Marine Environmental Indicators Demonstrator

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Scope and Challenges

- International initiatives for the Oceans – notably :
  - EU MSFD : protecting Europe's Seas and Oceans
  - UN SDG 14 : Conserve and sustainably use the oceans, seas and marine resources
  - UNESCO IOC Global Ocean Observing System (GOOS) : identifies a vision for a truly integrated global ocean observing system that delivers the essential information needed for our sustainable development, safety, wellbeing and prosperity
  - EU Blue Growth : to support sustainable growth in the marine and maritime sector

- This Demonstrator supports Spatial Planning activities and exploits the Marine Knowledge
  - Better understanding of several aspects of marine environment
  - Provide new and *open* knowledge - contributing to create an holistic view of human activities and environment
  - Bring the environment into the design process - decision making based on scientific evidence
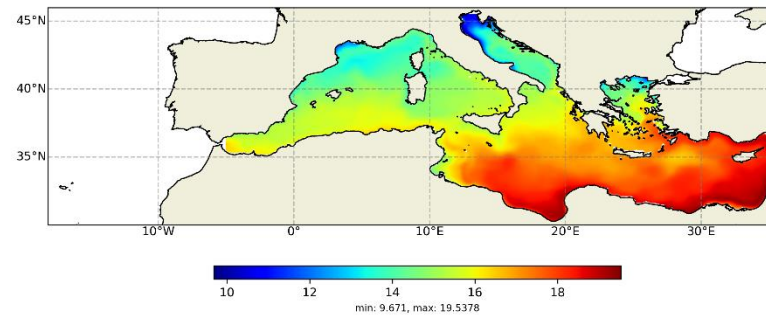
Climatological Analysis

Study of trend for annual, seasonal and monthly periods

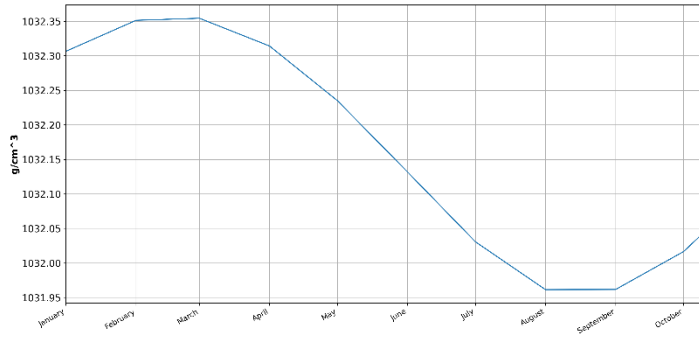**Data source : CMEMS Med Reanalysis product (model data)**
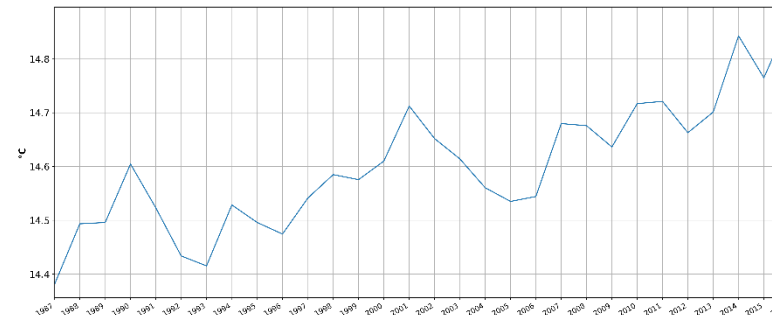

Sea Water Density plot, 1987 - 2016
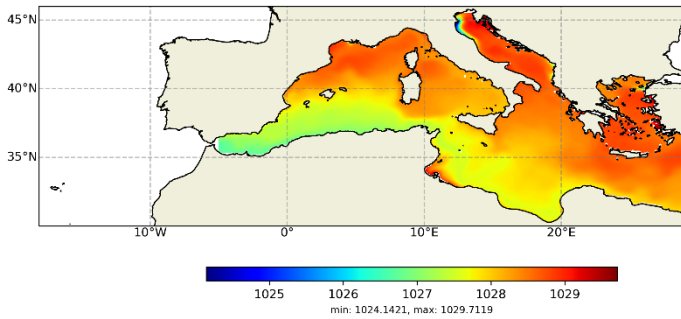
Potential Temperature plot, 1987 - 2016

Sea Water Density, 1987 - 2016, Gen - Dec

Potential Temperature, 1987 - 2016

Characteristics

Maps
- Monthly Mean
- Annual Mean
- Monthly Climatology
- Annual Climatology

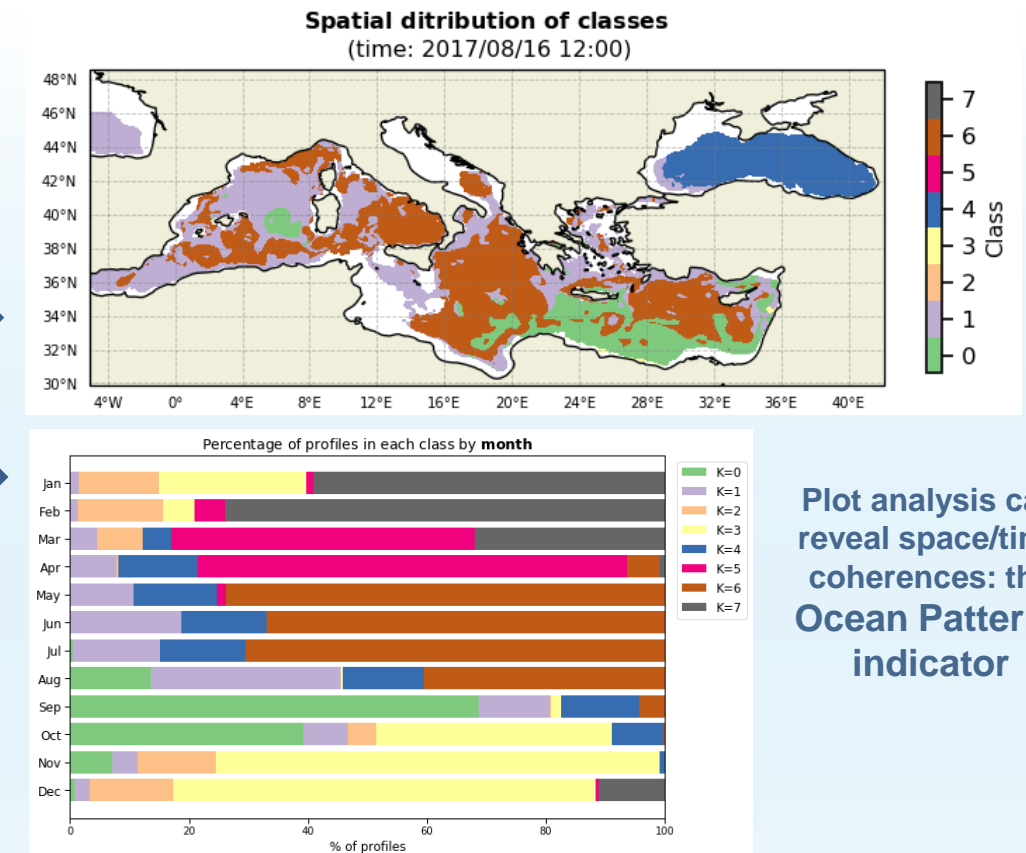Time-series
- Monthly Mean
- Annual Mean
- Monthly Climatology

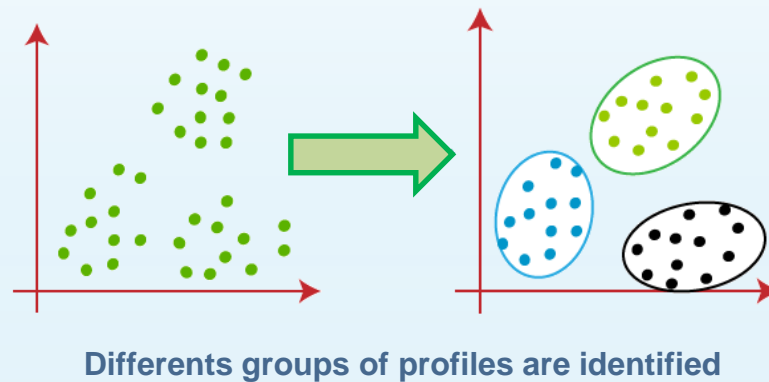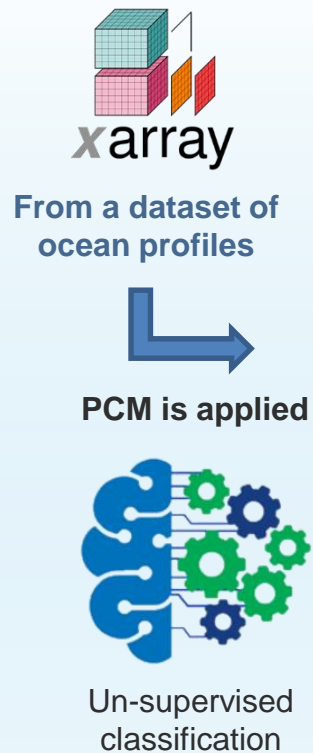## Output Environmental Fields
- Temperature
- Salinity
- Water Density
- Kinetic Energy
- Currents

What is the **Ocean Patterns Indicator**?

PCM (Profile Classification Model): allows to automatically gather ocean profiles in clusters according to their vertical structure similarities. Depending on the dataset, such clusters can show space/time coherence: **the ocean patterns indicators.**

From a dataset of ocean profiles

PCM is applied

Un-supervised classification

Differents groups of profiles are identified

Spatial ditribution of classes
(time: 2017/08/16 12:00)

Percentage of profiles in each class by **month**

Plot analysis can reveal space/time coherences: the Ocean Patterns indicator

Storm Severity Index

- Purpose : storm severity indicator for an area and time period
- Data source : C3S ERA5 data (hourly reanalysis 10 m wind data above sea)
- *Derived* data source : daily and monthly SSI grid data (now limited to 1987–1989, Med. Sea)
- Some Applications
  - To study the severity of an individual storm (impact on sea circulation)
  - To study an entire storm season (winter) of a sea area
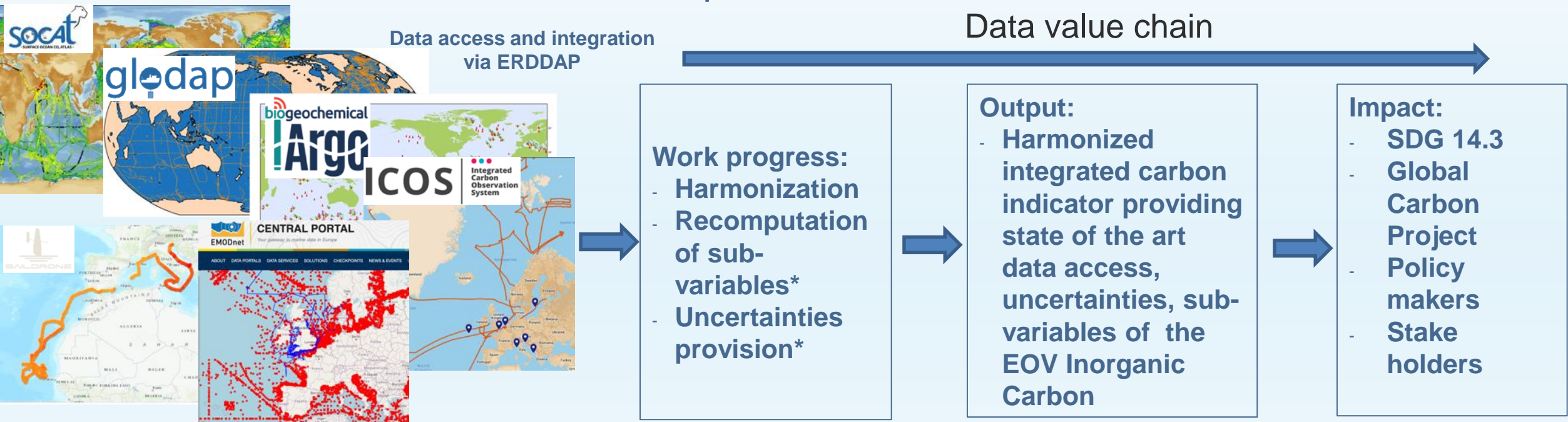 - To study storm climatology of a sea area (is there a severity increase)

Monthly SSI timeseries 1987 - 1989

Dec 1988
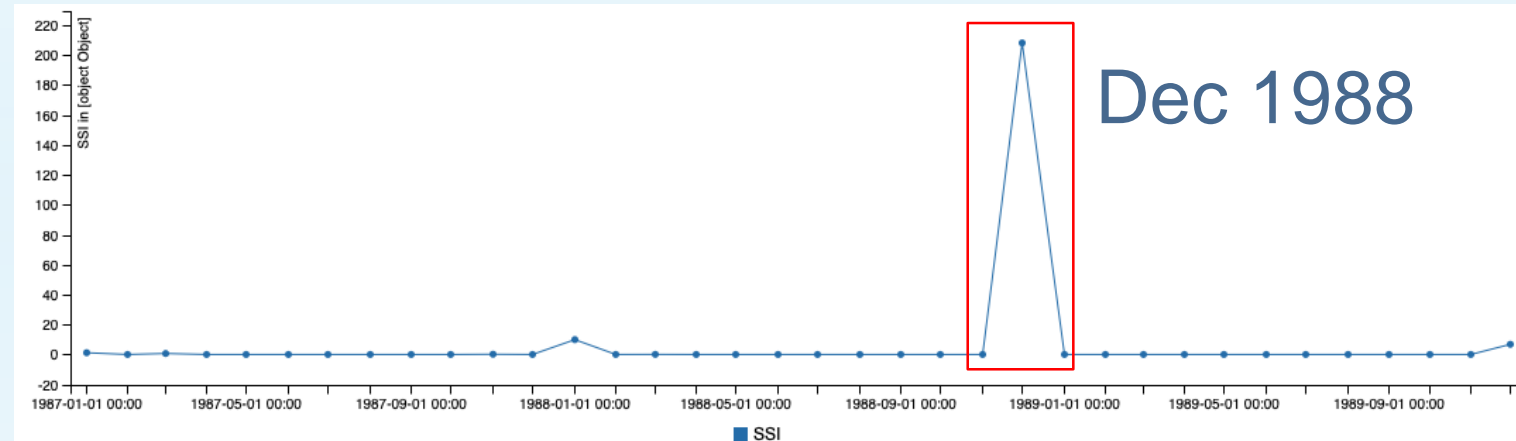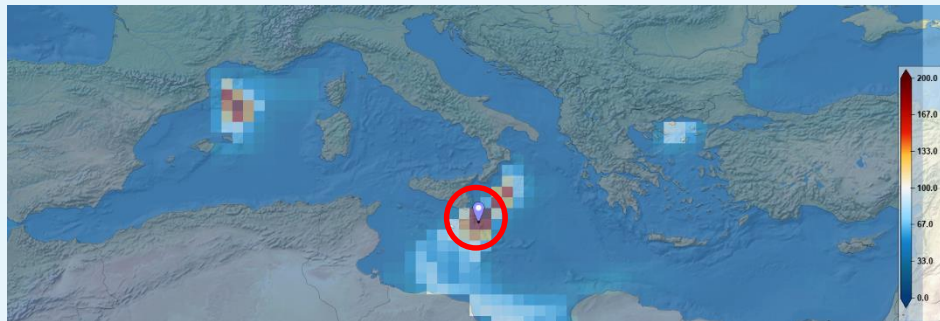
Marine Carbon Indicator

- Steps: integrating data via interoperable services, recomputation of missing EOV 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

Data access and integration via ERDDAP

Data value chain

Work progress:
- **Harmonization**
- **Recomputation of sub-variables***
- **Uncertainties provision***

Output:
- **Harmonized integrated carbon indicator providing state of the art data access, uncertainties, sub-variables of the EOV Inorganic Carbon**

Impact:
- **SDG 14.3**
- **Global Carbon Project**
- **Policy makers**
- **Stake holders**

Objectives

Development objectives of the service Marine Environmental Indicators are :

- To calculate and distribute online information and indicators on the environmental quality of the marine area
- Obtain new added value data applying Big Data analysis and machine learning methods on the multi-source data sets
- Enable users to perform on line and on the fly operations, such as select portion of a dataset, bring the information together, visualize them
- Scale the working domain to the global

How to use the VRE

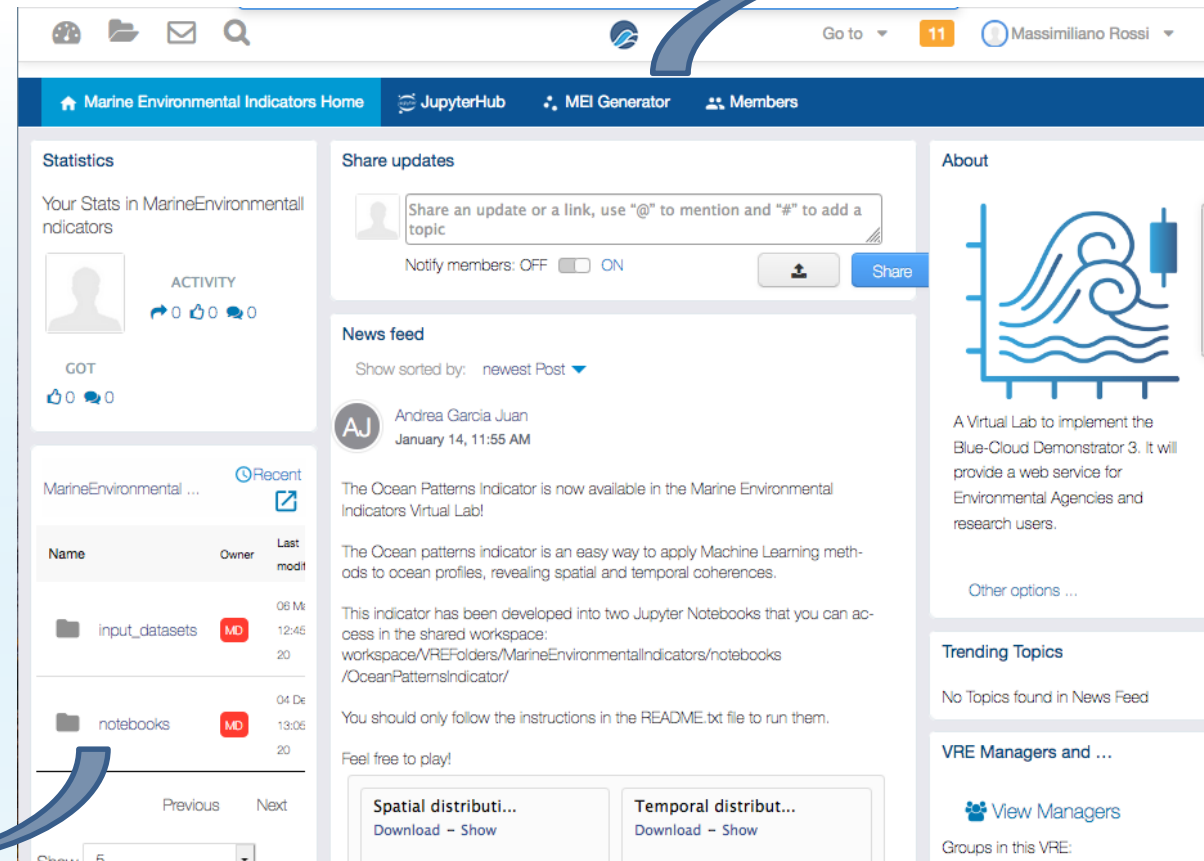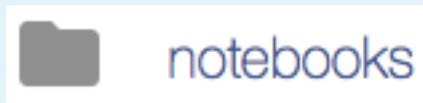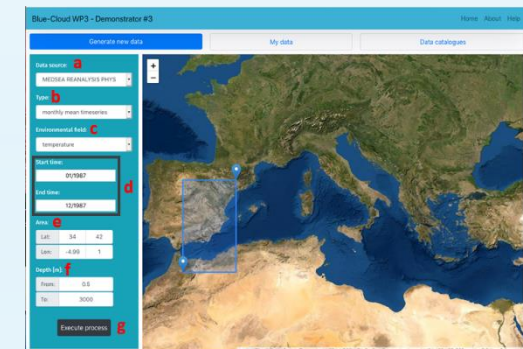https://blue-cloud.d4science.org/web/marineenvironmentalindicators/

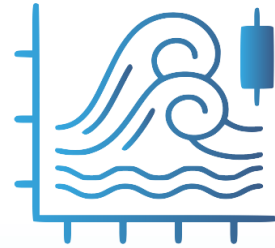Available :
- Ocean Patterns Indicators

Soon Available :
- Ocean Regimes Indicators
- Storm Severity Index (SSI)
- Inorganic Carbon Indicators

notebooks

Marine Environmental Indicators

Led by **cmcc**

THANK YOU

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