



Blue-Cloud

Piloting innovative services for Marine Research & the Blue Economy

Marine Environmental Indicators Demonstrator

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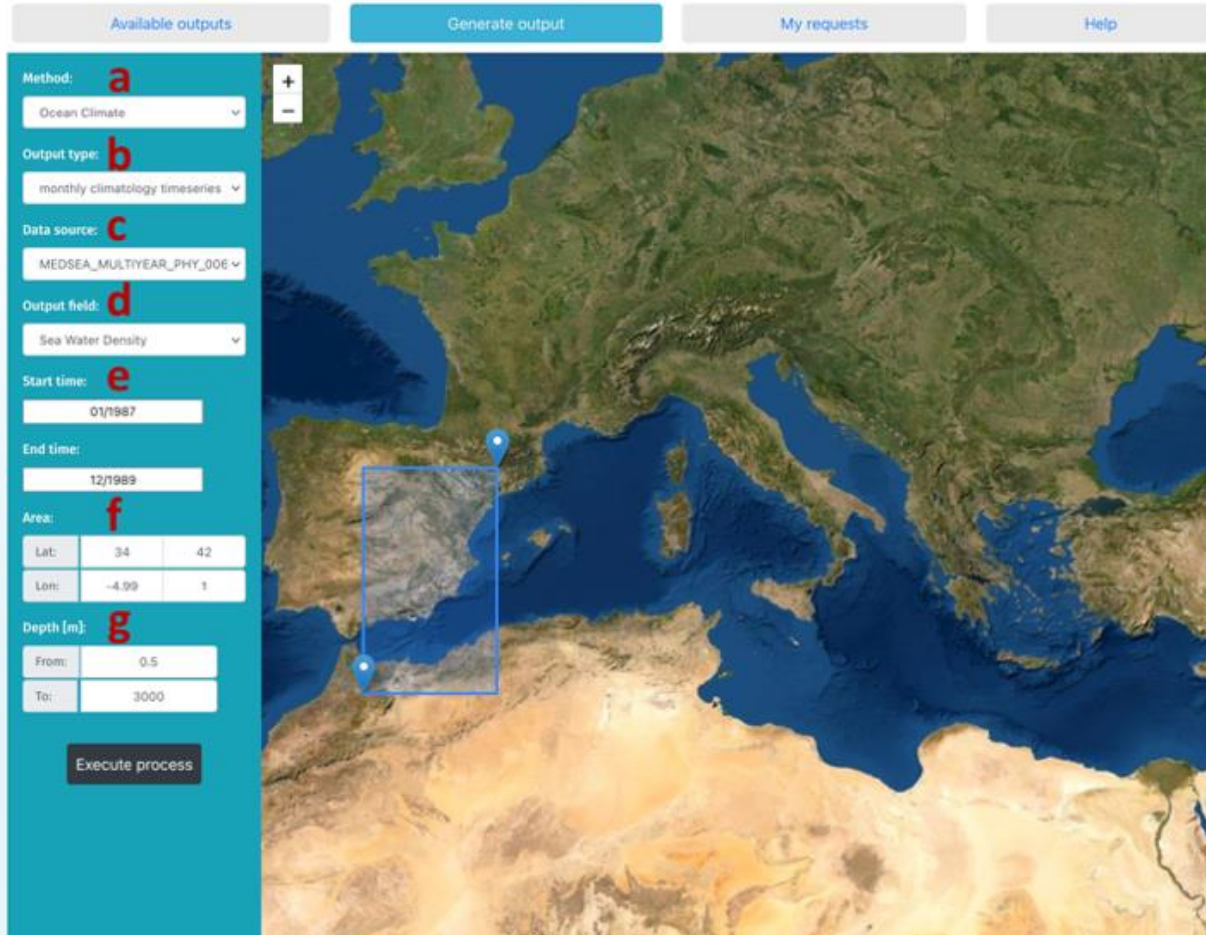


Target Users

- **Environmental Protection Agencies, Decision Makers in marine sector**
 - fostering the consolidation of science-informed decision-making processes
 - contributing to create the holistic view of the human activities (Blue Economy) and the environment (MSFD, SDG 14, SDG 13,...)
- **Scientists**
 - contributing to the implementation of the value chain, from marine data to knowledge
 - improve the understanding and predictability of the marine environment with innovative approaches

MEI Generator

(new version available soon)



Online computation of new added-value data, *selecting*:

-  output data or indicator
-  data source
-  region and time range
-  additional specific parameters

and submitting the processing request !

What Algorithms Are Available

- Outputs can be obtained by processing with
 - WPS Methods, available through MEI Generator
 - Notebooks in JupyterHub

● The available algorithms are :

	Method	Notebook
Ocean Climate	✓	
Ocean Patterns Indicator	✓	✓
Ocean Regimes Indicator	✓	✓
Storm Severity Index (SSI)		✓
Harmonized Integrated Carbon Data		✓

Ocean Climate

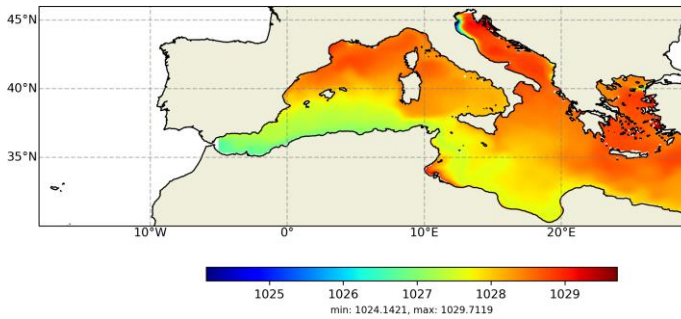
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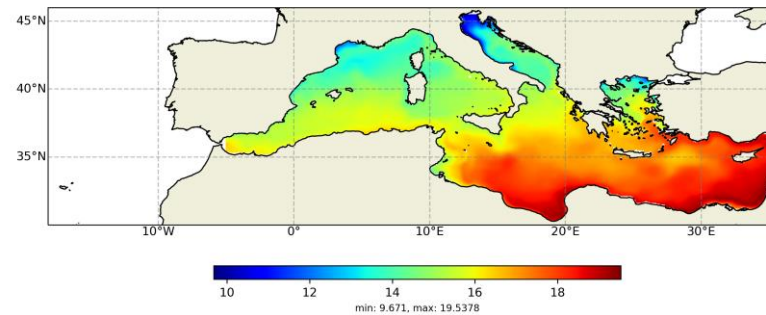
Study of sea condition and trend for annual, seasonal and monthly periods

Data source : Copernicus Marine Service, Med and Glo Reanalysis products (model data)

Sea Water Density plot, 1987 - 2016



Potential Temperature plot, 1987 - 2016



Output Characteristics

Maps

Monthly Mean

Annual Mean

Monthly Climatology

Annual Climatology

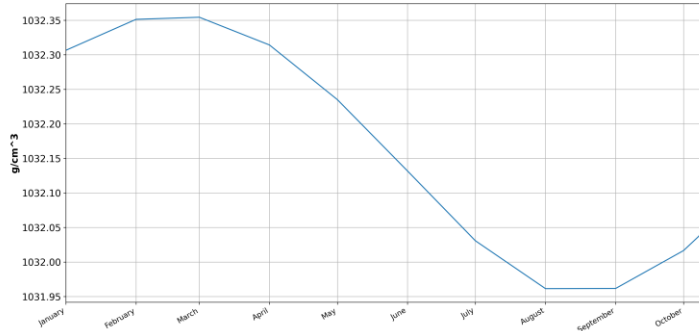
Monthly Mean

Annual Mean

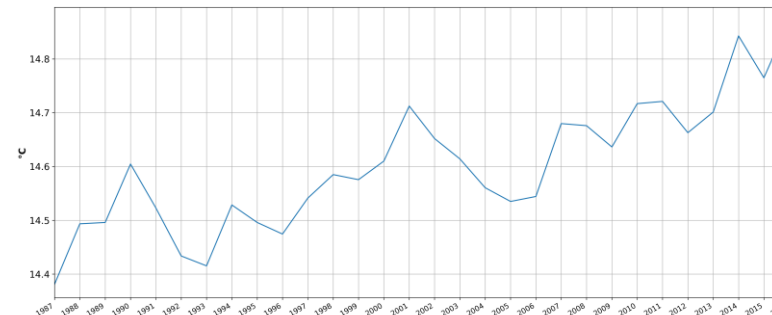
Monthly Climatology

Time-series

Sea Water Density, 1987 - 2016, Gen - Dec



Potential Temperature, 1987 - 2016

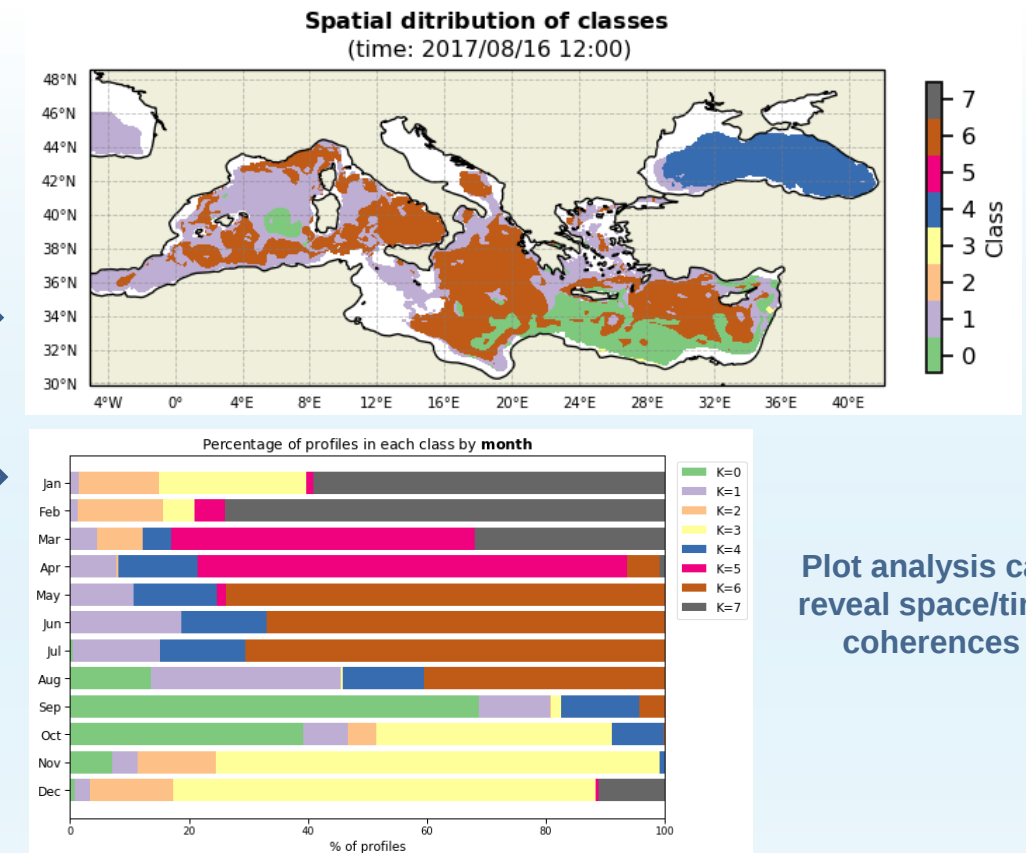
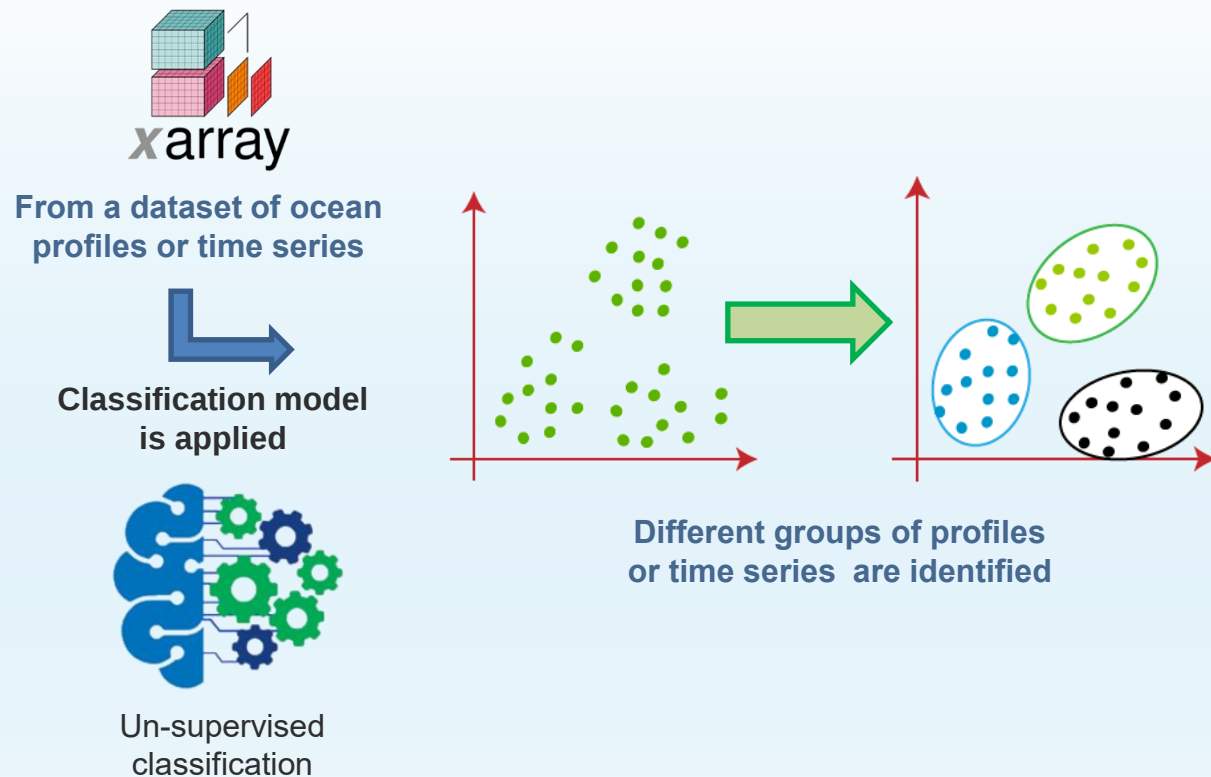


Output Environmental Fields

-  Temperature
-  Salinity
-  Water Density
-  Kinetic Energy
-  Currents

Ocean Patterns and Regimes Indicators

- Classification models allow to automatically gather ocean profiles (Patterns) or time series (Regimes) in clusters according to their similarities. Depending on the dataset, such clusters can show space/time coherence: **the ocean patterns and ocean regimes indicators.**



Storm Severity Index

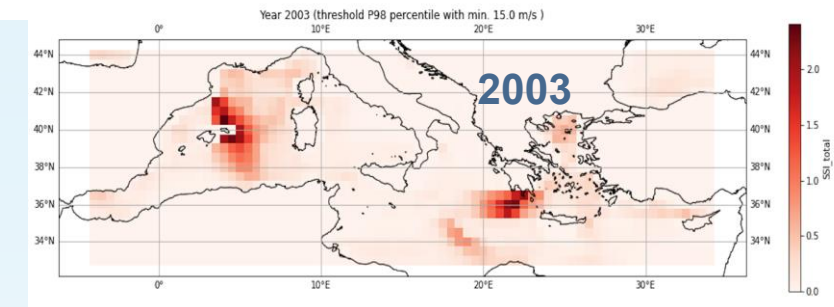
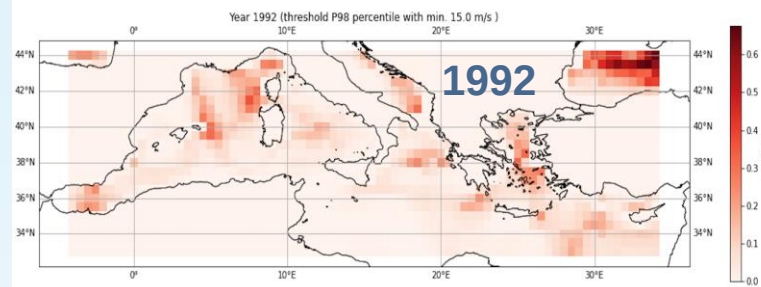
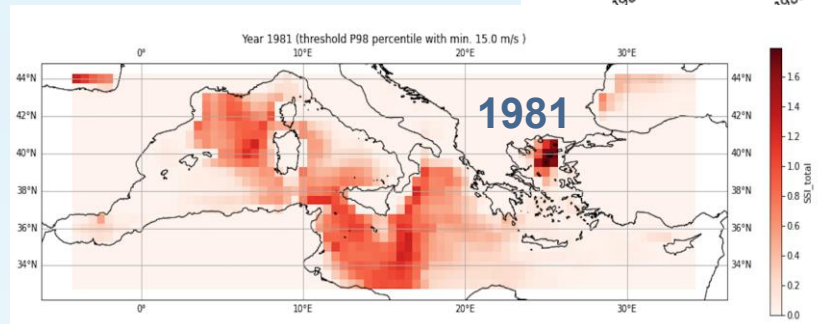
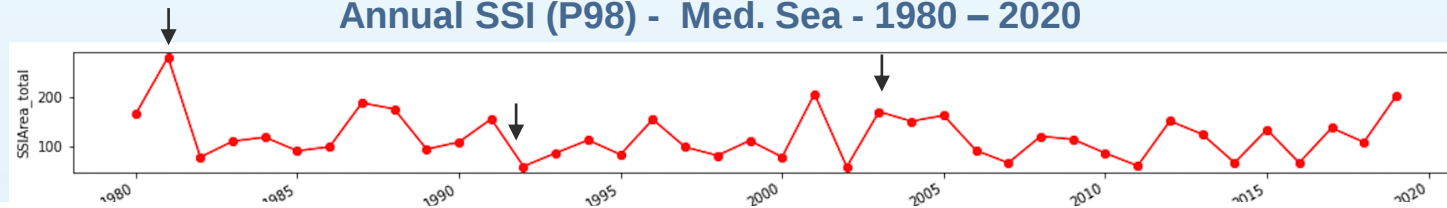
- Purpose** : to indicate exceptional wind/storm circumstances for an area and time period
- Data source** : C3S ERA5 data (hourly reanalysis 10 m wind data above sea), Med. Sea, 1979 - 2020
- Other input data** : calculated wind speed percentile values of the data source (e.g. P98 value for each grid cell)
- User input** : area bbox, time period & step, wind speed threshold (percentiles or fixed), plots (maps & time series)
- Calculated output** : SSI maps and time series data (NetCDF)

$$SSI_{k,T} = \sum_{t=1}^T \left[\left(\max\left(0, \frac{v_{k,t}}{v_{k,threshold}} - 1\right)^3 \right) \right]$$

k is a single grid cell in the Med. Sea, T is time period (in 10 min steps)

- Applications** : to study the severity of an individual storm, a storm season or storm climatology (> 30 years)

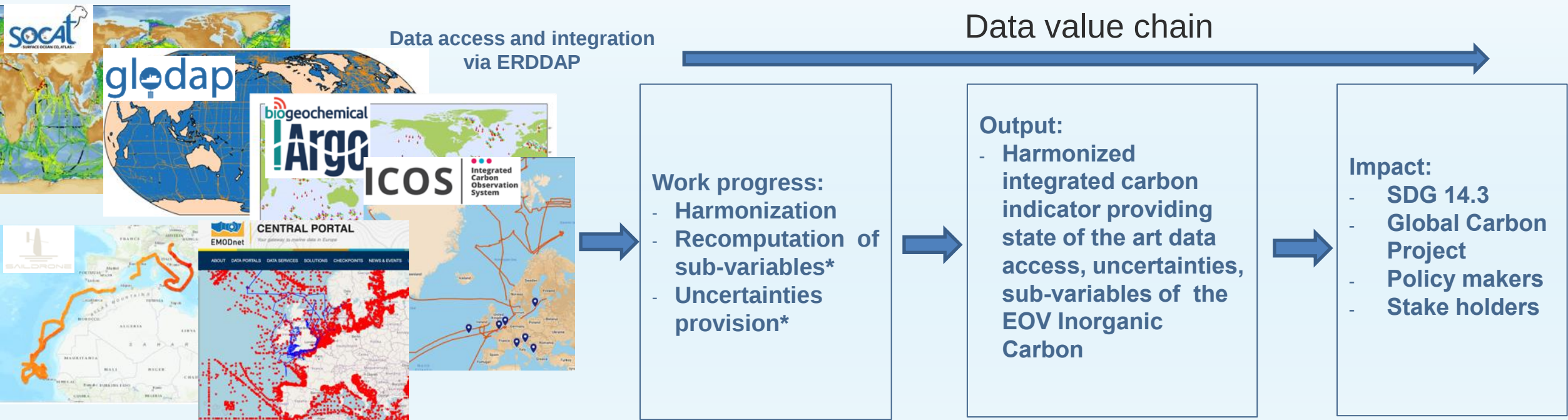
Annual SSI (P98) - Med. Sea - 1980 – 2020



Marine Carbon Data

- Steps: integrating data via interoperable services, recomputation of missing EOVI Inorganic Carbon sub-variables*, provision of uncertainties*
- Harmonized data access is the baseline for future applications and services, and will potentially allow for optimized network design
- Make data Fit for Purpose

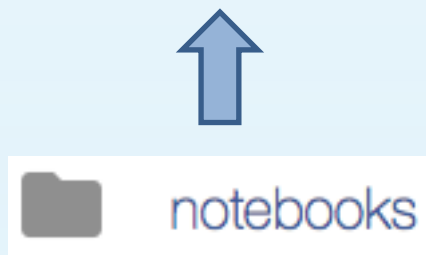
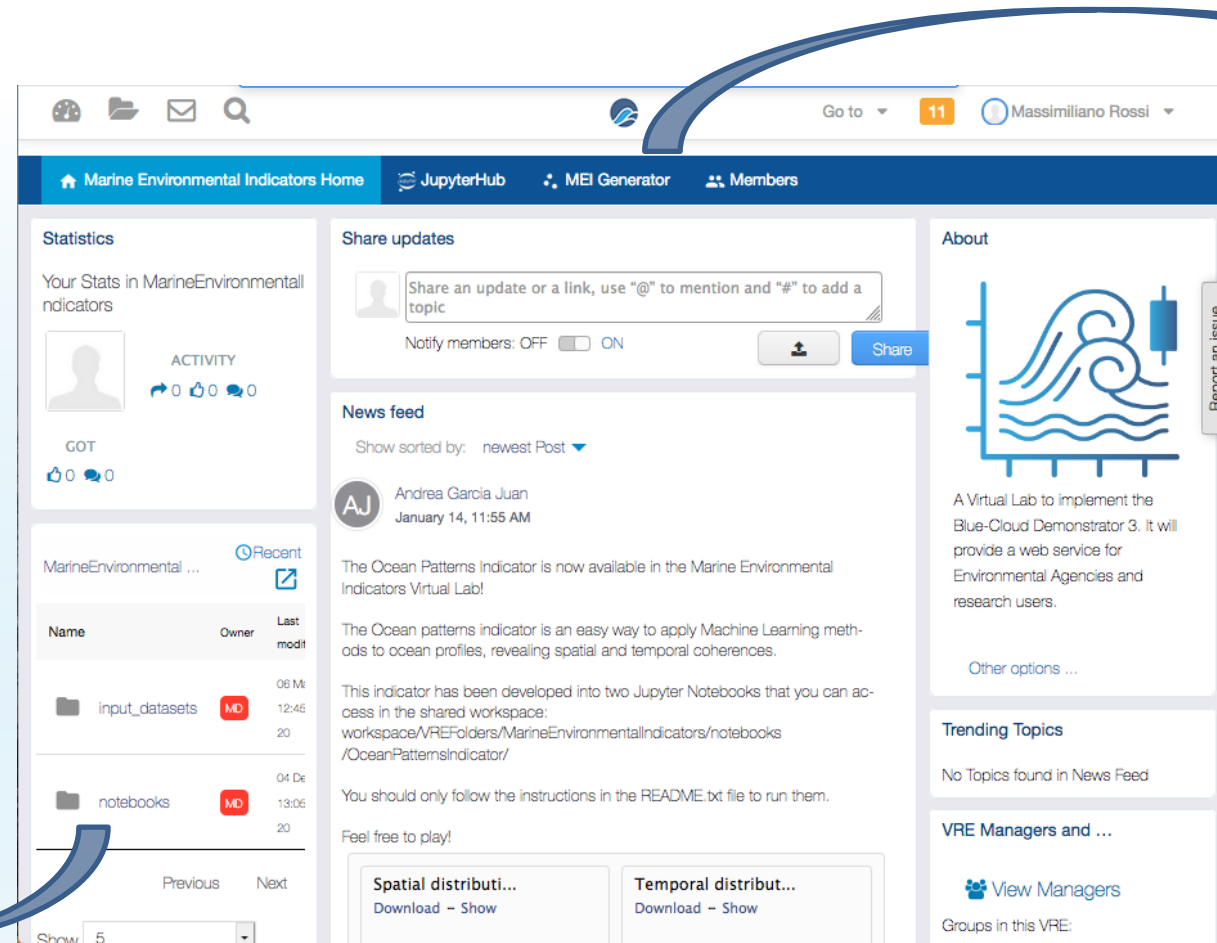
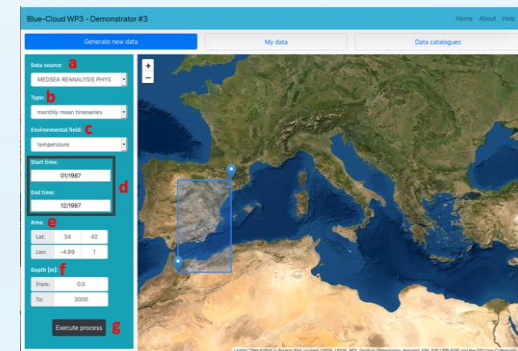
* Where possible due to data availability

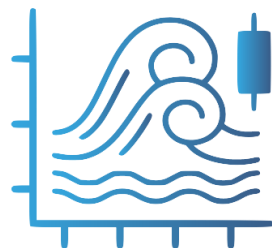


The Virtual Lab

<https://blue-cloud.d4science.org/web/marineenvironmentalindicators/>

- Ocean Patterns Indicators
- Ocean Regimes Indicators
- Storm Severity Index (SSI)
- Harmonized Integrated Carbon Data



Marine Environmental Indicators

For further questions or discussions :

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THANK YOU