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Blue Cloud sees major growth with new 'Virtual Labs'

Europe's pilot Open Science platform to study oceans and seas - [Blue Cloud](#) - saw its user base surge 80% over the past year with the launch of five new 'Virtual Labs'.

Blue Cloud saw the number of users grow by 79.9% over the past year with the launch of its five Virtual Labs that focus on biodiversity, plankton genomics, marine environment indicators, fisheries and aquaculture.

Providing knowledge and applications, these online laboratories support ocean research by connecting open-source marine data with analytical tools and are helping to strengthen the international research community while improving sustainability in our seas.

Supporting expert users, Blue Cloud's virtual labs enable researchers to develop data products and services that act as a foundation for future researchers to build new, added-value services to inform policy and decision-makers across the public and private sectors, increasing the sustainability of our seas and oceans.

Sara Pittonet Gaiarin, the project coordinator at Blue Cloud, said: "We are making it easier for marine researchers to access and process enormous amounts of data and test them in virtual laboratories equipped with a range of thematic services where real-life demonstrators are running.

"By using Blue Cloud's Virtual Labs, researchers can perform many tasks that may have previously been out of reach to small research teams. Now, any marine researchers connected to Blue Cloud can access maps of zooplankton abundances, calculate the 3D distribution of phytoplankton biomass using machine learning techniques, discover unknown marine plankton genes, generate graphical views of environmental data, calculate maps and time series of atmospheric wind circumstances for given areas, and much more. In the future, these products could potentially evolve into modelling services underpinning digital twins of the ocean, showcasing the value of Open Science in advancing knowledge systems for science-based decision making and Ocean governance".

Helping researchers working in marine data, the Blue Cloud platform allows small teams to capture and process enormous datasets. Dick Schaap, the technical coordinator at Blue Cloud, said: "The Blue Cloud Data Discovery and Access Service allows data retrieval across existing EU marine data services such as EMODnet and Copernicus Marine and other data infrastructures that collectively offer more than 10.5 million data sets and a few thousand data collections and derived data products".

"The federation model that Blue Cloud introduces makes sharing data, algorithms, and computing power in the maritime domain a reality. Blue Cloud allows researchers to apply

web-based open science to develop pipelines and workflows to address the big challenges we have for our oceans' health".

Virtual Labs

The five virtual labs are:

- **Zoo and Phytoplankton Essential Ocean Variables products** - Leveraging on time series analysis, the Zoo and Phytoplankton EOVS demonstrator describes the current state of plankton communities and forecasts their evolution. Its applications are helpful for fishery advisory organisations, marine policy officers, researchers and consultants from environmental agencies. The demonstrator adopts DIVAnd software tool (Data Interpolating Variational Analysis in n dimensions), machine learning-based methods, and relies on scientific validation services.
- **Plankton Genomics** - Led by the European Bioinformatics Institute (EMBL-EBI) and created by the Faculty of Sciences at Sorbonne University, with contributions from Flanders Marine Institute (VLIZ), this demonstrator showcases an in-depth assessment of plankton distributions by mining data across different datasets in the biomolecular, imaging and environmental domains. The initial users of the plankton genomics demonstrator are, primarily, scientific researchers, including taxonomists, computational ecologists and bioinformaticians, and a broad base of scientists interested in plankton biogeography, marine biogeochemistry, ecosystem health, and climate science.
- **Marine Environmental Indicators** - focusing on data related to the marine environment, this demonstrator aims to calculate and distribute online information and indicators on the environmental quality of the marine area, obtain new added-value data applying extensive data analysis and machine learning methods on multi-source data sets, and enable users to perform operations, such as selecting a portion of a dataset to perform statistical analysis or display the data. The target audience includes intermediate users such as environmental protection agencies and scientific users.
- **Fish, a matter of scales** - This demonstrator aims to deliver a scalable and robust open data portal for fisheries data in EU waters and beyond. The demonstrator will improve fisheries' data management and analytic capabilities by relying on Fisheries Atlas and the Global Record of Stocks and Fisheries. Fisheries managers may address the demonstrator, regional fisheries data analysts, system developers and the general public interested in stocks and fisheries, fish provenance, fisheries distribution, fisheries.
- **Aquaculture Monitor** – the aim is to deliver a tool to monitor and provide national aquaculture sector overviews on interoperable services where teams can compute and publish reproducible experiments using the services of Aquaculture Cage Atlas and Ponds Atlas. The demonstrator may interest regional aquaculture data analysts,

system developers, regional aquaculture managers and the general public interested in aquaculture locations, production, and tracking.

Blue Cloud

The Open Science Cloud for Europe's oceans and seas, Blue Cloud, federates services offered by marine data infrastructures, research infrastructures and e-infrastructures in Europe to support and empower Ocean research. It saw substantial growth in 2021 after launching five online laboratories, or 'virtual labs' that allow researchers to operate complex experiments for application across different marine domains, including Essential Ocean Variables, Marine Environmental Indicators and Fisheries & Aquaculture.

Ocean sustainability is one of the most important societal challenges we face today. The ocean produces over half of the world's oxygen, stores 50 times the CO₂ than our atmosphere, regulates our climate by transporting heat from the equator to the poles and transports around 80% of international trade goods. Increasing the knowledge of ocean and marine ecosystems requires availability and improved access to ocean observation data. Marine data has been collected for centuries by many ways and means – by vessels, sensors, fleets, monitoring stations, space observation - and in recent decades, Europe has built a landscape of marine data management infrastructures that collect, monitor and process data coming from oceans and seas. The challenge now lies in transforming this wealth of data into knowledge, leveraging Artificial Intelligence and machine learning to support science-based solutions that contribute to delivering the objectives of the EU Green Deal and the United Nations Agenda 2030.

"As of today, we count 750 users coming from different research institutes in Europe using the main assets of the Blue-Cloud platform. This shows there is a broad use of Blue Cloud by scientists and researchers working in the marine sector, and the uptake of the Virtual Labs will ensure we create innovative discoveries to understand our oceans much sooner," said Pittonet Gaiarin.

Designed and built within the European Open Science Cloud (EOSC) framework, the Blue Cloud project aims to provide Findable, Accessible, Interoperable and Reusable (FAIR) digital objects, from data products, to analytical models and services.

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[About Blue Cloud](#)

The European Open Science Cloud (EOSC) was launched by the European Commission in 2016 to provide a virtual environment with open and seamless services for storage, management, analysis and reuse of research data across borders and disciplines. Within this framework, Blue Cloud, as the "Future of Seas and Oceans Flagship Initiative" of EU HORIZON 2020 programme, is the thematic EOSC for the maritime domain, serving the Blue Economy Marine Environment and Marine Knowledge agendas.

Blue Cloud delivers a collaborative virtual environment to enhance FAIR and Open Science. Starting in October 2019, Blue Cloud is deploying a cyber platform with a smart federation of an unprecedented wealth of multidisciplinary data repositories, analytical tools, and

computing facilities to explore and demonstrate the potential of cloud-based Open Science and address ocean sustainability, delivering on the EU Green Deal, UN Ocean Decade, and G7 Future of the Oceans objectives.

Blue Cloud federates leading European marine data and research infrastructures (SeaDataNet, EurOBIS, Euro-ARGO, ICOS, SOCAT, ENA, EMODnet, CMEMS) and e-Infrastructures (EUDAT, D4Science, WEkEO DIAS), allowing researchers to combine, reuse, and share quality data and analytical processes and results across disciplines and countries. This federation occurs at the levels of data, computing and analytical service resources.

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YouTube: <https://www.youtube.com/watch?v=3WLNOQxKDAQ&t=25>