The Blue-Cloud and Digital Twin of the Ocean (DTO)

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Marine data management and blue economy

- Marine data are collected by governments, research institutes, and private industry (in Europe already more than 1.000 organisations)

- Marine data concern physics, geophysics, meteorology, chemistry, biology, geology, bathymetry

- Acquisition of oceanographic and marine data is expensive; annual costs in Europe estimated at **1.4 Billion Euro** (1.0 = in-situ; 0.4 = satellites)

Long history with establishing marine data infrastructures involving data collectors and networks of national, regional, European, and global data centres, with standardisation, quality control protocols, long term archiving, catalogues, and access

European landscape of marine data management
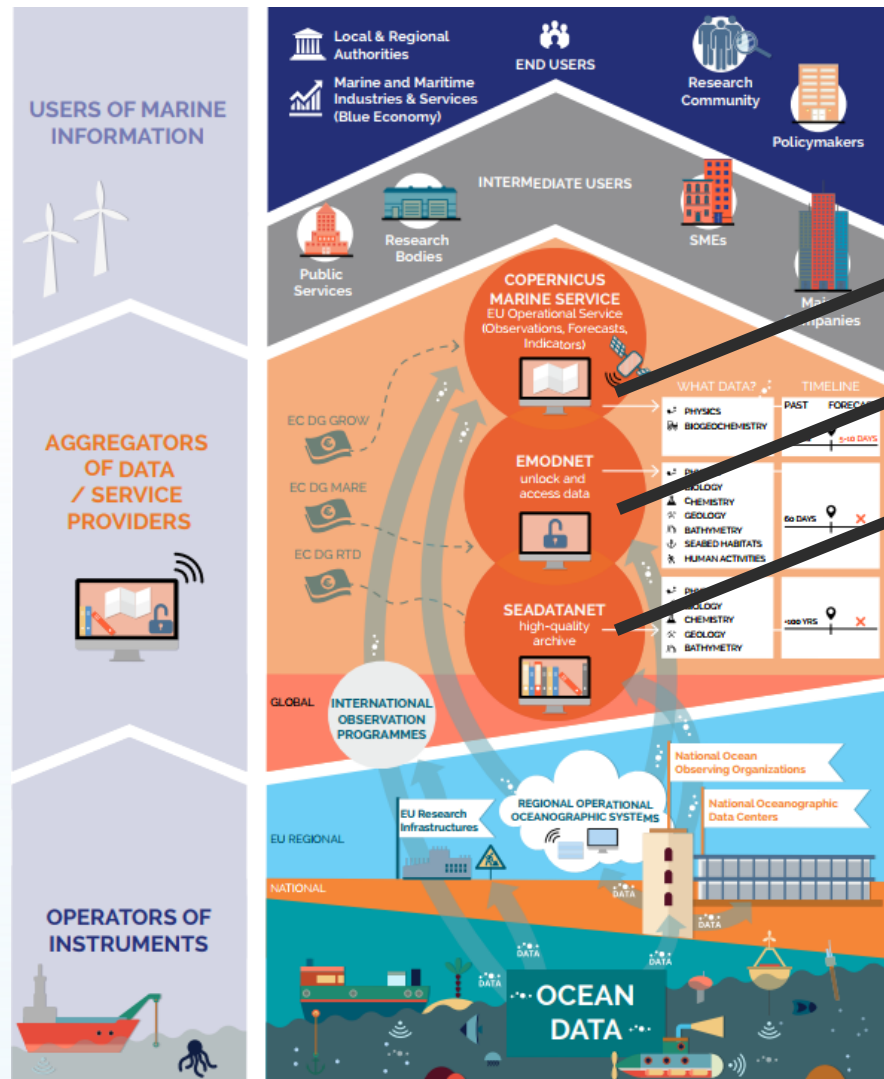
Blue-Cloud project

- **Funding:** H2020: The 'Future of Seas and Oceans Flagship Initiative' (BG-07-2019-2020) topic: [A] 2019 - Blue Cloud services

- **Timing:** 36 Months (started 1 October 2019)

- **Budget:** 5.9 Million Euro

- **Partnership:** 20 partners

The mission

Blue-Cloud aims to **pilot** a cyber platform bringing together and providing access to:

1. **multidisciplinary data** from observations and models,
2. **analytical tools**,
3. **computing facilities,**

which combined are essential to **support research to better understand and manage the many aspects of ocean sustainability**

Blue-Cloud federation of major infrastructures

Blue Data infrastructures
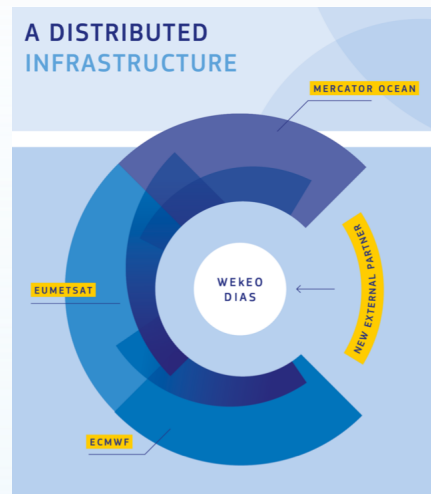
E-infrastructures

Blue-Cloud leading concept

Added-value services
and applications
VRE – Cloud Platform

Downstream
Services

Standards
OGC, ISO, W3C
& Vocabularies

Upstream
Services

Discovery and access
to datasets from many
sources
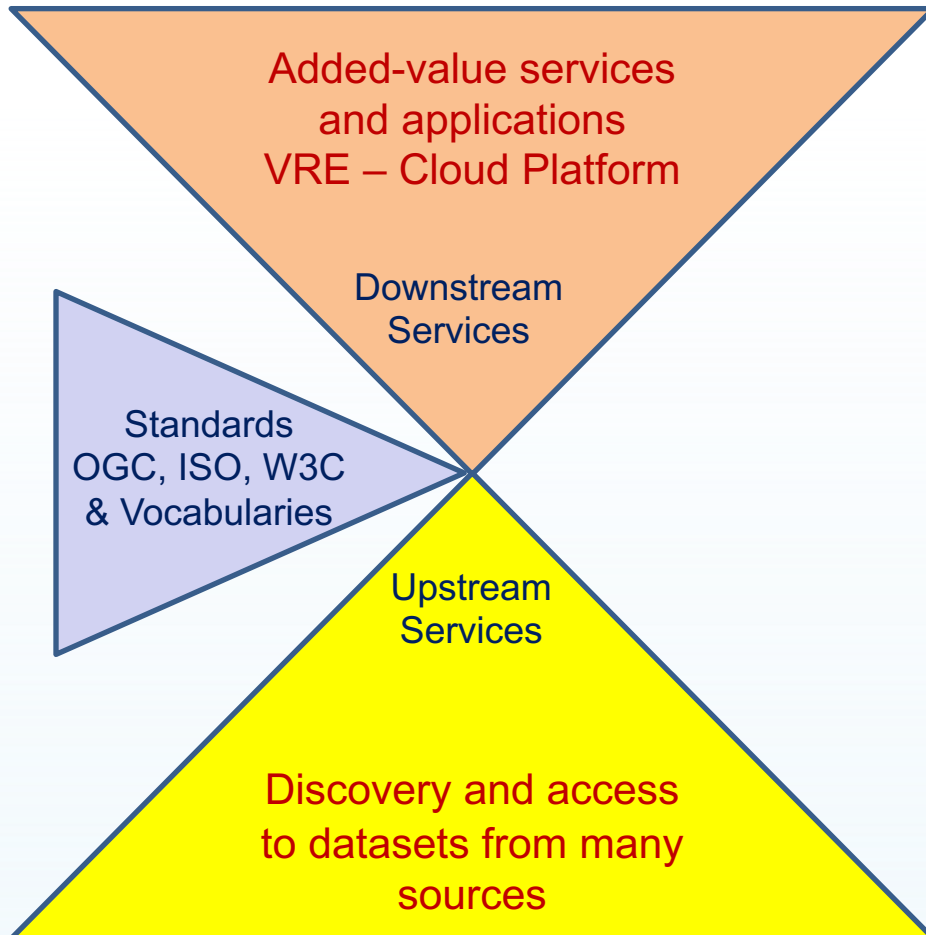
- Developing and deploying Virtual Research Environment (VRE) with an array of services for configuring Virtual Labs for specific analytical workflows, use cases and demonstrators

- Applying common standards and interoperability solutions for providing harmonized data and metadata

- Developing and deploying harmonised discovery and access to the established European marine data management and processing infrastructures,

Blue-Cloud planned Key Exploitable Results

Blue-Cloud

- A **data discovery and access service** to facilitate sharing with users of multi-disciplinary datasets from multiple repositories

- A **Blue Cloud Virtual Research Environment (VRE)** to facilitate the orchestration of computing and analytical services to build specific applications

- A number of **Virtual Labs** configured with specific analytical workflows to serve as **Demonstrators**

- A strategic **Roadmap 2030** exploring further perspective for development and funding, supported by major stakeholders
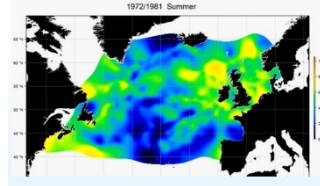
Tuning, testing and promoting with five demonstrators

Blue-Cloud

Biodiversity

Genomics

Environment

Fishery

Aquaculture

VLIZ — **Zoo- and Phytoplankton EOV products**

EMBL — **Plankton Genomics**

cmcc Centro Euro-Mediterraneo sui Cambiamenti Climatici — **Marine Environmental Indicators**
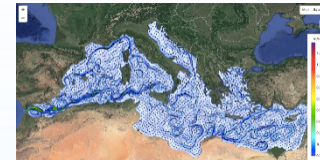
FAO FIAT PANIS — **Fish, a matter of scales**

FAO FIAT PANIS — **Aquaculture Monitor**

Blue-Cloud versus Digital Twin Ocean (DTO)

- Blue-Cloud is initial step in further evolution towards initial DTO and beyond

- Results of Blue-Cloud should be incorporated and further expanded as part of DTO

- Focus of Blue-Cloud is on federation and demonstrating web-based science for researchers in support of EOSC strategy

Blue-Cloud versus Digital Twin Ocean (DTO)

- DTO should be more end-to-end, adding extra shells around the core services:

  - Bringing in observations from smart sensors, Internet of Things, adopting Sensor Web Enablement (SWE) supporting FAIR, citizen science, crowd sourced data

  - Developing engagement and smart dialogues with many user communities, using visualisation and story board techniques for more understanding, knowledge transfer, and interaction

- DTO should expand the computing core, e.g with CMEMS models not only delivering fixed products, but also custom products

- DTO should develop use of Artificial Intelligence (AI) and Machine Learning (ML) for getting more knowledge out of data and data products

www.blue-cloud.org