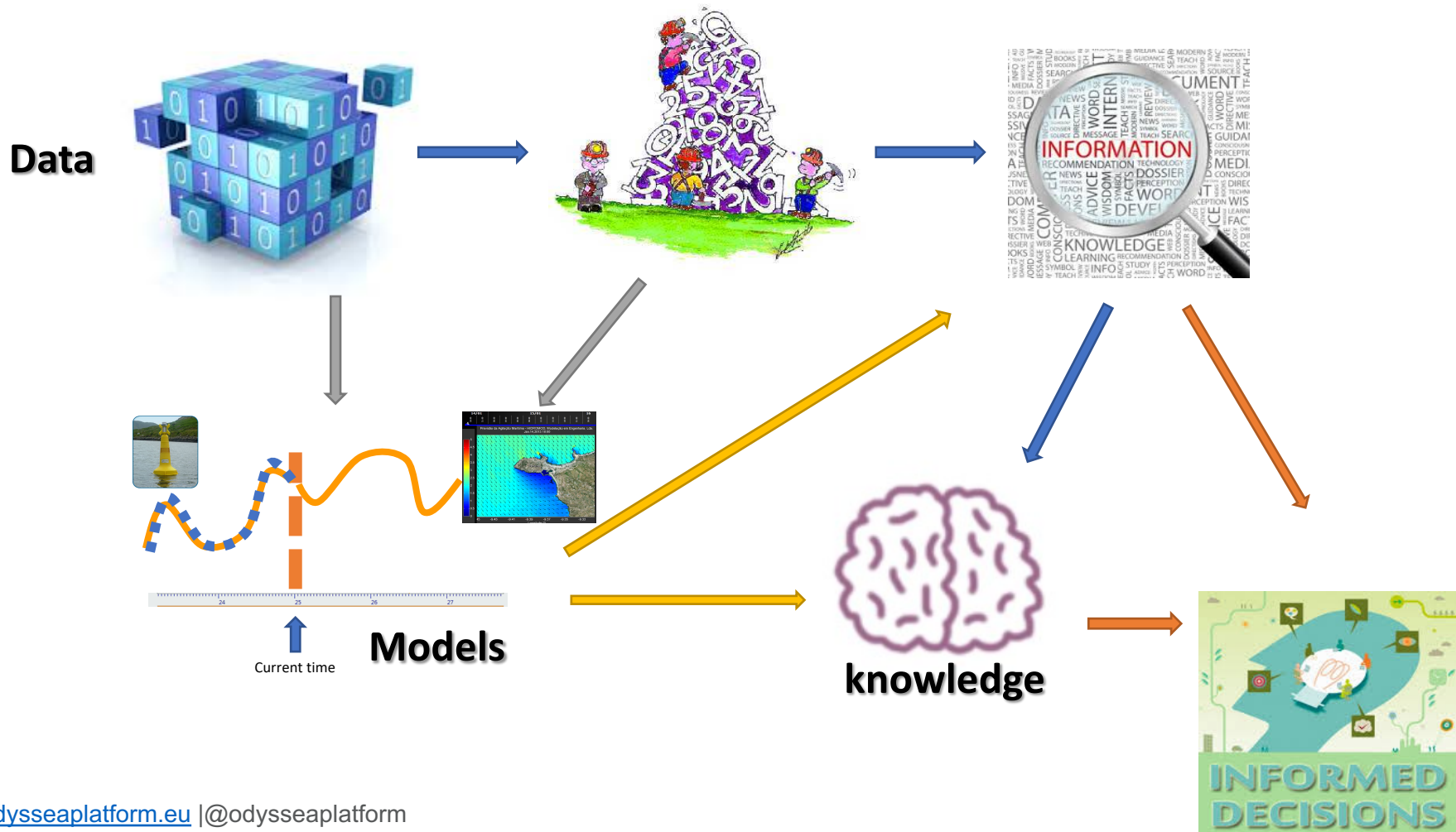


Water Temperature is 28°C

If Water Temperature is higher than 26°C for more than 5 days then 'HEAT STRESS'

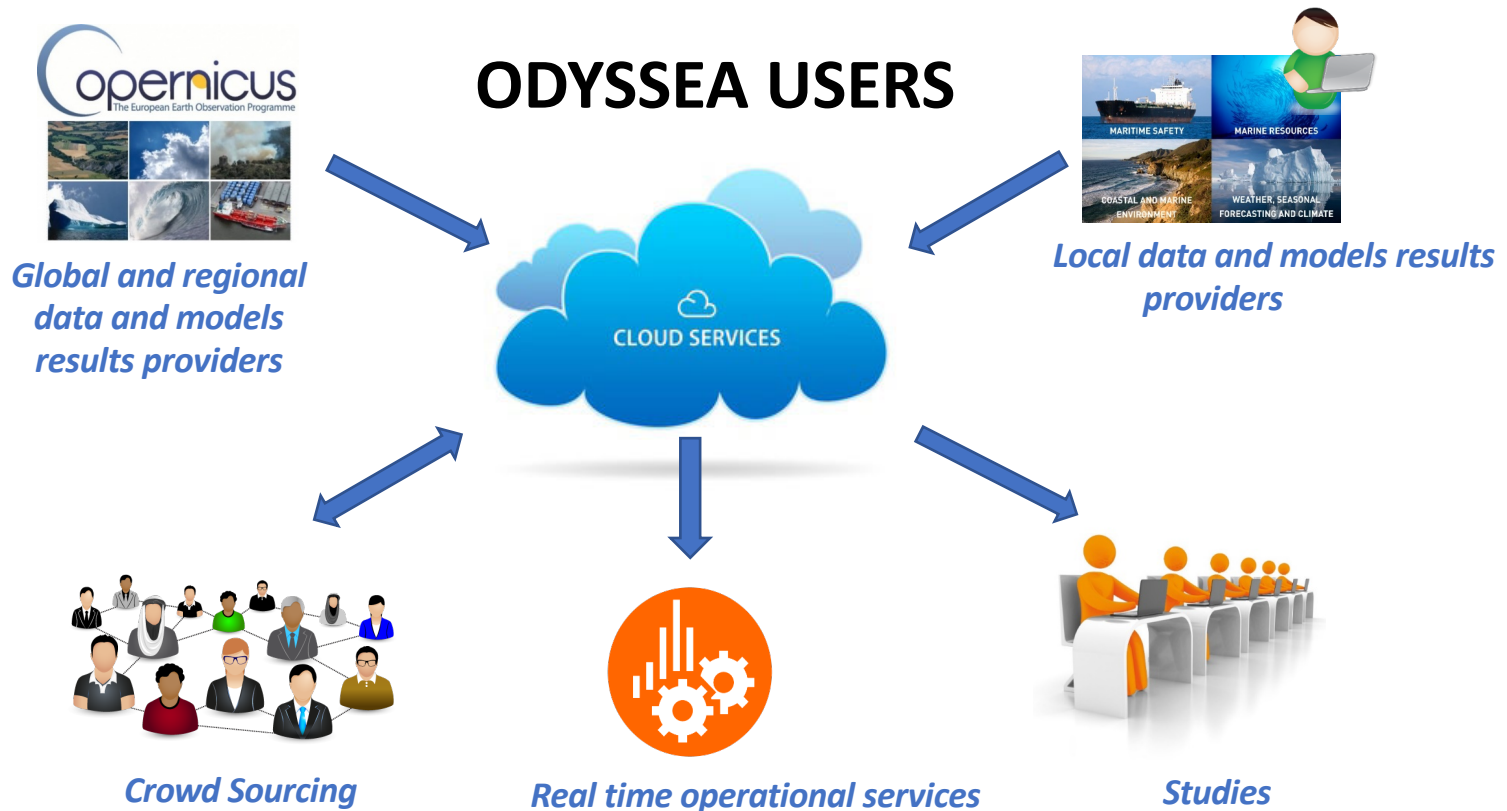
High probability of fish mortality

# Data to Information



# Sustainability

Business strategy to provide end-user services and ensure long-term sustainability



# ODYSSEA Central Objective



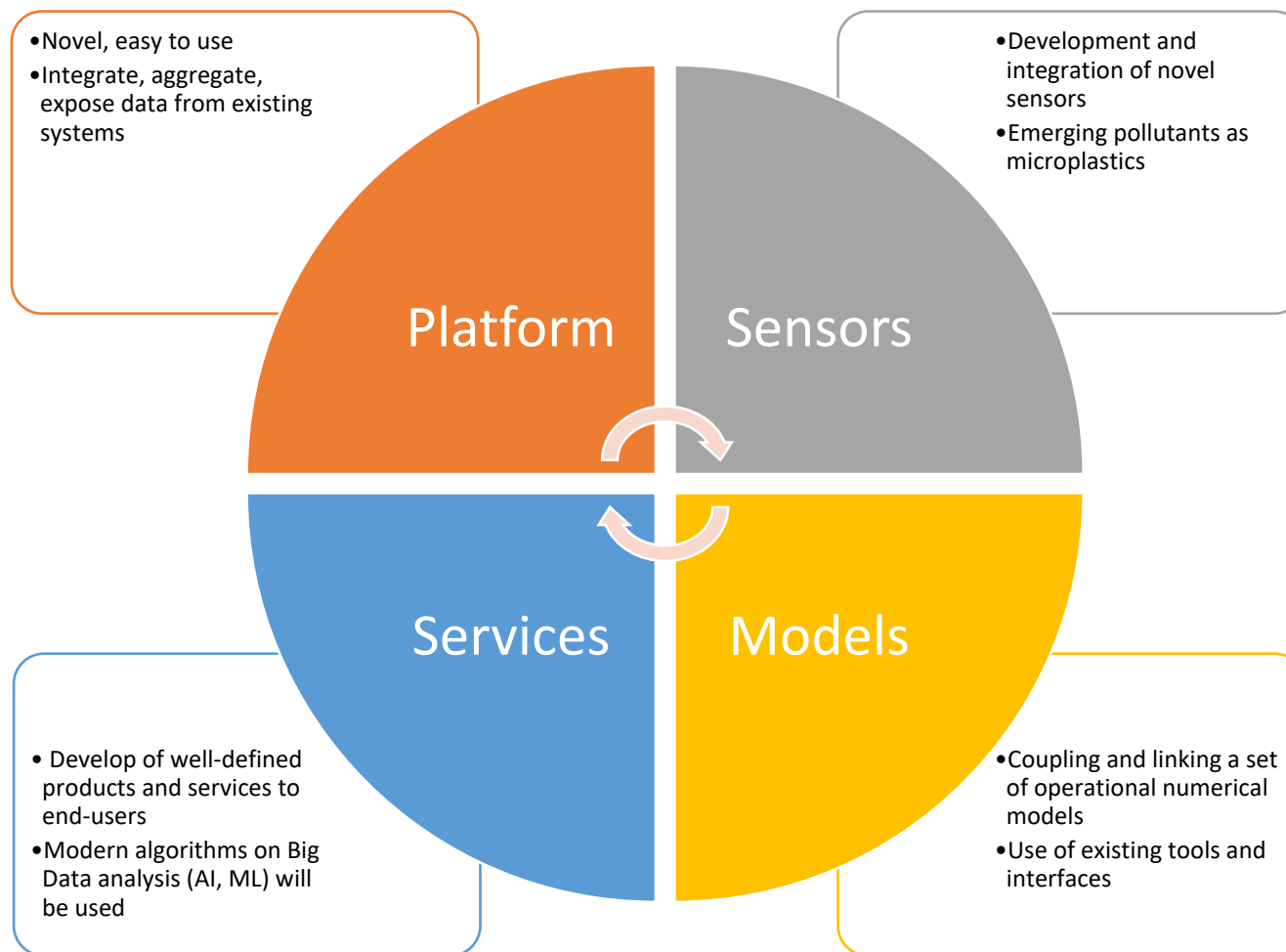
ODYSSEA is a user-centred project aiming to make Mediterranean marine data easily accessible and operational to multiple end-users, by

- harmonizing existing Earth Observing systems,
- upgrading operational oceanographic capacities,
- supporting EU policy implementation,
- improving interoperability in monitoring,
- fostering blue growth jobs creation, and
- opening participation to non-EU member states.

# ODYSSEA Pillars



ODYSSEA



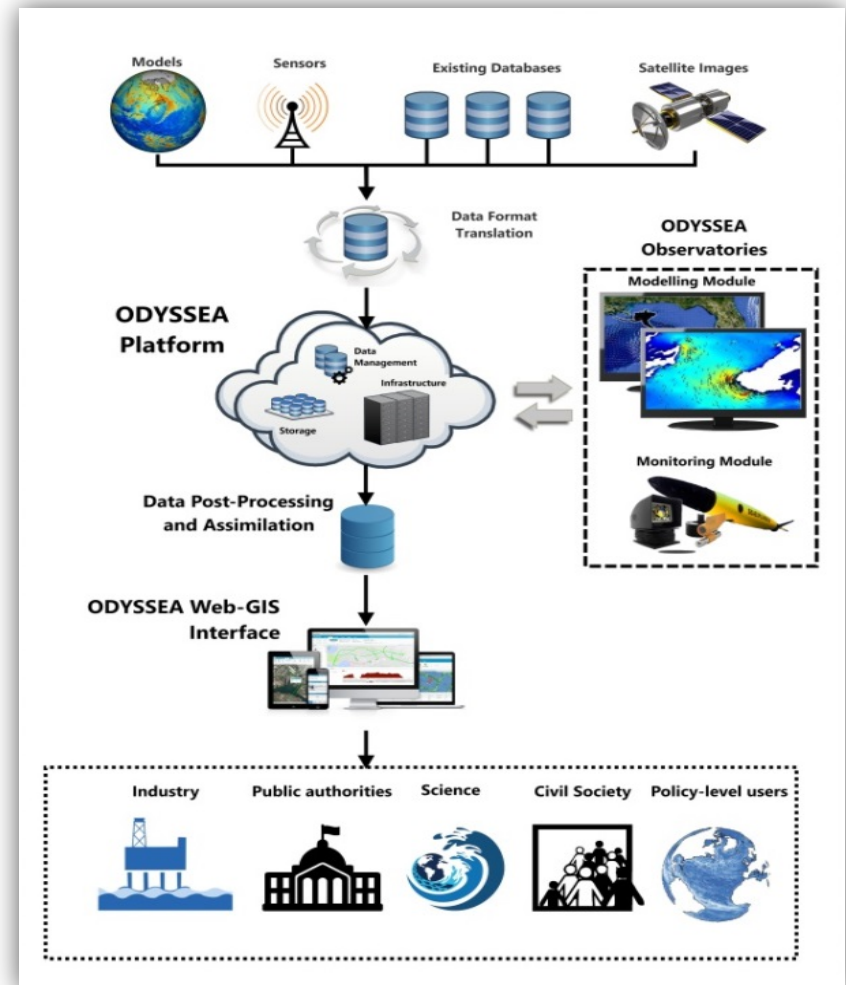


# What is ODYSSEA ?



ODYSSEA is a system bridging the gap between operational oceanography capacities and the need for information on marine conditions from the community of end-users.

ODYSSEA's ambition is to develop an **interoperable, fully-integrated and cost-effective multiplatform network of observing and forecasting systems** across the Mediterranean basin, addressing both the open sea and the coastal zone.



# ODYSSEA's Main Novelties



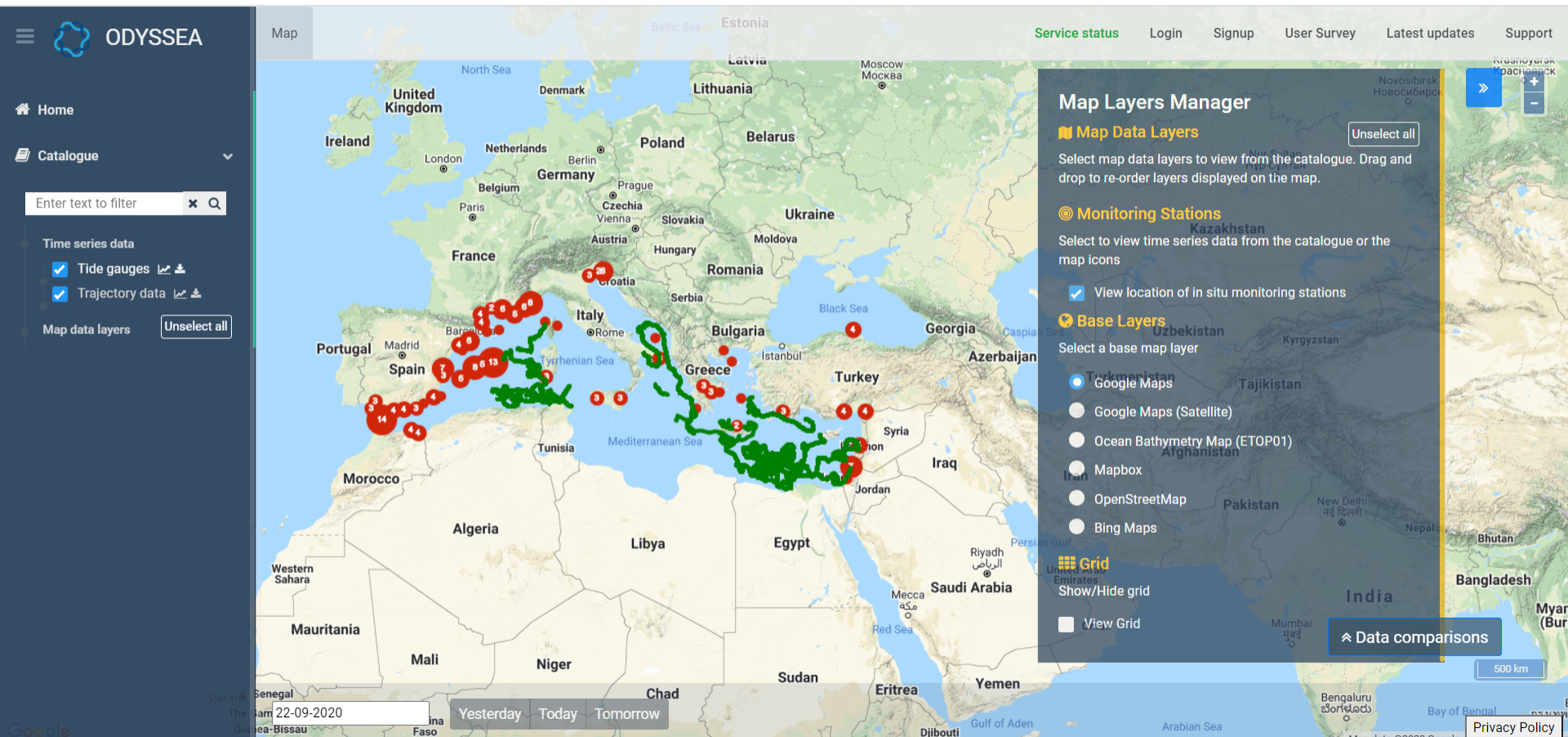
- Both primary data and on-demand derived data services will be made available and accessible through **a single command and via a single public portal**.
- The platform will allow to **search, collect, retrieve and integrate datasets** obtained from an expanded range of existing observational systems.
- To reduce costs and ensure active participation of end-users on ODYSSEA platform, **existing facilities (onshore and offshore)**, such as oil and gas terminals and rigs, mariculture installations, ports and harbours, **will be used to deploy static sensors**.
- Gliders will **integrate marine microplastics sensor and novel sensors** for real-time biological monitoring.
- Operational models will be coupled and running in each Observatory providing forecasts and **informing end-users on emergencies and risks**.
- Local/regional/national policy-makers and end-users will be **trained on the optimal platform usage**.



# ODYSSEA Platform v0.8



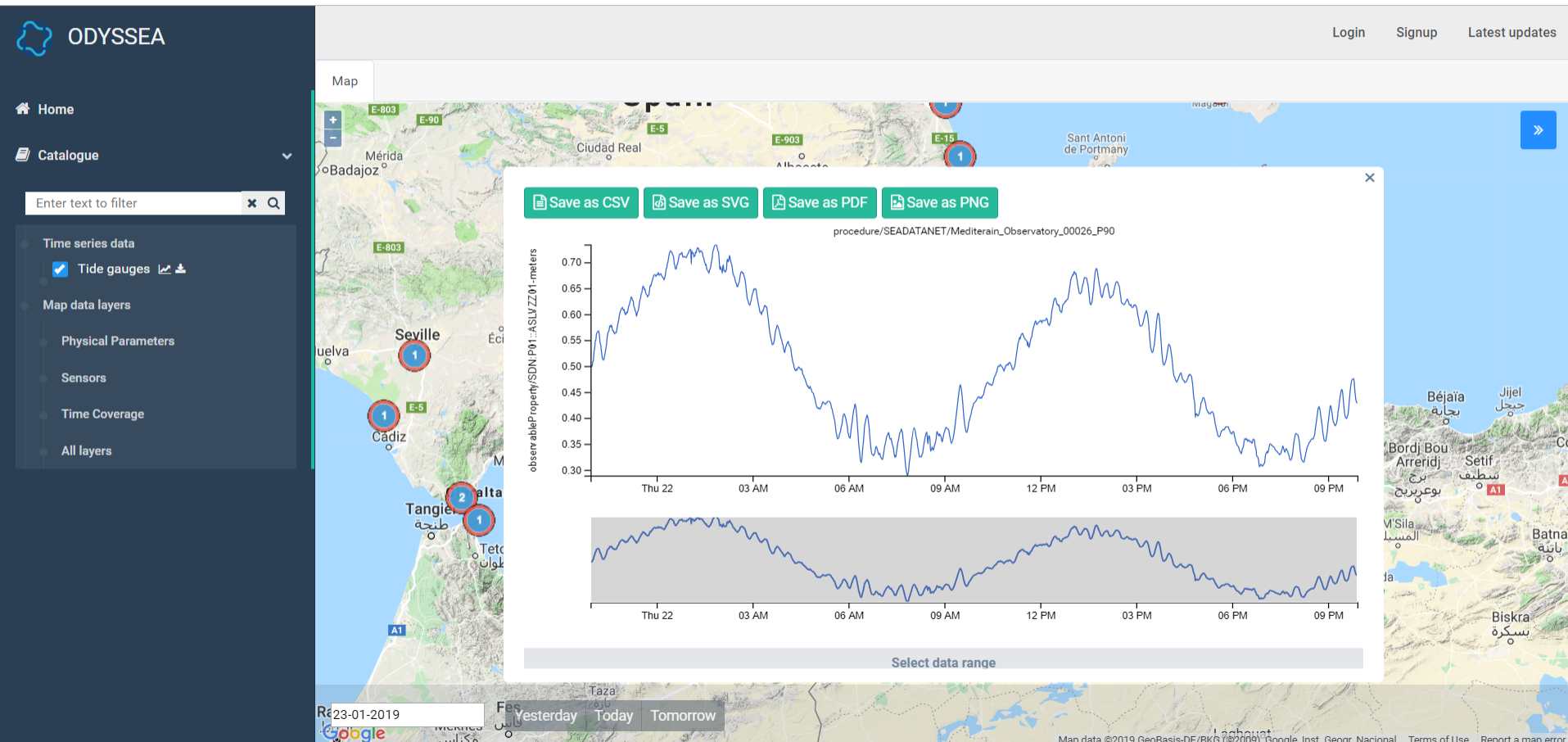
## Static and Mobile Sensors – Mediterranean Sea



# ODYSSEA Platform v0.8



## Tidal Sea Level Variability – Mediterranean Sea

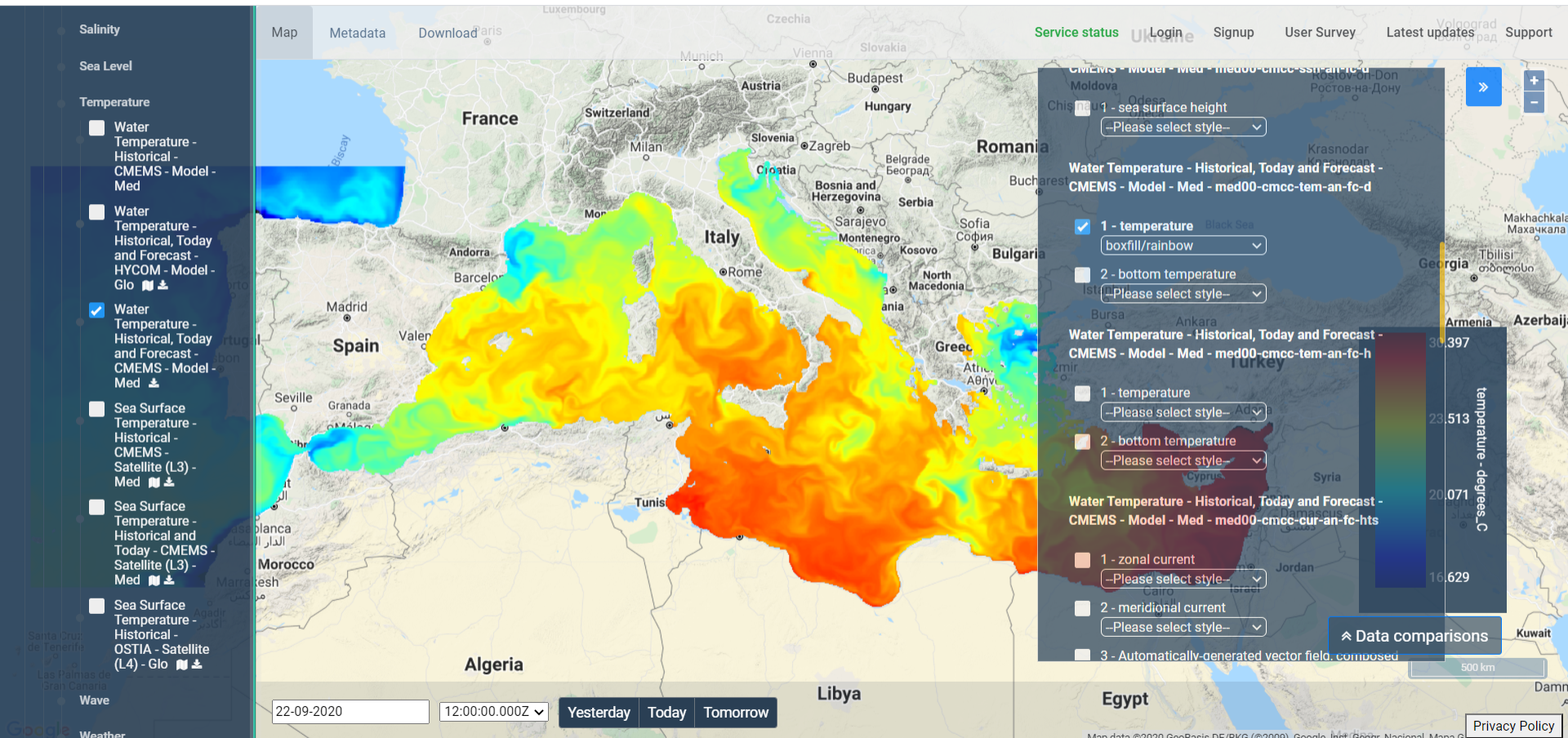




# ODYSSEA Platform v0.8



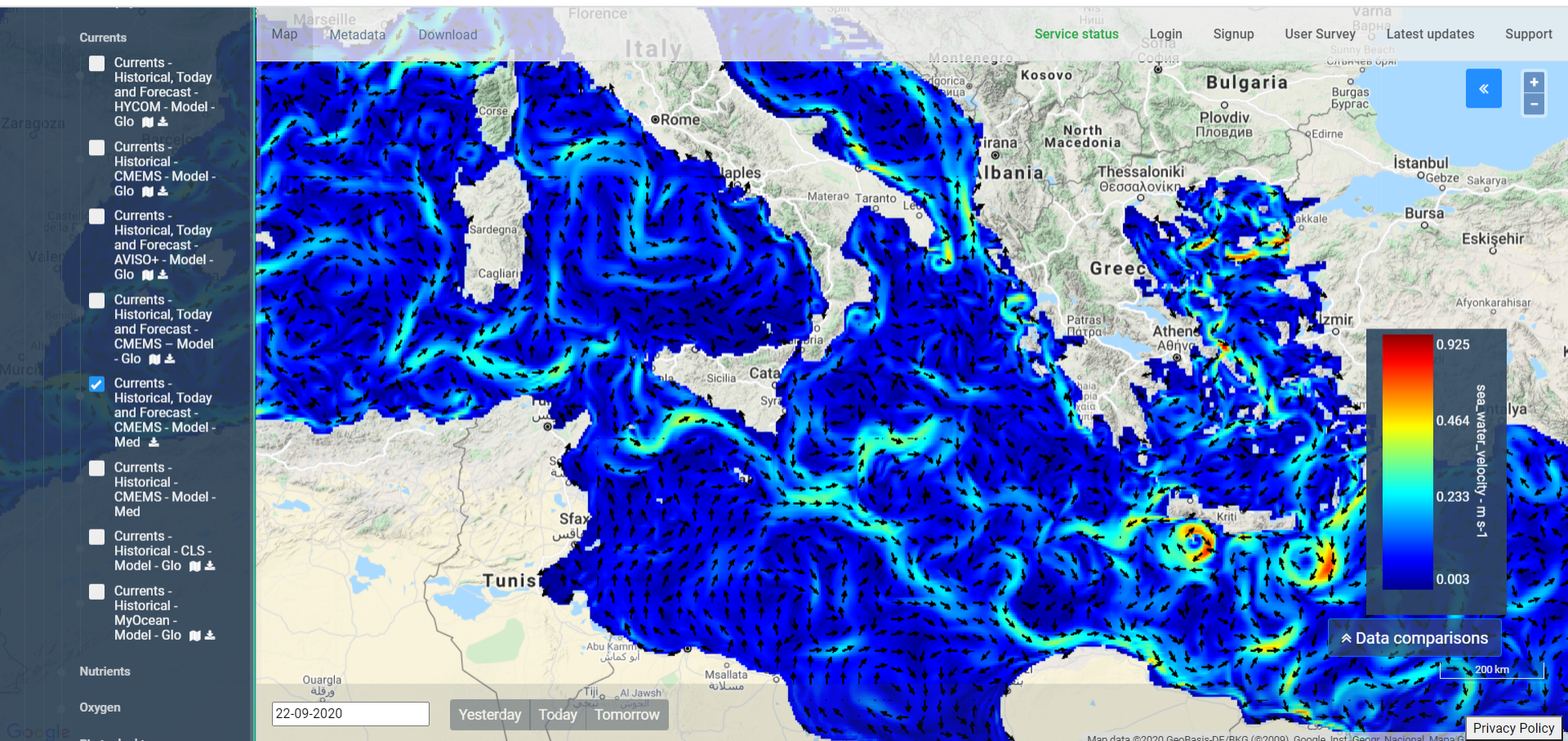
## Surface Water Temperature – Mediterranean Sea



# ODYSSEA Platform v0.8



## Surface Currents – Mediterranean Sea

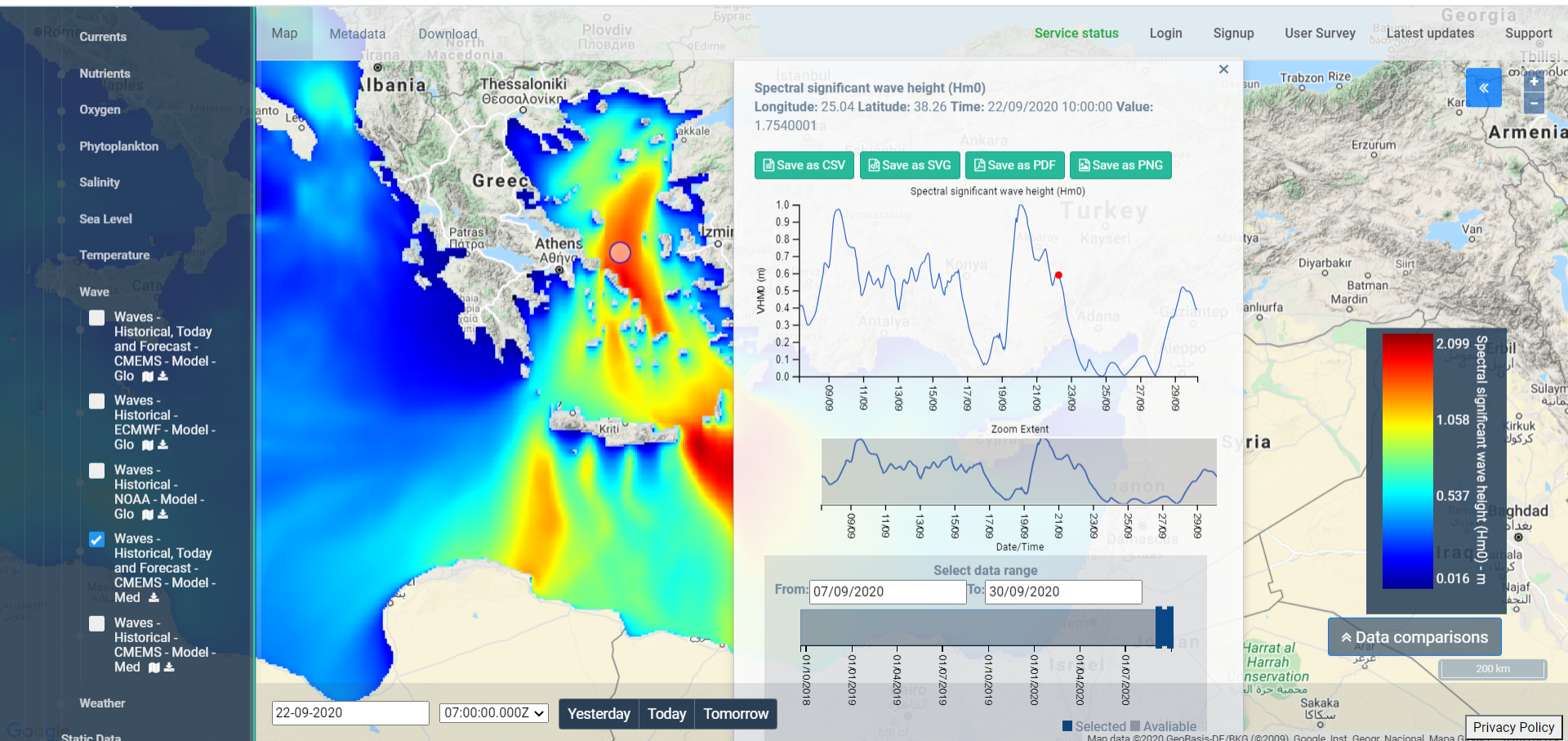




# ODYSSEA Platform v0.8



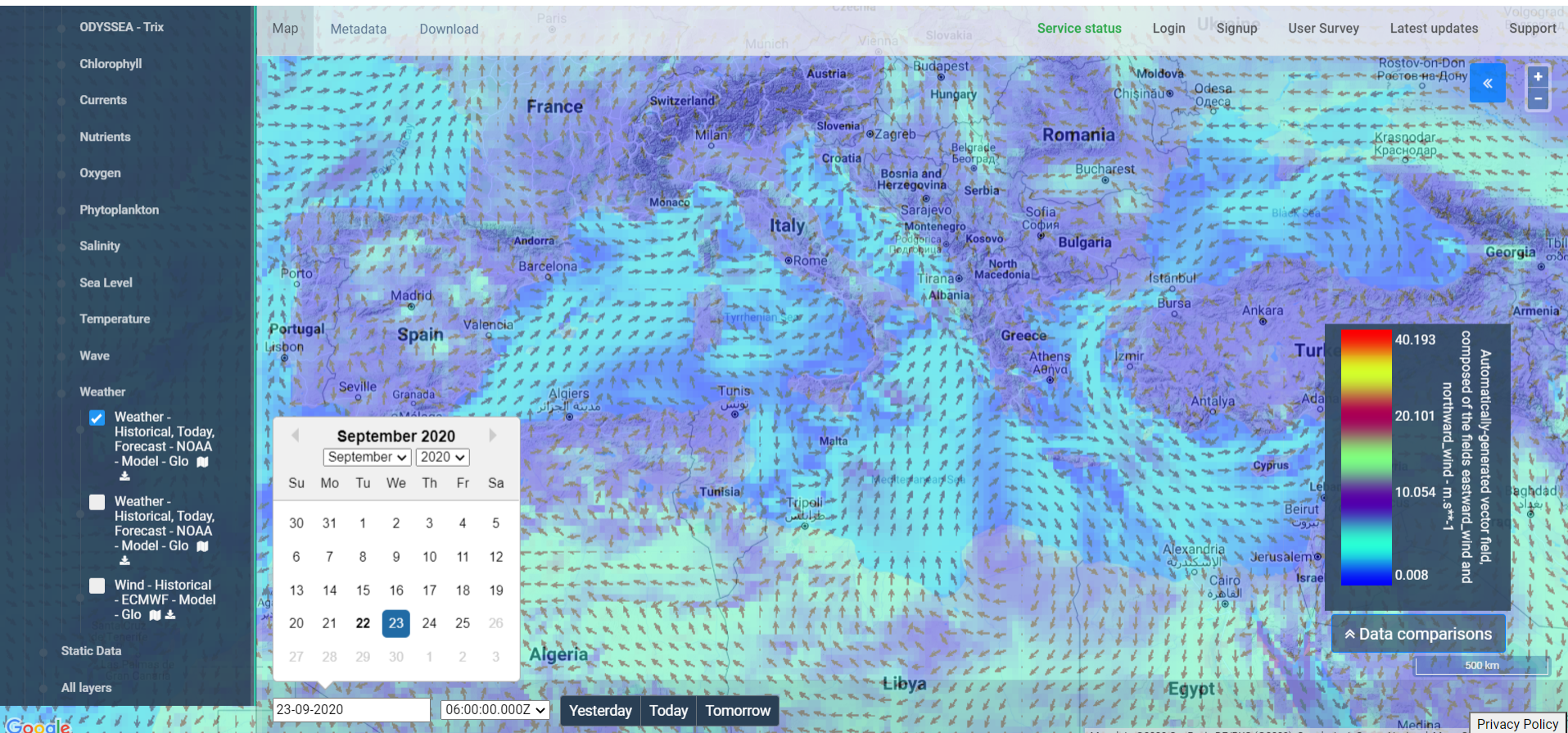
## Significant Wave Height – Mediterranean Sea



# ODYSSEA Platform v0.8



## Wind Field – Mediterranean Sea

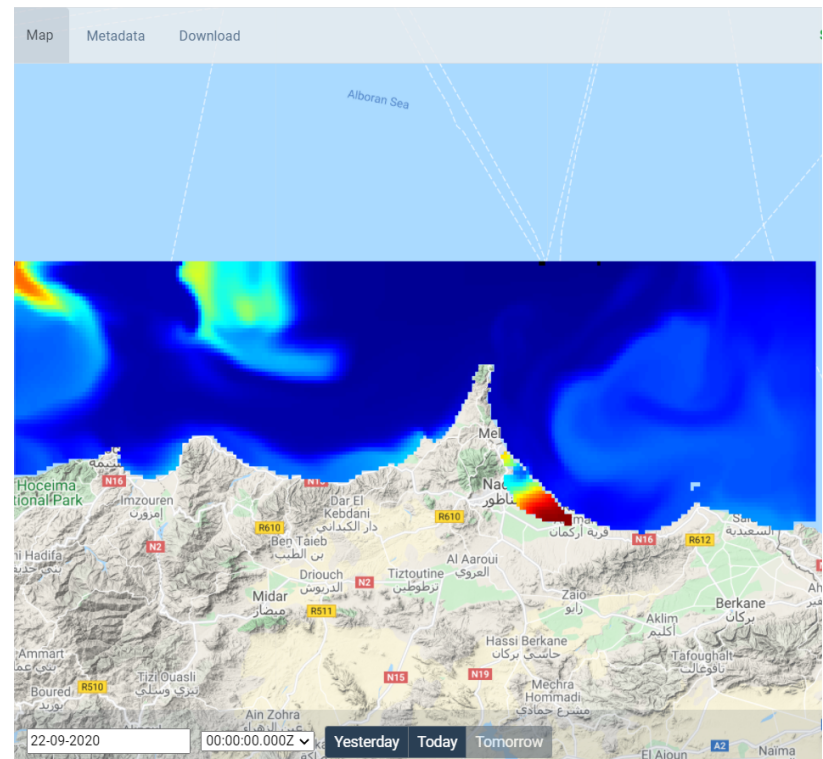
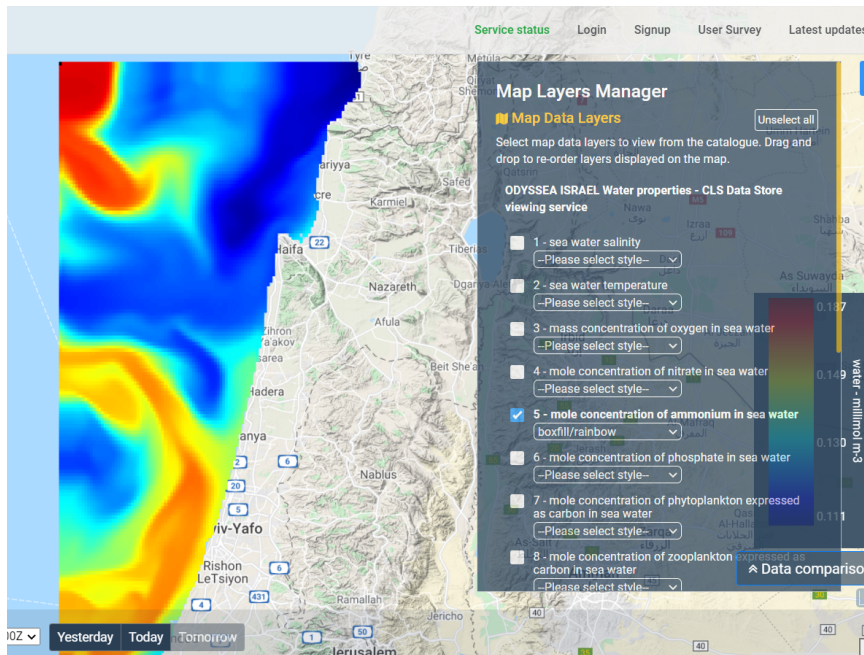




# ODYSSEA Platform v0.8



## High Resolution Water Quality Models – Morocco and Israel



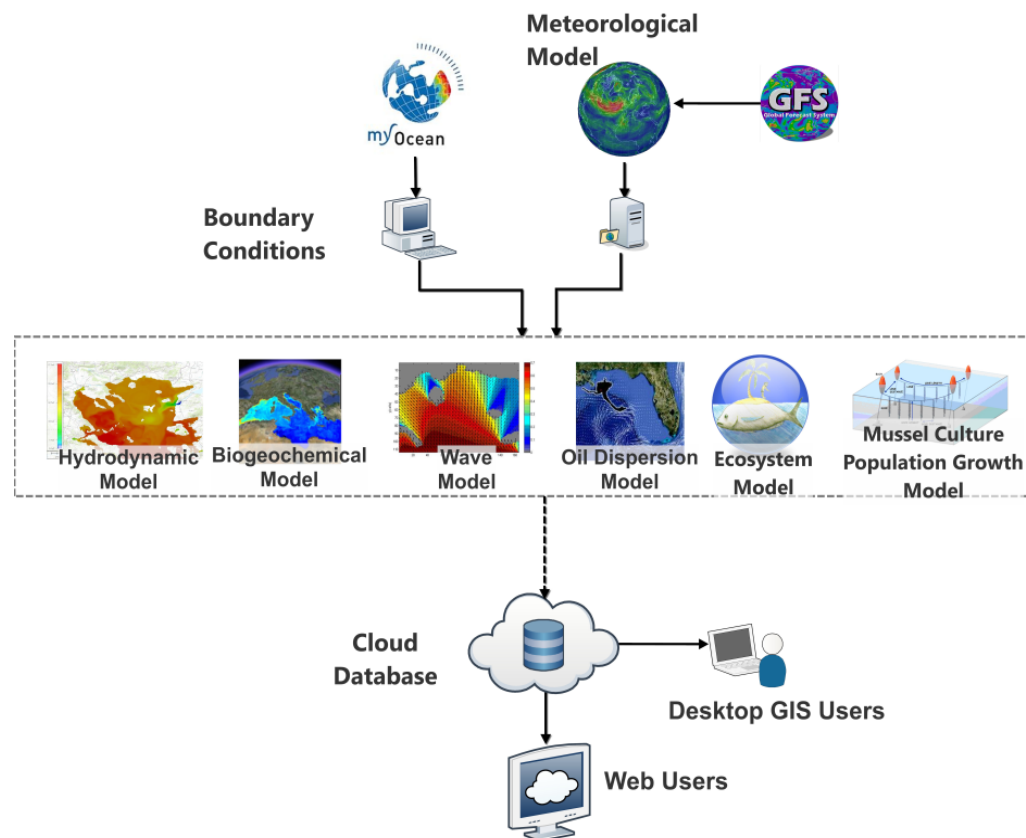


ODYSSEA

# The Models

- ✓ A prototype 'chain' of operational models will be developed,
- ✓ Link models to existing databases,
- ✓ Provide short- and long-term prognostic results,
- ✓ Manage risks and emergencies in coastal and offshore areas,
- ✓ Meet the requirements of various end-user groups,
- ✓ Report on parameters never previously reported,

Models: Meteorological (WRF), 3Dhydrodynamic (Delft3D), Wave (SWAN), Oil spill (MEDSLICK-II), Water quality (DELWAQ), Ecosystem models (Ecopath with Ecosim), Fish and Mussel/oyster culture population growth





# Biological Datasets Integration



ODYSSEA focuses on biological data integration

- Connect to existing platforms with open, reliable biological data at Mediterranean scale
- Develop new biological datasets at ODYSSEA Observatories
- Integrate biological dimension on the Monitoring module of ODYSSEA Observatories
- Develop/use existing marine biological models (e.g., Ecopath and Ecomap)
- Include the human impact (e.g., fisheries)
- Provide stock assessment recommendations per stock and per area
- Foster the ecosystem assessments, forecasts, scenarios and a deeper understanding of vulnerability, risks and interventions at local and regional levels



Contents lists available at ScienceDirect

## Ecological Informatics

journal homepage: [www.elsevier.com/locate/ecolinf](http://www.elsevier.com/locate/ecolinf)



# Seagrass detection in the mediterranean: A supervised learning approach

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### ARTICLE INFO

#### Keywords:

Seagrass classification  
Dataset integration and fusion  
Machine learning  
Data mining  
Mediterranean Sea

### ABSTRACT

We deal with the problem of detecting seagrass presence/absence and distinguishing seagrass families in the Mediterranean via supervised learning methods. By merging datasets about seagrass presence and other external environmental variables, we develop suitable training data, enhanced by seagrass absence data algorithmically produced based on certain hypotheses. Experiments comparing several popular classification algorithms yield up to 93.4% accuracy in detecting seagrass presence. In a feature strength analysis, the most important variables determining presence–absence are found to be Chlorophyll- $\alpha$  levels and Distance-to-Coast. For determining family, variables cannot be easily singled out; several different variables seem to be of importance, with Chlorophyll- $\alpha$  surpassing all others. In both problems, tree-based classification algorithms perform better than others, with Random Forest being the most effective. Hidden preferences reveal that *Cymodocea* and *Posidonia* favor the low, limited-range chlorophyll- $\alpha$  levels ( $< 0.5 \text{ mg/m}^3$ ), *Halophila* tolerates higher salinities ( $> 39$ ), while *Ruppia* prefers euryhaline conditions (37.5–39).



ODYSSEA

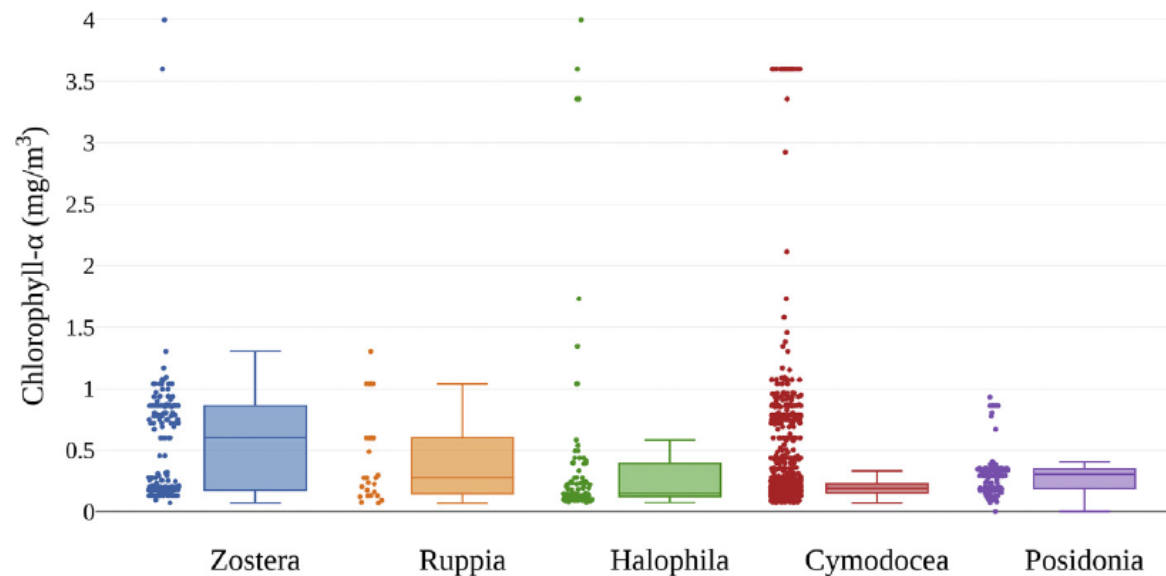


Fig. 9. Distribution of Chlorophyll- $\alpha$ -December values per seagrass family.

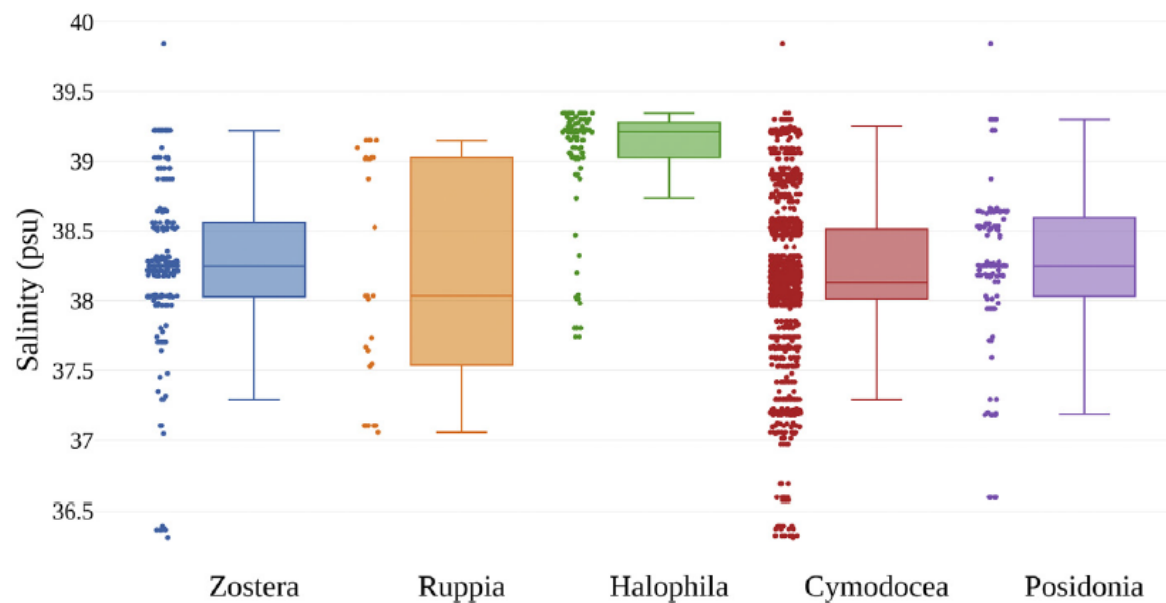


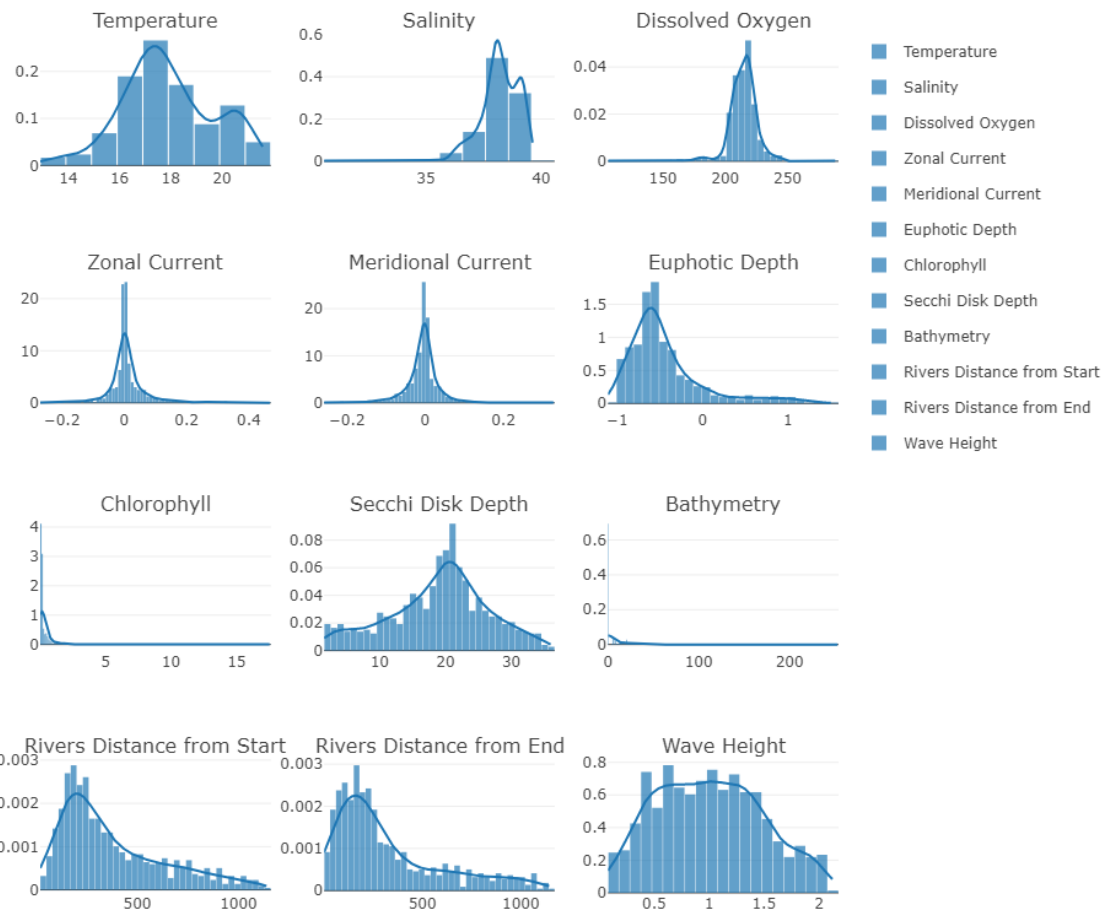
Fig. 10. Distribution of Salinity-December values per seagrass family.

# Biological Datasets Integration

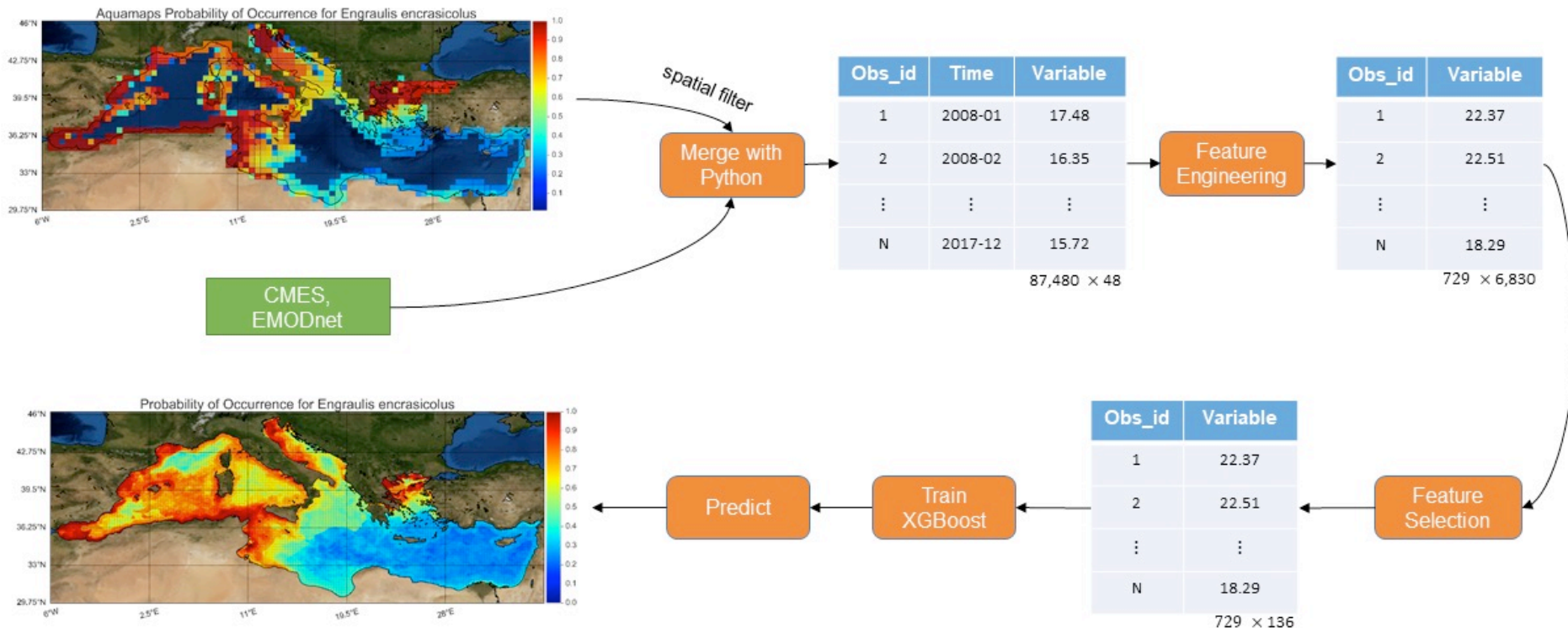


ODYSSEA

Engraulis Encrasicolus Distribution



# Apply AI and ML tools for Species Distribution Models



# ODYSSEA link to BWM Convention Implementation



ODYSSEA is a high-resolution marine information system for the Mediterranean Sea which combines abiotic and biological datasets.

It can aid the BWM Convention Implementation by cooperating with Port Authorities and Shipping Companies to provide a service in line with the requirements of the Ballast Water Convention. More specifically:

1. Developing customized operational high resolution water quality and ballast water dispersion models for specific ports;
2. Develop tools for AIS early detection and control;
3. Employ AI and ML tools to distinguish “natural” Alien Invasive Species from “Ballast-related” AIS
4. Utilize existing datasets to produce risk assessment tools following the HELCOM/OSPAR algorithm – assess the risk associated with the discharge of ballast water by a ship at a specific port.

# The process - What will players do to comply

- Analyse the data **to be collected by the ports**
- Transfer data to ODYSSEA platform **to be analysed by ODYSSEA experts**
- Cluster ports according to their physicochemical and ecological characteristics **to be developed by ODYSSEA experts**
- Run models, tools and risk assessments to produce reports on ship vessels **to be carried out by ODYSSEA Algorithms**
- Based on risk assessment produce or prohibit exemption certificate **to be carried out by Maritime Administrations**

# THANK-YOU

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