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Federation Workshop

6 November 2024 | Lisbon, Portugal

The First Federation Workshop

Held at the **Instituto Hidrográfico in Lisbon on the 6th of November 2024,** the **first Blue-Cloud Federation Workshop gathered 40 partners from the Blue-Cloud consortium**, together with representatives of marine research infrastructures and initiatives, with the aim to address the need for for sharing open science practices and advancements in digital tools and services for **European researchers addressing marine and ocean challenges.** Through presentations and panel discussions, we explored approaches to facilitate the sharing of best practices and interoperable workflows in alignment with the **European Commission's Ocean Pact and the European Open Science Cloud (EOSC).**

After a few, welcoming words from **Sara Pittonet Gaiarin**, Blue-Cloud 2026's Coordinator, and our local host **João Vitorino**, **Zoi Konstantinou, Policy Officer at the European Commission for DG MARE**, opened the workshop by addressing the need for a sustainable approach to marine knowledge, noting the importance of coordinated efforts. The Commission is committed to improving transparency and access to marine knowledge in support of sustainable development. She introduced the **European Commission's Ocean Pact,** which will provide a framework for enhancing marine data sharing and collaboration across EU member states.

Morning Session: Blue-Cloud As An Incubator For Marine Open Science

The morning's programme commenced with presentations on national and European initiatives promoting Open Science and data accessibility in marine and environmental research. **João Moreira and Marta Coelho Abrantes,** representing Portugal's Foundation for Science and Technology **(Fundação para a Ciência e Tecnologia, FCT)** and ESFRI national delegates for Portugal, presented Portugal' s National Research Data Programme. The programme highlights Portugal's commitment to data interoperability and open-access principles, ensuring research data is both accessible and managed effectively within national and international frameworks. By joining forces with the EOSC, Portugal has positioned itself as a critical partner in the broader open science ecosystem, as João Moreira was remarking, "The expected impact is to foster open science, to promote a national network of competence centres, to strengthen our services and infrastructures and to continue the work that we have been carrying out with the community."

They outlined FCT's approach to open-access publication, research data management, and infrastructure interoperability, with **Portugal's National Research Data Programme** being a centralised effort to make research data more usable and impactful.

The morning sessions continued with a presentation on the **Blue-Cloud Virtual Research Environment (VRE) by Pasquale Pagano**, CNR-ISTI and Blue-Cloud Scientific Coordinator, and **Dick Schaap**, MARIS, Technical Coordinator of the project. P.Pagano presented the Blue-Cloud VRE as an interoperable research platform that provides tools and resources for researchers worldwide to collaborate and share marine data seamlessly.

D. Schaap presented the **Blue-Cloud Data Discovery and Access Service,**

which aims to facilitate the access to marine datasets through a federated approach connecting different Blue Data Infrastructures.

Key features of the **VRE include Virtual Labs for Plankton Genomics, Fisheries management, Marine Environment Indicators, and more**, each accessible to researchers through a unified digital environment. They explained that these resources, grounded in open science principles, are intended to help reduce barriers to data access and provide researchers with an inclusive, collaborative research infrastructure.

Next, **Julien Barde, IRD**, and **Matthias Münnich, ETH Zurich**, delivered insightful presentations that highlighted advancements in marine data management and analysis.

Julien Barde, introduced the **Global Fisheries Atlas Virtual Lab.** This VLab serves as a FAIR-compliant entry point for end-users to discover, access, and understand the state of important fish stocks and fisheries worldwide. J. Barde emphasised the importance of o**pen science principles** for the sustainable management of fisheries, and demonstrated how the VLab integrates diverse datasets and code, enabling users to better reproduce and explore some key data products describing fisheries activities.

Matthias Münnich, presented the development of a generic modelling workflow within the **Workbench for Ecosystem-level Essential Ocean Variables (EOVs)**. This workflow is designed to generate high-quality interpolated maps of the global distribution of plankton entities. adopting machine learning models for gap filling using several predictors. The presentation highlighted how the Blue-Cloud VRE facilitates efficient data processing and analysis, advancing the understanding of marine ecosystems.

Afternoon Session: Bringing Joint Efforts Together

In the afternoon, the workshop welcomed invited presentations from **Research Infrastructures (RIs), projects and initiatives working on marine, environmental and climate related topics.**

Lara Veylit, from the CLIMAREST Project, introduced the Marine Restoration Toolbox. This platform serves as a resource for practitioners involved in ecological restoration, and was recently hosted within the Blue- Cloud VRE where it exploits Blue-Cloud computing resources for undertaking some pilot experiments before entering into production.

Claudio D'Onofrio, from ICOS ERIC, presented the data lifecycle and quality management processes within ICOS, a network focused on greenhouse gas observation. ICOS has developed a standardised data workflow that ensures data interoperability and traceability, helping to establish the FAIR (Findable, Accessible, Interoperable, Reusable) principles as standard practice.

"If all data adhered to these FAIR principles, it would simplify research exponentially."

Claudio D'Onofrio, ICOS ERIC/ICOS Carbon Portal

Euro–ARGO ERIC, represented by **Yann-Hervé De Roeck**, presented its platform and global network contributing to the Global Ocean Observing System and the Global Climate Observing System.

Ingrid Puillat, EMSO ERIC Director General, presented the evolution of EMSO's IT infrastructure, which currently leverages a federated ERDDAP system to enhance data distribution and retrieval of its operative sites across Europe while optimising Data access and ensuring Data sustainability.

Julio Paneque, from LifeWatch ERIC, presented its federated services, including the LifeWatch search engine, LifeBlock system, and workflow engine. These tools facilitate access to a vast array of biological and environmental data, supporting complex research workflows and promoting data interoperability.

The workshop reaffirmed **Blue-Cloud's commitment to FAIR data standards**, providing an accessible platform that enables researchers to contribute to and benefit from interoperable data repositories supporting open science principles.

Training and education on FAIR data principles emerged as priorities, with Blue-Cloud addressing this need by hosting three FAIR Data Principles Webinars and bringing together collaborative tools and shared methodologies to support broader dissemination of FAIR principles across the marine research community.

An important highlight of the day was the official signing of the **Memorandum of Understanding between FAIR-EASE and Blue-Cloud**, with both projects working on a series of common approaches and best practices, applied to data services and data analysis.

Pasquale Pagano, Blue-Cloud's Scientific Coordinator, and Alessandro Rizzo, FAIR-EASE's Coordinator

The Outcomes

The Blue-Cloud Federation workshop was the first attempt by Blue-Cloud 2026 to bring together multiple research infrastructures and projects active in the marine and ocean landscape to debate on solutions to innovate and strengthen the FAIRness of their services. Blue-Cloud role as a **"Science Factory"** was introduced, a cloud-based environment where to exploit resources, design replicable workflows and run experiments that, by boosting open science practices, can ultimately help the research community to address greater ocean challenges in a collaborative, faster and trustable way.

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