# Powering the European Marine Data Ecosystem

For a digital and green future

Posters abstracts booklet

EMODnet OPEN CONFERENCE 2023

Version 1.2

# Table of Contents

## Posters

# Table of Contents

## Posters

# Table of Contents

## Posters

# 1. EMODnet near real time river and land boundary services

Currently state-of-the-art global, regional and coastal ocean models continue to use constant river flow or monthly averaged climatologies as land boundary conditions. This type of boundary ignores river temporal variability and human induced changes that may impact severely the circulating flow. Furthermore, this simple boundary condition disregards the influence of tides, estuaries mixing and atmospheric conditions. Recent efforts in river data collection and development of numerical models allow to improve the coupling of the water continuum (rivers, estuaries and ocean) and to produce more realistic fields in near the coastal area.

The EMODnet near-real-time river data service has been designed to satisfy the needs from the coastal community by providing access on a one-stop-shop to standardised operational river information from national and regional water administrations. It collects data from the closest hydrologic stations to the coastal area which are free from tidal influence. Currently, it integrates more than 700 stations from 35 providers of 17 countries from 3 continents (Europe, North America, and South America). To improve land boundary conditions, an estuarine proxy that incorporates local tides and ocean and atmospheric operational conditions has been designed. This numerical model proxy, based on the MOHID model, produces more realistic hourly salinity concentrations and discharged volumes reaching the coastal area with low computing cost.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 2. Empowering marine research with AI-driven imaging: insights and applications from the iMagine project

The EC-funded project iMagine offers a range of image data collections, advanced image analysis tools driven by Artificial Intelligence (AI), and comprehensive Best Practice guides for scientific image analysis. These resources will significantly enhance the efficiency and precision of processing and interpreting imaging data within marine and freshwater research, thereby expediting our understanding of essential processes and factors related to the health of oceans, seas, coastal areas, and inland waters. By leveraging the computational capabilities of the European Open Science Cloud, iMagine introduces a versatile framework for the development, training, and implementation of AI models. Researchers can readily adopt this framework to enhance their AI-based applications, encompassing water pollution mitigation, biodiversity and ecosystem research, climate change assessment, beach monitoring, and the broader realm of AI-driven solutions.

The collaboration among the eight aquatic use cases under iMagine will yield standardised approaches in data handling, quality assurance, performance assessment, integration, traceability, and adherence to FAIR principles, thereby fostering uniformity across Research Infrastructures. Further tests and checks will be performed by additional use cases selected through a continuous open call with a two-month cut-off date.

The resultant iMagine AI development and testing platform and the practical iMagine use case applications will be valuable to the European marine data management landscape. iMagine outcomes will be relevant for initiatives such as the Digital Twin of the Ocean, EMODnet, Copernicus, and similar international ventures.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 3. Sailing for Science onboard Mediterranea - Insights from two Advanced Citizen Science Campaigns across the Med Sea waters

*"Progetto Mediterranea"* is a nautical, cultural, scientific and social expedition, with the Mediterranean as central focus and considered not only as a saltwater basin to be explored by sailing, but as a meeting point of different people and cultures. Since 2013, each year this initiative recognized in the framework of the UN Ocean Decade has been divided into sailing routes and nautical training activities, accompanied by activities in the intercepted coastal environments and meetings onboard for in-depth study of specific topics, sometimes under the guidance of experts and professionals. In this regard, along the route planned at the beginning of the year, vertical projects with ad hoc social, cultural or scientific objectives are developed. The latter type, is the aspect that was most deeply explored during the two weeks of "Advanced Citizen Science Campaigns 2023" performed onboard. Engaging people from different backgrounds and ages, we planned two weeks of activities along the Montenegro and Albania coasts at first and in the Ionian Islands, between Corfu and Lefkas, in the second leg. We collected data relevant for different aspects of marine sciences and we organized some lectures onboard to deepen the crew knowledge on Med Sea biodiversity, engaging them in data collection and field sampling obtaining data which may be relevant also for the EMODnet thematic portals.

At the end of the expedition, we summarized all the performed activities in two final reports, we got in touch with relevant research groups to validate and share the most significant observations and all the relevant results obtained will be entirely shared with the scientific community at EU level in the next few weeks.

**Poster Theme:**
EMODnet, Mission Ocean and Wider Society

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# 4. Contributing to the EU Atlas of the Seas developing shared communication and educational tools to address the Ocean Literacy challenges in Europe and beyond

The **European Atlas of the Seas** is the official digital mapping tool of the European Commission's Directorate General for Maritime Affairs and Fisheries (**DG MARE**) dedicated to **Ocean Literacy**. I actively contributed to this infrastructure obtaining data sharable as data provider, according to my academic and professional background in marine sciences and cartography applied to environmental issues. During the year 2023 I performed several outreach activities engaging different stakeholders both from private and public sector, obtaining useful insights from field observations performed also through SCUBA diving sessions. Moreover, this contribution is a tangible proof of how different sectors of the civil society through a multiperspective and intergenerational exchange can contribute to better address even the most delicate challenges of the Blue Economy sector, facing the main sustainability challenges in the upcoming years.

To impact directly the Atlas community, I served as marine biologist, scientific diver and GIS expert in different contexts, through some field-based research and teaching experiences which are summarized in an interview focused on my career and scientific contributions so far: https://maritime-forum.ec.europa.eu/contents/european-atlas-seas-short-interview-martina-gaglioti_en. In the last few years, relying on a source-to sea approach I tried to shed light on the most relevant topics related to climate-change and conservation priorities addressing many efforts in my hometown Province and native Country, particularly engaging some secondary school students in the framework of the first EU Blue School project recognized for Latina Province (Italy, Latium region). I guided many high school students in field data collection contributing to the layer of the Education for Climate Change challenge, measuring parameters and collecting data on marine and freshwater biodiversity, exploring local protected and designated areas (i.e. Circeo Man and Biosphere Reserve; Ninfa Natural Monument), learning on field how to recognize and detect vulnerable or alien species,

performing environmental monitoring through a participative approach to GIS tools and cartography. On this perspective, collaborating with some EMODnet Secretariat representatives I contributed also to the implementation of the Atlas itself, with a Teacher's corner exercise developed with specific reference to ecosystems and species mentioned in the Habitat Directive (i.e. *Posidonia oceanica* seagrass meadows from a Sardinian Nature 2000 site). In this occasion I made available some data acquired in relevant sites of the Med Sea within the Nature 2000 network and national MPAs system, relying on local ecological knowledge and field commitment acquiring data through scuba diving sampling and translating my observations into georeferenced data useful for the Atlas implementation. My contribution to Marine Spatial Planning so far has been enacted according to the MSP strategy, focusing also in transboundary actions aimed at capacity building actions in the less-developed countries, even beyond the EU boundaries (i.e. "TRASH TALK IN ACTION" recognized as a Mission Charter Action). This work represents as a whole a relevant part of a long-term commitment in the framework of the EMODnet platform development, since its first steps as a first prize recipient of the first Open Sea Lab in Antwerp (2017), to Team Leader of successful contributions mentioned among the finalists ranking of the OSL 3.0 Hackathon (i.e. GIS MAPPERS team project: https://www.youtube.com/watch?v=2TzmpBMm210&si=A04PF4wkyG4d2HvY).

**Poster Theme:**
EMODnet for Global and the
UN Ocean Decade

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# 5. EMODnet in Blue-Cloud 2026: Advancing ocean research through cloud-based data integration and Open Science

Cloud-based computing, together with open science, enables scientists to address complex research questions and environmental challenges. The increase in the amount of data produced, and made openly available in data infrastructures such as EMODnet, presents new challenges in terms of access, combination, process and management. Overcoming these challenges allows us to create innovative data-driven products and make their workflows accessible and re-usable, fostering informed and evidence-based decision making.

Blue-Cloud offers simplified access to EMODnet data collections through the Data Discovery & Access Service and for use in the Virtual Research Environment (VRE) and its Virtual Labs (VLabs). In particular, Blue-Cloud VLabs integrate diverse data from EMODnet with other types from different aggregators. For example, VLab "Coastal oceans observations along Europe", provides a workflow integrating physics, geology, human activities and bathymetry data from EMODnet. VLab "Carbon-Plankton dynamics" combines biodiversity and chemistry data from EMODnet with carbon data from ICOS.

Data collections from EMODnet are also an important part to develop and exploit the Blue-Cloud Essential Ocean Variables (EOVs) Workbenches (WBs). These provide validated and harmonised data collections for physics, chemistry and biology using big data technologies, data lakes and cloud-based software tools.

The Physics WB considers EMODnet Physics as potential data source among with the main Blue Data Infrastructures to gather temperature and salinity data and integrate them harmonising the metadata information and removing duplicates to obtain new consistent datasets with enhanced spatial and temporal coverage for deriving information products and ocean indicators. EMODnet Physics is also a target user of the WB workflow for its further exploitation, thus its engagement is crucial for co-designing solutions.

Improving data interoperability between European marine data management infrastructures, and EOSC initiatives such as Blue-Cloud, is crucial to handle and exchange more multidisciplinary data and to feed into the Digital Twin of the Ocean.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 6. DASSH: Unlocking Ocean Secrets through FAIR biodiversity data

As a Centre of Excellence DASSH (the UK Archive for Marine Species and Habitats Data and UK Node of OBIS) provides leadership, best practices, services, tools, and training to support the archiving, management, and publication of marine biodiversity data in standardised formats. Ensuring that marine biodiversity data follows the FAIR (Findable, Accessible, Interoperable and Reusable) data principles has been shown to keep data safe and secure, increase the efficiency and integrity of research, improve visibility of research work, and enable greater collaboration.
The DASSH strategy is to uphold the principle of "Publish Once, Harvest Many Times". Once published, data can be harvested by national, global, and thematic data catalogues, or downloaded by individuals through the DASSH-hosted data mapper, and via national and European portals. This further broadens the visibility of the data and widens opportunities for re-use and collaboration.

In the poster presentation we will highlight the role of DASSH in ensuring marine biodiversity data is standardised and FAIR, as well as how we ensure accessibility and interoperability by partnering with different national and international data aggregators (including EMODnet, OBIS, and GBIF). This work ensures that data can be used to inform evidence-driven policy at a range of scales.

We also highlight work looking at the groundbreaking integration of new data streams into DASSH workflows, including current work on eDNA and imagery-derived occurrence data. These new data streams are revolutionising biodiversity science. Improving the accessibility of these data types through their inclusion in spatial biodiversity portals will help to maximise the value of this information.

**Poster Theme:**
EMODnet, Ocean Best practices and Interoperability

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# 7. Geological maps for EMODnet from the Norwegian offshore and coastal areas in the North Sea, Norwegian Sea, and Barents Sea

The Geological Survey of Norway (NGU) delivers a range of seabed maps to EMODnet Geology. These map products originate from geological mapping within the MAREANO offshore seabed mapping programme (www.mareano.no) and marine base map projects in the coastal zone. The geomorphology and sediment distribution patterns reflect a complex geological history, as well as various modern-day hydrodynamic processes. As of early 2023, MAREANO has mapped nearly 270 000 km2 of the Norwegian offshore areas while c. 12 000 km2 of the coastal zone has so far been mapped. Together these maps span environmental gradients from shallow water to more than 5500 m depth, with ocean currents in places exceeding 1 m per second and water temperatures falling below -1 °C. Data used for geological interpretation typically include multibeam bathymetry and backscatter, sub-bottom profiler, underwater video, and seabed samples. In the coastal zone, NGUs mapping has been conducted a under series of seabed mapping projects in collaboration with local communities, industry and other stakeholders. To meet the needs of many different users, maps from the coastal zone are compiled and intended for use in higher detail (typically 1:20 000) than the offshore maps (typically 1:100 000). In 2020-2022 NGU collaborated with The Norwegian Mapping Authority (responsible for bathymetry) and the Institute of Marine Research (responsible for biology, habitats and oceanography), in a national coastal pilot project.

By producing more than fifty different map products for three pilot areas on the Norwegian coast we demonstrated the benefits of such information. Bathymetric and geological maps produced by MAREANO and coastal mapping projects, provide the foundation for benthic habitat mapping when combined with biological and oceanographic data. Results from the mapping conducted over the past 20 years have significantly increased our understanding of Norway's seabed and contributed to the knowledge base for sustainable management.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 8. Digging up the oceans' past: A Citizen Science project for Historical Scientific Papers

EMODnet Biology has been actively involved in the critical task of rescuing historical biodiversity data, which holds immense value as it offers a unique glimpse into past ecosystems, challenging to replicate. Simultaneously, Citizen Science plays a significant role both at fostering environmental awareness and at contributing valuable data to the scientific community. In an innovative endeavor within the EMODnet Biology framework, a coordinated pilot effort was initiated to involve citizens in rescue of historical data. This pioneering project, titled "digging up the oceans' past" was developed by the Data Management Team of the Hellenic Centre for Marine Research. It was based on the 1908 document "Danish Oceanographical Expedition to the Mediterranean and adjacent seas". This project was developed and hosted on the Zooniverse Platform, the world's largest collection of online citizen science projects, and garnered the participation of 23 volunteers who conducted a total of 73 data classifications. The derived results were used for the curation of the dataset, which is now available through the MedOBIS IPT platform. Additionally, it provided an opportunity to engage and inform citizen scientists about the EMODnet Biology project enabling contributions from people outside the project consortium. We firmly believe that such projects will yield even more profound insights into ocean conservation and the wider society in the near future.

The Biodiversity Heritage Library (BHL) currently offers an extensive collection of historical datasets related to marine species, comprising over 1600 documents, each encompassing data on 100 or more taxa. This abundance of resources presents a substantial potential for future data rescue activities.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 9. The Biocheck Tool: Enhancing data quality in marine biodiversity research

Accurate and comprehensive marine biodiversity occurrence data is crucial for understanding and predicting species population trends, constituting the base for ecological and conservation studies. EMODnet Biology, in synergy with global initiatives like the Ocean Biodiversity Information System (OBIS) and the Global Biodiversity Information Facility (GBIF), is committed to aggregating and disseminating high-quality biodiversity and sample related data. However, ensuring data quality requires curation, standardization and validation, often complicated due to scattered and format-dependent quality control tools tailored to specific user needs. The Biocheck tool is an innovative web application that expands on the EMODnetBiocheckR package, both built upon the obistools R package and developed from the collaborative efforts of the LifeWatch and EMODnet Biology projects. This tool is designed to comprehensively explore and quality control marine biodiversity (meta)data, adhering to the widely accepted Darwin Core data standard. Therefore, serving as the default quality control tool for all types of marine biodiversity occurrence data. The Biocheck tool conducts a series of critical quality checks on:
- (Meta)data format and integrity;
- Taxonomy, based on the World Register of Marine Species (WoRMS);
- Marine and coastal biogeography;
- Parameters associated with occurrences such as organism quantifications, biometrics and facts or environmental and sampling related data.

The tool's output includes dataset-specific exploratory maps and plots, offering valuable insights into the data, as well as an exhaustive list of potentially problematic records that fail the quality checks. The Biocheck tool thus plays a pivotal role in elevating the quality and reliability of marine biodiversity data, contributing to our understanding of species populations and facilitating informed conservation and ecological decisions.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 10. Romanian Maritime Hydrographic Directorate's approach to the "collect once and use several times" philosophy

As the national hydrographic office, the Maritime Hydrographic Directorate (MHD) holds a diverse set of responsibilities. These include the management of the national maritime hydrographic data system, the surveying of navigation routes and harbor approach channels, performing continuous meteorological monitoring, and providing sea service forecasting for Navy. Additionally, MHD is responsible for producing the official nautical charts in both paper and electronic formats, known as Electronic Nautical Charts (ENC).

With a wide spectrum of activities within Romania's jurisdiction on the Black Sea and nearly a century of accumulated expertise in maritime domain, MHD is well-positioned to offer valuable insights into the planning of Romania's maritime space. Given its extensive experience, the MHD assumes the regional role as a key actor, in the knowledge of the marine environment and the application of international regulations in the field of navigation safety, as well as the role of national authority in the field of hydrography.

All its responsibilities are embodied in a series of specific activities, initially involving the generation of vast amounts of big data related to the marine environment, followed by the creation of specialized products. Clearly, the management of such a substantial volume of data necessitates innovative approaches in terms of storage, networking, and processing.

In this respect, MHD aims to align with the EMODnet philosophy of "collect once and use many times", by contributing high-quality hydrographic and oceanographic data sets from in-situ surveys to at least four discipline-based themes, such as: bathymetry (including bathymetric data and derived products, digital coastlines, and baseline inventories), geology (covering sea-floor geology, seabed substrates, and coastline migration rates), human activities (encompassing Maritime Spatial Planning, cultural heritage, and the management of cables and pipelines), and physics (which includes underwater noise, wave patterns, sea state, wind, and sea level data).

**Poster Theme:**

EMODnet, Ocean Observation and the marine knowledge value chain

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# 11. An EMODnet Geology WP6 case study: structural map of Italian seas

The Geological Survey of Italy – ISPRA coordinates Work Package 6 "Geological events and probabilities" of EMODnet Geology which includes earthquakes, volcanoes, landslides, fluid emissions, tsunamis and Quaternary tectonics. In the frame of activities aimed at providing Italian products, ISPRA carries on cooperation with marine geology researchers from several universities and research institutes.

Data gathered allowed to realize an update of the structural map of Italian seas. The map shows relevant tectonic features detected in Italian seas updated on the base of marine geological researches carried out in the last thirty years, which benefited of relevant technological innovations in marine geological surveys (multibeam, sub-bottom CHIRP, high penetration seismics). The map contains structural data from original surveys as well as selected data from scientific literature or from strategic national research programmes, integrated and validated in order to create a harmonized dataset.

Structural and volcanic elements are classified according to the INSPIRE compliant EMODnet terminology and are characterized by geometric, kinematic and chronological parameters which are listed in different fields of the attribute table of each shapefile composing the map. They are represented on top of the EMODnet Bathymetry DTM together with information on seismicity. The map aims to present in a synthetic but exhaustive way the structural setting of Italian seas, a key region in the geologically very active Mediterranean Sea, which is dominated by the geodynamic process of convergence and collision between the European and African plates. The map evidences the migration over time and space of the tectonic events and the features that have contributed mostly to the current conformation of the Italian seafloor as well as those that may originate geohazards.

The map represents a solid base for more detailed studies on seismotectonics and applied geology, for territorial management and spatial planning as well as for scientific dissemination.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 12. The European Atlas of the Seas: An Ocean Literacy Tool Powered by EMODnet for Wider Society

The European Atlas of the Seas (www.european-atlas-of-the-seas.eu) is a user-friendly online map-based Ocean Literacy tool available in 24 languages developed at the initiative of the Directorate-General for Maritime Affairs and Fisheries (DG MARE) of the European Commission and powered by the European Marine Observation and Data Network (EMODnet) Secretariat. It makes it possible for people across Europe to explore a wide range of marine topics, such as the environment, marine life, nature conservation, sea surface temperature trends, sea level rise, marine litter, fisheries, aquaculture, tourism, energy, transport, and much more!

With a catalogue of more than 275 interactive map layers that is constantly updated and enriched and the possibility to create custom maps that can be printed, shared and embedded in websites and blogs, the Atlas is an easy and attractive way for everyone to connect to our blue planet and better understand how the ocean influences us and how we influence the ocean. Thematic predefined maps that combine selected map layers make it possible for users to learn about ocean observation and marine data as well as important pillars of the European Green Deal, in particular biodiversity, food from the ocean, clean energy and climate change.

EMODnet provides more than 50% of the map layers in the Atlas. Other data providers include, for example, the Copernicus Marine Service, the European Environmental Agency (EEA), Eurostat and the Joint Research Center (JRC).

The Atlas can be used in schools in multiple ways. The Teachers Corner (http://learn.european-atlas-of-the-seas.eu) provides ready to use map-based exercises in English, French and Portuguese for students of different age groups as well as fun activities such as a Treasure Hunt, two virtual boat races and a Geocaching Game! The recently developed 'My Maps' tool now also enables teachers to create their own working space in the Atlas.

**Poster Theme:**
EMODnet, Mission Ocean and Wider Society

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# 13. EMODnet Biology develops tools for EMODnet users

Since 2021, EMODnet Biology has been working towards the development of tools that allow users to query and download EMODnet's webservices. These tools are available in the form of R packages and offer a way to interrogate and access EMODnet's geographic vector data (EMODnetWFS) and EMODnet's geographic raster data and metadata (EMODnetWCS).
R is a free software environment for statistical computing and graphics and runs on UNIX platfforms, Windows and MacOS.
EMODnet's webservices adhere to OGC (Open Geospatial Consortium) standards, meaning that users can query all thematic lots endpoints in a structured way and retrieved the data and or information they require for their work. In this poster we present the functionalities of the EMODnetWFS and EMODnetWCS R packages, how they can be used and what outputs to expect.
Both R packages are available via the EMODnet GitHub repository and are in continuous development, following issues raised by users or those identified by the developing team itself. Future aims are to ensure they are published on CRAN, thus not only reaching a wider audience but also ensuring it follows criteria that attest to its quality and usefulness.

References:
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• EMODnetWCS Github repository, https://github.com/EMODnet/EMODnetWCS, last accessed on 2023-10-12

**Poster Theme:**
EMODnet Biology develops tools for EMODnet users

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# 14. Production of Free amino acids through solid state fermentation from *Oncorhynchus mykiss*

Aquaculture stands as the world's swiftest-growing animal food industry, rapidly ascending as the primary source of aquatic animal nutrition for human consumption. However, alongside the natural mortality, the valorization of fish generates considerable fish waste, posing environmental hazards if not managed appropriately. Through the avenue of solid-state fermentation (SSF) - collagen, omega-3, and fish protein hydrolysates (FPH) were extracted from fish waste, aiming to enhance marine resource utilization efficiency and mitigate adverse environmental impacts associated with industrial fish waste. This study focuses on exploitation of *Oncorhynchus mykiss*, a sterile and deceased fish, via SSF as a strategy for extracting FPH in the form of free amino acids (FAA). The proposed technological strategy utilize a single reactor unit to generate proteases (via production of hydrolytic enzymes), and subsequently employing these enzymes for the fermentation of fish waste. The initial experimental phase involved the quantification of protease activity originating from the *Bacillus cereus* inoculum across two temperatures ($30°C$ and $37°C$). Furthermore, for the purpose of performance comparison, the fermentation of *O. mykiss* waste was evaluated without the addition of any external inoculum (control conditions).

The results indicate that the highest production of FAA ($15.86 \pm 0.27$ mg/g DM) is achieved through fermentation at $30°C$ under control conditions. This outcome is attributed to the inhibition of proteases in the inoculated conditions. During the scale-up process, enhanced FAA release is observed under agitated conditions, yielding $13.76 \pm 2.32$ mg/g DM at 48 hours. Additionally, the release of omega 3 (1.16%) and collagen (0.82g/100g) was also observed.

**Poster Theme:**
EMODnet and the Blue Economy

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# 15. EMODnet Chemistry webODV - Online data analysis and visualization

webODV (https://webodv.awi.de) is the online version of the ODV (Ocean Data View, https://odv.awi.de) software and provides ODV typical interactive functionalities for data exploration, analysis and visualization in the form of web services. The idea is to provide users with intuitive and easy-to-use interfaces in their web-browser to access datasets maintained and administered centrally on a server, using the full capacity of ODV. webODV can be used from any computer in the world, no software installation or data download are required. webODV provides online access to large international data collections and community datasets, such as, from the EMODnet Chemistry project (https://emodnet.ec.europa.eu/en/chemistry). webODV supports collaborative research, reproducibility and sharing of results. It can be used to extract, explore and analyze data and to create publication-ready state-of-the-art visualizations.

Since 2021, the Alfred Wegener Institute and EMODnet Chemistry are operating a webODV instance at https://emodnet-chemistry.webodv.awi.de/ . With more than 100 users per month from 42 countries from all continents, this webODV instance has grown into a popular tool within Europe and worldwide.

With webODV users can create a large variety of plot types, including along-track sections, temporal evolution plots, maps on constant depth or density surfaces, Hovmöller diagrams and more. webODV has powerful station and sample filters as well as interactive zooming capabilities, allowing data subsetting and extraction in many different ways. webODV supports a wide range of map projections and interrupted global maps providing minimal geographical distortions for all ocean basins at the same time.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 16. Spatial and temporal patterns of eutrophication: a new data product for the European Seas

The state and the evolution of eutrophication within the European Seas are of paramount importance for many stakeholders, in particular in the frame of the implementation of European Union (EU) marine policies such as the Marine Strategy Framework Directive (MSFD), Water Framework Directive (WFD) , and Maritime Spatial Planning Directive (MSP).
The Eutrophication and Acidity aggregated datasets of EMODnet Chemistry consist of data collections gathering measurements of oxygen, inorganic and organic nitrogen and phosphorus,, silicate and chlorophyll-a concentration. Thanks to this collection, gridded products have been constructed with the DIVAnd (Data-interpolating variational analysis in n dimensions) software tool for different areas and at different spatio-temporal resolutions. The "All European Seas" products cover the largest domain, they consist of monthly fields for each variable, calculated on a 0.25° X 0.25° grid, for the 1960-2020 time period. The "Sea Regions" products focus on 6 European Sea basins, are calculated for 6-year periods and have a spatial resolution depending on the area: North Sea, Black Sea, Baltic Sea, Mediterranean Sea, Arctic Ocean and Northeast Atlantic Ocean. Finally, the "Coastal areas" products provide high-resolution gridded fields near major river mouths (Gulf of Riga, Danube Delta, Po River and Loire River).
In this work we will present the original data in the quality-controlled, aggregated collections as well as the last version of the gridded fields obtained as a result of the spatial interpolation performed with the DIVAnd tool.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 17. Marine Litter Database and associated products

Marine litter is a growing problem for the environment and human health. EMODnet Chemistry set up a Marine Litter Database (MLDB) in 2018 to gather and harmonize available marine litter data at European scale. This database contains data of beach and seafloor litter (trawlings). In addition, data of floating micro-litter and micro-litter in sediments follow the general data pathway of EMODnet Chemistry/SeaDataNet infrastructure. The data are mainly provided by the EMODnet project partners, but there are also additional sources from EU Member States and neighbouring countries. Datasets have been collected over a long period of time (2001-2022), in the framework of MSFD monitoring programs, research projects or by European citizens through Citizen Science tools like Marine Litter Watch. Based on this database, many data products have been produced, like beach, seafloor and micro litter distribution (maps for all types of litter or for specific types of items) or composition (material categories percentage). These products provide a publicly accessible visualization of the non-exhaustive distribution of marine litter on a Pan-European scale. The aim is to provide a synthetic and intuitive overview of the large amount of information and relevant aspects collected in the marine litter datasets. This poster briefly explains the path of marine litter data, from its collection to its valorisation.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 18. Connecting EMODnet to the broader world: multidisciplinary interoperability driven by controlled vocabularies

Pioneering work on semantic and syntactic harmonisation in the marine domain started under the auspices of IOC-IODE in the 1980s through its network of National Oceanographic Data Centres. Successive European-funded programmes since 2002, notably SEA-SEARCH, NETMAR and SeaDataNet/SeaDataCloud have built further knowledge and capability. As we respond to growing demand for easily-accessible data from a wide diversity of sources, such groundwork in data harmonisation is facilitating integration of European marine data, as exemplified by the achievements of EMODnet.

The adoption of common vocabularies by SeaDataNet and associated communities and the early decision to serve and manage these vocabularies from a single point of truth, like the NERC Vocabulary Server (NVS), in both machine- and human-readable formats, is also facilitating the development of tools and workflows that rely on trusted and resilient vocabulary services. The collective community effort involved in order to achieve this harmonised and semantically-annotated foundation layer should not be underestimated.

The NVS, hosted at the National Oceanography Centre (NOC) and managed by the British Oceanographic Data Centre (BODC), plays a key role in providing the content and technical governance for vocabularies underpinning SeaDataNet and EMODnet workflows. The vocabulary management team at BODC is responsible for addressing various requests including those for new terms and mappings, as well as developing new community-specific vocabularies.

The latter facilitate the discovery and aggregation of specialised EMODnet Chemistry datasets, as well as wider needs from the overall EMODnet community.

Such engagement has enabled us to build demonstrators showcasing the use of semantic technology and to reach agreement on common standards connecting international communities and trusted semantic resources. This poster will showcase some of these successes and highlight future efforts needed to fully integrate data, within and across domains utilising emerging and evolving technologies, coupled with global semantic best practices.

**Poster Theme:**
EMODnet, Ocean Best Practices and Interoperability

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# 19. Enhancing Oxygen Data Accuracy: Implementing Best Practices in the SOCIB Glider Canales Endurance Program

In the field of ocean data management, SOCIB (Balearic Islands Coastal Observing and
Forecasting System) has been a pioneer in advancing data quality and interoperability. This work highlights SOCIB's efforts to implement best practices in the glider mission, following international standards to provide high-quality observations. SOCIB initiatives aim to improve data quality and reliability, ultimately contributing to Ocean Best Practices's development within the EMODnet framework. In the recent decade, the requirement for precise and reliable data has expanded substantially, especially under pressure to explain climate change. While manufacturers have improved laboratory calibrations and instrument stability, in-field delayed mode (DM) correction to world-class standards remains limited, especially for glider platforms. Seasonal cruises in the Mallorca and Ibiza channels gather CTD profiles and oxygen water samples to generate high-quality scientific data. These measurements are carefully corrected and used for the inter-comparison with the ocean gliders. As the need for oxygen data has drastically increased and ocean gliders can be equipped with oxygen sensors, important actions need to be implemented to ensure that data is reliable, consistent, and ready for diverse research applications. Especially now that global temperatures have risen due to climate change, the solubility of oxygen in water has decreased, so it is crucial to ensure and obtain accurate oxygen measurements.

Therefore, at SOCIB, we have been implemented best practices in the lab that ensure and evaluate the conditions Of the oxygen glider sensors. We will present the procedures at SOCIB to ensure that the glider oxygen data collected at different times remains coherent and valuable for scientific analysis. These measurements will be compared to seasonal Canales Cruise Winkler samples. SOCIB's best practices and inter-calibration initiatives help advance Ocean Best Practices and EMODnet data interoperability. Also, these activities support EMODnet's worldwide mission of connecting and sharing best practices and oceanographic data.

**Poster Theme:**
EMODnet, Ocean Best Practices and Interoperability

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# 20. Europe's marine minerals: EMODnet geology and Geological Service for Europe (GSEU)

Minerals are major geopolitical actors in the present world. Supply chains of strategic (SRM) and critical raw materials (CRM) like cobalt, copper, lithium, nickel and rare earth elements are highly concentrated, generating risks. The European Marine Observation and Data Network (EMODnet) is a long-term marine data initiative funded by the European Maritime, Fisheries and Aquaculture Fund (EMFAF) and supported by the EU's integrated maritime policy. The EMODnet Geology team released in 2023 a series of pan-European products related to marine themes including Marine Minerals. Data products are available through the integrated EMODnet Central Portal: https://emodnet.ec.europa.eu/en. Collated marine mineral types and energy resources are grouped in 4 main categories: Marine Aggregates, Marine Critical Minerals, Marine Hydrocarbons and Hydrates, Marine non-critical Minerals. The twelve types mapped are: aggregates; hydrocarbons; gas hydrates; sapropel, marine placers; phosphorites; evaporites; polymetallic sulphides; polymetallic nodules; cobalt-rich ferromanganese crust; metal-rich sediments; rock, pegmatite and vein hosted mineralisation. The marine minerals theme is also connected to the five-year EU Coordination and Support Action, GSEU, (EuroGeoSurveys) that will deliver a plan for a sustainable Geological Service for Europe to be implemented beyond the 2027 project end, including assessing Europe's offshore CRM resources, improving the knowledge of underexplored areas and their mineral resources, harmonizing datasets with a focus on European strategic and CRM.

With Earth's population growth, efforts to meet our needs for resources with indigenous supplies continue. Many minerals and CRM form important components in low-carbon and resource-efficient technologies such as electric car batteries, wind turbines and solar panels. Information on the types of minerals and their genetic models has relevance to engineering disciplines including exploration and extractive industries, beach nourishment and reclamation projects, and more general, in Marine Spatial Planning. A large community is already benefiting from the project's outcomes, including Environmental and marine EU policies

**Poster Theme:**
EMODnet, Ocean Observation and the marine knowledge value chain

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# 21. EMODnet Physics – Enriching metadata for Essential Ocean Variables

One of the challenges that EMODnet Physics aims to address is the harmonisation of access to data, metadata and products from a wide range of observing systems. The UK's National Oceanography Centre (NOC) has worked as a component of the EMODnet Physics service to improve the metadata for a number of ocean observing variables, specifically for sea level data, as well as providing support for other ocean observing technologies, such as gliders.

Sea Surface Height is a key physics Global Ocean Observing System (GOOS) Essential Ocean Variable (EOV) and Sea Level is a Global Climate Observing System (GCOS) Essential Climate Variable (ECV). EMODnet Physics is integrating tide gauge data from multiple sources, and we need to help users understand the data lifecycle, such as where data have come from, what quality control has been performed, and who has been involved in the creation of a dataset.

The NOC has been working on standard names for tidal parameters, both observed and calculated, we've specified new attributes for datum and benchmark metadata, and have contributed to projects developing PIDs for sensors, to help reduce data duplication. We have been working with the EuroSea project and the EuroGOOS tide gauge task team to promote the tide gauge metadata catalogue, developed by the Irish Marine Institute - https://eutgn.marine.ie.

Under EMODnet Physics, we have been discussing next steps for the catalogue, such as importing information into GitHub to improve updates and reduce duplication of effort.

The NOC, through EMODnet Physics, has been able to provide support to other ocean observing networks, particularly by creating new parameters in common vocabularies. Part of the NOC, the British Oceanographic Data Centre (BODC) hosts and manages the NERC Vocabulary Server (NVS). For example, we have added new instrument terms for gliders and create new river and water level terms.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 22. Geomorphological features of the east mediterranean sea based on EMODnet digital bathymetry

The morphology of the seabed is a key factor in the framework of marine strategy and marine spatial planning for the sustainable use of resources while respecting the conservation of diverse marine and submarine environments at national, European as well international level. The seabed of the Eastern Mediterranean and in particular the Greek Seas is characterized by a highly complex morphology with submarine mountains, ridges and steep slopes, deep plains, valleys and gorges that shape the conditions for the circulation of the sea masses, the development and maintenance of marine biodiversity, marine and submarine biotic and abiotic resources and the occurrence of marine and submarine natural hazards.

High-resolution swath bathymetry acquired through various oceanographic surveys throughout the years, were compiled in a DTM of an almost 130m-resolution by the EMODnet Bathymetry Lot in order to reveal a more detailed and accurate sea bottom morphology, which publicly distributed. Based on this DTM product (release of 2018), along with existing literature, mid-scale morphological features of the East Mediterranean Sea were identified, described and finally compiled into an updated atlas of geomorphological features, published by IUCN in the framework of the "State of the knowledge of deep-water vulnerable species and habitats in the Eastern Mediterranean" project.

Within this project, in total, 47 individual or groups of positive morphological features (seamounts, knolls, mounds, ridges) and a total of roughly 400 submarine canyons and gullies were identified and described on the seafloor of the Eastern Mediterranean. The 165 underwater morphological formations from those identified and belonging to the Greek territory, were included in the "National Gazetteer of Underwater Feature Names" which was submitted to the United Nations Organization during the 3rd Session of the UN Group of Experts on Geographical Names held in New York, 1-5 May 2023.

## Poster Theme:
EMODnet, Ocean Observation and the marine knowledge value chain

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# 23. EMODnet dtms for the mediteranean, black and caribbean seas' biozones delineation

Seafloor geomorphology is widely recognized as a research area of interdisciplinary interest, as understanding the general structure of ocean topography can advance knowledge in multiple disciplines such as geology, biology, physics, etc. The identification of seafloor landforms is therefore of considerable importance because, among other factors, morphology significantly affects the distribution of benthic species and habitats. The definition of the boundaries between the three main biological zones (sublittoral, bathyal and abyssal) of the Mediterranean, Black and Caribbean Seas was implemented for the purposes of the EMODnet Seabed Habitat Mapping Lot, based on the EMODnet Bathymetry products and the existing relevant literature.

In all basins the boundary between the circalittoral and the bathyal as well as the boundary between the bathyal and the abyssal zones, are defined as abrupt changes in slope. In the former case, the gentle slope of the continental shelf gives way to the much steeper continental slope, while in the latter an abrupt transition leads from the steep continental slope to the deep-sea abyssal plain. Those boundaries were delineated by GIS-based methodology using the 2018 DTM data products for the Mediterranean and Black Seas and 2022 DTMs for the Caribbean Sea as initial inputs and the derived slope from the DTMs as well depth thresholds from the existing literature along with expert judgment.

**Poster Theme:**
EMODnet, Ocean Observation and the marine knowledge value chain

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# 24. EMODnet Bathymetry's Heightmap Interpolation Package

We present the heightmap interpolation package developed within EMODnet Bathymetry. The package implements various methods for interpolating grid cells of an elevation/bathymetric map given a set of reference elevation data at known locations. While interpolation is a broad term that depends on the sampling and distribution of the reference data, we try to fit all the use cases by providing two types of interpolation methods. On the one hand, we provide scattered data interpolation techniques, where we consider the reference data as punctual data by not assuming any gridding or regular sampling on it.

These methods create a global interpolation function that can be queried at any point in space. Given a desired resolution and gridding, the package then computes the value of missing data by querying such interpolant on the unknown map cells. On the other hand, we also provide hole filling methods for those cases where the reference data is already gridded and the interpolation problem consists in filling largemissing but continuous parts of the map surrounded by known data. While scattered data interpolators can also be used for this purpose, the heightmap interpolation package implements inpainting approaches, usually devised for image processing, to tackle this hole filling problem. These methods take advantage of the regular gridding of the data to provide higher-degree interpolations faster than some similar scattered data approaches while also requiring much less memory to execute.

The package is publicly available as an open-source Python library, allowing its reuse for purposes other than the ones envisioned in EMODnet Bathymetry. In this sense, and in order to ease its adoption by the general public, the heightmap interpolation package has already been integrated within Ifremer's GLOBE software.

**Poster Theme:**
EMODnet innovations in data, data products, and services

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# 25. Pan European coastal vulnerability: developing a new coastal behaviour data product, EMODnet Geology.

The identification and communication of potential risks faced by coastal-zone populations is becoming increasingly important to strengthen society's resilience and enable communities to better handle coastal hazards. Assessing risk and vulnerability is important to inform the public, as well as coastal managers, on sustainable policy and practice. This so-called coastal vulnerability has been assessed, quantified and mapped using a wide variety of approaches, focussing on hazard, risk and resilience. Many studies place emphasis on physical parameters such as geology and topography, and on marine factors such as wave energy and storm frequency. Others also incorporate socio-economic factors such as population, cultural heritage, presence of crucial infrastructure, land use and conservation status.

Our pan-European assessment of coastal vulnerability adds a new layer of information to the existing EMODnet Geology product suite on shoreline change. Using the most complete inventory to date of case studies on coastal vulnerability in scientific journals, books and governmental reports, we have developed a detailed database on various vulnerability aspects across Europe and in other countries around the world. By geo-locating the maps from these studies, we have been able to assess the extent of coverage of coastal vulnerability assessment around European shorelines. Drawing on the existing literature, we have developed a common legend, indicating lower, intermediate and higher levels of vulnerability mapped at a pan-European scale.

Our research indicates incomplete coverage by existing studies, highlighting the potential to use data from existing EMODnet products such as shoreline migration, geology and bathymetry, to develop a basic coastal vulnerability index that can be validated against existing studies and used to fill the gaps. The resulting applied data product will help raise awareness in the general public and facilitate the work of coastal policy makers, planners and practitioners.

**Poster Theme:**

EMODnet innovations in data, data products and services

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# 26. New contaminant maps for the European Seas: contribution by EMODnet Chemistry

EMODnet Chemistry is a network of 66 marine institutes and monitoring agencies and 5 International organizations from 32 countries, producing harmonised, standardised and validated data collections for chemicals and marine pollution from in-situ measurements derived from more than 500 data providers. Utilizing the data collections for creating dedicated products to support marine strategies like the MSFD, user requirements and other needs related to the protection of marine environment is a core priority of the network.

In the case of contaminants, the large heterogeneity of data in terms of analysed substances, matrices, sampling methods, analytical protocols and in monitoring frequency and purposes by the different laboratories all over Europe, makes the effort for the aggregated data collections and products preparation quite challenging. Regional groups led by regional coordinators for 6 MSFD regions (North Sea, Black Sea, Baltic Sea, Mediterranean Sea, Arctic Ocean and Northeast Atlantic Ocean) are working together using ODV software for harmonizing, validating and aggregating data on contaminants in the marine environment.

The presentation will describe the latest developments concerning new and updated contaminant maps for selected parameters of MSFD interest for seawater, sediment, and biota: DDT, Hexachlorobenzene, Tributyltin, Triphenyltin, Mercury, Cadmium, Lead, Nickel, Anthracene, Fluoranthene, Benzo(a)pyrene, Naphthalene.

Four types of maps have been produced: a) monitored matrices, b) measurement counts, c) median values of data available in the last six years, and d) contaminants in marine organisms. The maps are aiming to display the spatial distributions of sampling stations and the data availability solely without any further interpretation of data values and will be published on the EMODnet Central Portal using open source tools and server applications with web services.

**Poster Theme:**
EMODnet innovations in data, data products, and services

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# 27. The seabed substrate data products provide information about the marine environment – EMODnet Geology

Increasing anthropogenic pressure in marine and coastal environments emphasizes the importance of the easily accessible, reliable, and suitable data on marine environment, to support conservation, research, and sustainable marine management decisions. The EMODnet (European Marine Observation and Data network) Geology project has been aiming to address this demand by collecting and harmonising geological data at different scales from all the European sea areas since 2009, at present with a collaboration of about 40 partners and subcontractors. Seabed substrate data is one of the key elements of EMODnet Geology. In the project, national seabed substrate data is harmonised into a shared schema, based on the sediment grain size. The latest update of the EMODnet seabed substrate products from September 2023 includes seabed substrate data at scales from 1:1500 to 1:1 000 000. The data covers all European marine areas as well as the Caspian Sea and the Caribbean Sea.

However, grain size alone does not define all seabed surface characteristics that have significance for marine environment. For example, features like glacial clay, moving sediments and bioclastic features, do not stand out. The first review of such seabed surface features was done in the previous phase of the project, including an analysis of their occurrence and a definition of preliminary surface feature groups. In addition, the project group started to work with seabed dynamics, especially seabed erosion.

The development of usable and valuable data products further, requires a collaboration with different stakeholders and end users. At best, this kind of data could be a valuable addition to understand and define marine environment, when the sediment grain size distribution is insufficient.

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**Poster Theme:**
EMODnet innovations in data, data products and services

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# 28. EMODnet Geology: Mapping, finding, compiling and harmonizing geological data of the seafloor

Data and information on the ocean floor is scattered, difficult to find and often inaccessible, seldom compatible, and often usable only by insiders. The main reason for this situation is the inaccessibility of the ocean floor and the need to use and rely on mostly geophysical methods. Thus, the ocean floor is by far not as well explored as on-shore areas: "we have better maps of the surface of Mars and the Moon than we do of the bottom of the ocean." [Gene Feldmann, NASA, 2009, https://www.nasa.gov/audience/forstudents/5-8/features/oceans-the-great-unknown-58.html].

Thus, in 2009 the European Commission established the European Marine Observation and Data Network (EMODnet) programme subdivided into seven thematic projects and EMODnet Geology is one of them. It's aims are to build digitally available map layers of the European Seas to be findable, accessible, interoperable and freely available (according to the FAIR data principles).

Within the EMODnet Geology (lead by GTK) the Workpackage "Seafloor geology" (lead by BGR) compiles and harmonizes heterogeneous marine geological and geomorphological data from the EMODnet partners all over Europe. These data are often mapped under extreme conditions in submarine environments such as mid-oceanic ridges, rift propagation zone, and subsea volcanic centres, e.g. the Grimsey lineament rift propagation zone located north-of Iceland.

These data of the different origins need to be compiled from the EMODnet Geology partners and transferred to a common data format. And last but not least, they need to be semantically and geometrically harmonized across EEZ-boundaries despite the different geological environments and digital formats to be made available according to FAIR data principles via the EMODnet Geology portal https://emodnet.ec.europa.eu/en/geology.

Underpinned by examples from the Icelandic Sea region, this poster will present and discuss the aspects of mapping, compilation and harmonization and outline the benefits of Seafloor geology data within the EMODnet geology Lot.

**Poster Theme:**
EMODnet, Ocean Best practices and Interoperability

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As part of the Horizon 2020 projects 'iAtlantic' (Integrated Assessment of Atlantic Marine Ecosystems in Space and Time) and 'SUMMER' (Sustainable management of mesopelagic resources), PANGAEA and EMODnet are continuing previous efforts to link their data infrastructures. The objectives are (1) to transfer standardised and harmonised metadata and data using solutions tailored to EMODnet's requirements and PANGAEA's infrastructure capacities, and (2) to ensure wider data dissemination through the four EMODnet themes: Physics, Biology, Bathymetry and Chemistry. The Physics harvesting process for physical oceanographic data via the OAI-PMH protocol was already established, but required a critical update to provide access to a large number of the latest PANGAEA datasets. PANGAEA and Biology/EurOBIS have worked to improve interoperability and are developing a semi-automated workflow for the transfer of biological data resources using open access scripting tools. In addition, PANGAEA has integrated the 'Biological Classifications' filter function, which mirrors the WoRMS taxonomy, to meet Biology's harvesting requirements, and has joined EMODnet Biology Phase V as a partner. Bathymetry is considering the integration of the PANGAEA Bathymetry Web Map/Feature Services (WMS/WFS), the development of which has been coordinated by the German Marine Research Alliance (DAM). WMS/WFS allows visualized and targeted discovery of PANGAEA publications, exposing the spatial coverage and availability of multibeam echosounder datasets.

Chemistry, PANGAEA and SeaDataNet have recently intensified their dialogue on a semi-automated workflow for the transfer of chemical oceanographic data, resulting in a joint action plan. In summary, EMODnet and PANGAEA have made important progress in linking their data infrastructures. However, further work is needed to achieve correct data conversions during the transfer and to ensure that fundamental differences, such as parameter naming and dataset granularity, are taken into account. Some of this work is beyond the scope of iAtlantic and SUMMER and will require additional resources in the future.

**Poster Theme:**
Ocean Best practices and Interoperability

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# 30. EMODnet, Ocean Observation and the marine knowledge value chain Geological seafloor mapping in Icelandic waters

We present Iceland contribution to the European Marine Observation and Data Network (EMODnet Geology) and the first comprehensive marine geological seafloor map compilation for Icelandic EEZ across an area of 764,000 km2 in the North Atlantic Ocean. Our study is based on a variety of datasets, such as multi-beam bathymetry, seismic reflection profiles, seafloor samples and core data. Mapping the seafloor geology of Icelandic waters is highly variable and challenging including volcanic, tectonic, hydrothermal, sedimentary, and glacial features. On the Icelandic insular shelf and shelf slopes, 17 active volcanic systems have been defined and over 600 craters and 250 eruptive fissures that are common within active spreading zones. Subaerial and submarine lava flows, primarily seen as pillow lava sheets, were mapped along the Reykjanesand Kolbeinsey Ridges. Distinct submarine pillow lava flows can be seen deeper than 400 m depth with flow lengths up to 8-9 km from the crater of origin, and an aerial extent of 45-50 km2. Tectonic elements, fault zones, or fissures are prominent along the active spreading zones, and common across the insular shelf all around Iceland. They follow the primary structural trend of the mid-oceanic ridges north and southwest of Iceland and are predominantly active normal fault systems, accompanied by earthquakes. Near the rift axes, these faults can form 20 km long and up to 400 m high continuous fault escarpments. Many submarine landslides are found in the fjords of east and west Iceland and on the insular shelf slopes.

This marine geological map compilation for Icelandic waters provides vital data input and starting point for future research and mapping projects that require maps such as seabed substrate, seafloor geology, coastal behavior, geological events and probabilities, minerals, and submerged landscape map coverages.

**Poster Theme:**
EMODnet, Ocean Best practices and Interoperability

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# 31. Gas Seeps, Shallow Gas Reservoirs, and Gas Hydrates on Turkey's Black Sea Shelf

The Black Sea represents the world's largest anoxic basin, characterized by enduring reserves of hydrogen sulfide (H2S). The Turkish apron of the Black Sea represents a transition from shelf to continental slope and a flat abyssal plain. Along the southern coasts of the Black Sea, high sedimentation rates in certain shelf and slope regions identify these areas as significant sources of methane. Shallow gas migration and surface outcrops contribute to the formation of seabed morpho-structures, such as pockmarks, commonly linked with the discharge of gas and/or liquid into near-surface sediments.

Therefore, in this study, we integrate data collected from multiple research cruises aboard the R/V "K. Piri Reis (Dokuz Eylul University, Izmir, Turkey)" "Poseidon," "Professor Logachev," and "Le Suroit." The authors participated in these cruises with the aim of mapping shallow gas accumulations, identifying Bottom Simulating Reflectors (BSRs) as indicators of gas hydrates, and locating mud volcanoes along the Turkish coasts of the Black Sea

According to our collected data, sub-bottom profiler records along the entire length of the Turkish shelf reveal the presence of shallow gas in upper sediments. Round and elongated pockmarks are found at a depth of 180 to 300 m on the eastern shelf of the Black Sea. Gas seeps are also observed in the studies including shallow sub-bottom profiler sections.

Multichannel seismic reflection data from offshore regions near Trabzon, Yeşilırmak, Samsun, Akcakoca, Kozlu, and Trakya indicate extensive methane accumulations in both the western and eastern parts of the Black Sea that can be harmonized by EMODnet maps. These data also reveal gas-bearing sediment structures, evidenced by features such as acoustic masking, acoustic columns, enhanced reflections, and BSRs. Additionally, our data includes sampled gas hydrates in gravity cores.
**Keywords**: Multichannel seismic reflection, sub-bottom profiler, shallow gas, gas hydrates, Black Sea

**Poster Theme:**
EMODnet and the Blue Economy

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# 32. EMODnet and Ireland's National Marine Planning Framework: a two-way street for marine spatial planning data

Marine Spatial Planning (MSP) aims to balance the different demands for using the sea.  It brings together users of the ocean to enable coordinated decisions about how to use marine resources sustainably and reducing potential conflicts between sectors. Ireland's Marine Spatial Plan is known as the National Marine Planning Framework (NMPF).
MarinePlan.ie is Ireland's marine spatial planning portal, hosted by the Department of Housing Local Government and Heritage.  It links the relevant policies for each marine activity with relevant data. It uses data from EMODNet data for the marine Activities Map which informs users of the spatial distribution of activities and policies.
The Marine Institute, Ireland's national oceanographic data centre, hosts Ireland's Marine Atlas which is the principal repository of marine-related data to support both the implementation of the NMPF and evidence-based decision making. The atlas is a publicly accessible reporting and investigative tool for Ireland's reporting on ocean conditions as required under relevant EU Directives (e.g. MSFD, MSP, WFD). The atlas includes marine data such as protected sites, ocean features, fisheries and aquaculture, marine monitoring, seabed habitats, tourism and leisure, transport, infrastructure,  and more.
These data have been submitted to EMODnet through the Ingestion portal to be available to the wider European MSP community.

The Marine Atlas also incorporates layers generated by different EMODNet Themes, as the physics, chemistry and biology of the marine domain is not delimited by territorial boundaries. Providing data collected in support of the NMPF to EMODNet and utilising data layers produced by relevant EMODnet themes ensures the "best available" data are accessible to decision makers and provides transparency to the planning process.

**Poster Theme:**
EMODnet, EU Policy and regulatory monitoring data

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# 33. Geological Mapping of the NE Atlantic from shelf to the abyss off the Portuguese coasts

Geological mapping off the Portuguese coasts has been carried out by various national and international institutions mainly based on competitive funding for research. The compilation and loading of the EMODnet-Geology portal is run by IPMA (the Portuguese Institute for the Sea and Atmosphere). Recent geological mapping has been carried out in the scope of the need of producing baseline data in the deep ocean to contribute to the Marine Strategy Framework Directive.

Recent research produced novel results on previously unknown geological features and processes from the continental shelf down to the abyss of which some highlights are described.

1. Submerged coastal escarpments marking Holocene and Pleistocene sea-level standstills;
2. Late Pleistocene sorted bedforms on the mid to deep continental shelf;
3. Plate boundary at the Terceira Rift in the Azores Archipelago;
4. The Eastern boundary of the West Iberia Late Cretaceous Alkaline Province (WILCAP);
5. Plutonic source of the Central Atlantic Magmatic Province (CAMP, base Jurassic) off Portugal;
6. Deep water Contourite deposits off Madeira Island from Late Cretaceous to Quaternary;
7. The nature of the crust and upper lithospheric mantle at the Madeira-Tore Rise and adjacent abyssal Plains;
8. FeMn crusts at the lion seamount;

9. Mass Transport Deposits off Portugal and seamount morphological rejuvenation;
10. The basement nature at the Africa-Eurasia plate boundary in the Atlantic: Gloria Fault basement;
11. Nature of the magnetic anomalies observed on the rifted WIM, focus on the J anomaly and implications for the margin breakup;

Geological mapping allows defining a variety of geological processes and terrains that contribute to the understanding of the continental and oceanic crust, natural hazards and mineral resources from the coast to the deep ocean.

**Poster Theme:**
EMODnet, Ocean Observation and the marine knowledge value chain

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# 34. First non-governmental operated ERDDAP in Sweden supplying near real time ocean data to EMODnet

In mid 2022 Voice of the Ocean (VOTO) set up the first ERDDAP data broker server in Sweden operated by a private foundation. This ERDDAP distributes data from VOTO's fleet of autonomous ocean robots to the European scientific community via EMODnet. The VOTO fleet of ocean gliders continually occupy strategically placed observatories at three locations in Baltic sea, taking measurements of temperature, salinity, oxygen and chlorophyll from seabed to surface every hour. Data are delivered in near real time data via satellite to the ERDDAP and made available to the public.

In addition to distributing data, the VOTO ERDDAP server has been used to train users and administrators of the ERDDAP data broker system via workshops in Gothenburg and Cape Town, as well as an online series of webinars hosted by GOOS and AtlantOS. This poster highlights some of the uses of ERDDAP for sharing oceanographic data via EMODnet, as well as links to data download and analysis scripts and learning resources developed by VOTO. Data from the VOTO ERDDAP were used to track methane from the destroyed Nord Stream pipeline and to observe the effects of Storm Hans on the summer stratification in the Baltic Sea.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 35. Regional ocean data repositories: use case of data flow from provider to aggregators

The European marine data landscape is relying on data flows from data providers to central data systems and aggregators (e.g. Copernicus Marine, EMODnet, SeaDataNet). The former are, generally, local organizations that have the capacity to operate sustained (or temporary) regional observing networks and publish their data in their institutional data servers. Additionally, data providers are curating their datasets (meta/data corrections, delayed mode QC). For instance, an improved version of a time series could be available at the provider data portal after the first version was collected by Copernicus Marine. This may result in different versions of the same dataset being available at different data portals without a clear indication of their relation. In this scenario, it would be desirable to facilitate data updates on the data aggregator side so they can react and update their data assets (e.g. data products) and services (e.g. model reanalysis) timely. One possibility is to rely on M2M interfaces on the provider side allowing communication of data updates to the data aggregator side. Furthermore, data provenance might be enhanced by stating the relationship between the provider and the aggregator's datasets. Firstly, we present how SOCIB is facing this challenge through its Data API, and secondly, we present a use case regarding the data flow from the SOCIB to HCMR, who is the MonGOOS/EuroGOOS reference point for data aggregation and distribution into Copernicus Marine In Situ Service. Potentially, this operational procedure could be leveraged to a Best Practice in the data management area in the frame of the IODE.

Following this approach, SOCIB aims to improve the interoperability with other stakeholders' data systems. In this regard, contacts have been made with EMODnet Physics, Coriolis and Puertos del Estado to build the data pipeline from SOCIB towards these data aggregators.

**Poster Theme:**
EMODnet, Ocean Best practices and Interoperabilitys

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# 36. Collating national ocean observing responsibilities and data flows in Europe

Ocean observing and monitoring in Europe is dominantly in the hands of countries and therefore follows different national approaches. Responsibilities are usually distributed among several national authorities and data flows vary significantly between them. The resulting incompatibilities within and between countries poses challenges for coordinating European ocean observing, as attempted by the European Ocean Observing System (EOOS).

EOOS generally aims to enhance the effectiveness and efficiency of national observation efforts of our ocean, seas and coastal waters. The Resource Forum within EOOS, chaired by JPI Oceans, moderates the strategic discussions for long-term funding of ocean observations. This entails to identify gaps in national ocean observing, to overcome organisational and regulatory barriers, and to ensure that nationally generated data reach EMODnet in a harmonized way for widespread use and multiple reuse.

In 2022, the EOOS Resource Forum identified the incomplete knowledge over national ocean observing setups to be a fundamental obstacle for coordination efficiency. It was therefore agreed to collate national overviews of ocean observation and monitoring and downstream data flows. The collations are intended as a solid basis to improve coordination, identify gaps, and recognize synergy potential in ocean observing.

Ultimately this should aid to coordinate policy and funding efforts towards a sustained European Ocean Observing System (as per the EOOS Roadmap 2023-2027) and cater data efficiently to EMODnet as a central hub for the data and information gathered through national routines.

The poster presents the first outcomes of the ongoing survey, showing charts of ocean observation setups in three European countries. Results will be made available on the EOOS website to underpin discussions with EOOS members on aligning ocean observation efforts and with EMODnet for optimising dataflows and reuse. It is foreseen to include more countries in the survey and to extend the survey from in-situ to satellite observations.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 37. IEO contribution in the monitoring of European data and role of EMODnet Bathymetry

The Spanish Institute of Oceanography (IEO) performs multidisciplinary studies of the marine environment since 1914. The acquired data is organized into different databases according to the subject and the variables represented (geology, fisheries, aquaculture, pollution, habitats, etc.). The IEO has consolidated an institutional GIS and the Spatial Data Infrastructure (IDEO) following the trends of INSPIRE. http://www.ideo-base.ieo.es.

All layers have their metadata about ISO19115 and INSPIRE. IDEO is based on Web services, Open standards, ISO (OGC) and INSPIRE standards, and both provide access to the geographical marine information of IEO. Currently, the IEO is participating in many European initiatives, especially in several lots of EMODNET. From GIS department it is working on EMODNET High Resolution Seabed Mapping http://www.emodnet-bathymetry.eu/. Other relevant active involvement of IEO in European initiatives are the works carry out to Marine Strategy Framework Directive 2008/56/EC (MSFD). The aim of the MSFD is to protect the marine environment across Europe. Member States must study the environmental status of their marine environment, develop monitoring programs and programs of measures. The works are performed to a 6-year cycle. The monitoring programs provide scientific data to determinate if the marine waters are achieving or maintaining Good Environmental Status (GES).

The researchers and technicians of IEO, carry out the majority of monitoring programs in Spain in the framework by the Ministry of Ecological Transition mandate. Besides, the IEO participate in LIFE IP INTEMARES, financing by EU, with the aim to achieve a network of efficiently managed marine Natura 2000 areas, making monitoring programs in order to improve the knowledge necessary of the marine areas, and their different habitats and species and vulnerable ecosystems. The DTM of bathymetry data provides in the EMODNET Bathymetry with the contribution of IEO, are relevant in planning and implementing of MSFD and LIFE IP INTEMARES monitoring programs.

**Poster Theme:**
EMODnet, EU Policy, and regulatory monitoring data

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# 38. EuroGO-SHIP will improve the flow of higher quality (including real-time) data to European marine data aggregators and service providers

EuroGO-SHIP aims to shape a new European research infrastructure and services in support of more accurate ship-based observations. The project will enhance the quality and integration of ship-based hydrographic data across nations, and provide benefits for various users, such as: research infrastructures, scientists, policy makers, funding agencies and the general public.

EuroGO-SHIP is a part of the fundamental data collecting infrastructure providing data that is ingested by EMODnet to develop and update European data products, and aims to improve the speed of data delivery to EMODnet via European marine data aggregators.
The project will also offer new services and opportunities for Ocean observation including training for early career scientists to ensure the ongoing delivery of data.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 39. Text mining advances in the framework of EMODnet Biology

Platforms such as OBIS and WoRMS are populated with standardised data, yet the majority of biodiversity data and associated metadata is available in documents, contemporary and historical. Multiple initiatives within the EMODnet Biology project have produced diverse applications of text mining (i.e. the extraction of entities from text) to assist curators and evaluate which information is recognisable by computers. Data archaeology and rescue (within Phase II of EMODnet Biology) pinned the steps required to extract information from hardcopy documents to the final upload to MedOBIS platform. Expanding this work, the DECO workflow (Phase III) chained multiple tools and steps to extract multiple types of ecological entities, such as species names, environments, which are well defined and standardised.

This work presents the main outcomes of a feasibility study (Phase IV) which focused on the investigation of machine learning advancements to extract traits information for species from text, as well as sampling devices and methodologies. Other initiatives of EMODnet which concern traits include Benthic occurrences, habitat maps, and species traits, EMODnet Biology thermal traits and the Btrait, which analyse and/or provide the means to analyse trait data. Traits refer to the characteristics of a species, including its morphology, anatomy, physiology, biochemistry, and phenology.

WoRMS database has ~73,000 taxa with traits information, grouped in 68 distinct categories. Here, we used the WoRMS traits to train four deep neural models, evaluate their precision and recall performance against a curated set of abstracts. From these BioBERT showcased the most promising results, yet further work is needed for the standardisation and nomenclature of traits to make them more retrievable.

The evaluation and development of text mining tools in the field of marine biology assists the curation workflow, enhances existing web platforms and showcases the important steps required for advancing data and metadata standards.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 40. Understanding Ocean Carbon: How OceanICU will strengthen the marine knowledge value chain via a multi-disciplinary research approach.

OceanICU is a Horizon Europe five-year project that seeks to gain a new understanding of the biological carbon pump and its processes in order to provide fundamental knowledge and tools to help policy makers, regulators and Ocean industry—fishing and mining along with the wider Blue Economy—manage and understand the impact of their actions on Ocean carbon. This will ultimately lead to a better approach for addressing climate change in alignment with the EU Green Deal to reduce the net emissions of greenhouse gases to Zero by 2050.

New data products will be developed as an output of the project's investigations into BioDiversity and Biogeochemistry to define the status of Ocean Carbon and to assess future climate driven changes to the Ocean Carbon cycle. This new understanding will be incorporated into models which will also feature data derived from consultations with Blue Economy Industry stakeholders that will deliver societally relevant scenarios. Currently, the majority of models include processes relevant to climate but do not include parameters relevant to Blue Economy industry, therefore OceanICU will provide an improved link in the value chain.

These models will then be integrated into decision support tools that will help policy makers, licensers, and practitioners and other stakeholders make better decisions regarding Ocean and climate management by informing a variety of scenarios, including where to sample the Ocean and what the combined effects of climate change and resource extraction will be on the Ocean Carbon cycle.

The project will also deliver an effective educational pathway to early career scientists and European youth interested in Ocean observation therefore supporting the next generation of researchers for the ongoing delivery of data for ingestion by EMODnet.

**Poster Theme:**
Ocean Observation and the marine knowledge value chain

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# 41. EMODnet Seabed Habitats: Collecting habitat maps once, using many times

EMODnet Seabed Habitats (https://emodnet.ec.Europa.eu/en/seabed-habitats) has collected the largest number of habitat maps from individual surveys and survey-based sample points in Europe to date. The ESBH portal hosts over half a million records, including 1100 maps and approximately 513,000 point observation data.

These collated data have standardised attributes and metadata and present a great opportunity to create new products which aim to answer specific questions, such as 'what is the current known extent of habitat X in region Y?' By querying the library of habitat maps and point data, ESBH have produced 'composite data products' displaying the distribution of three Essential Ocean Variables (EOVs) in European Waters: Seagrass cover, Macroalgal canopy cover and Live hard coral cover. Each EOV can be displayed in polygon or point format. A Biogenic substrate layer has also been created from the collection of maps and is included in the latest iteration of EUSeaMap (v2023). EUSeaMap is a is a broad-scale habitat map for all European sea basins and now includes two new regions in the Caspian Sea and in some European territories in the Caribbean.

Finally, 163 million downloads have been currently tracked corresponding to a total volume of 26 TB of data downloaded. EMODnet is always searching for new habitat maps and sample points to standardise and publish for the benefit of all. We welcome all contributions for any region.

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**Poster Theme:**
EMODnet innovations in data, data products and services

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# 42. DTO-BioFlow, Integrating Marine biodiversity data into the Digital Twin of the Ocean.

The ocean and its biodiversity are essential to life on this planet. Comprehensive data on biodiversity, and related human and environmental pressures are crucial to understand its current state and how this may change. Protecting and restoring biodiversity is one of three objectives of the Horizon Europe Mission to restore our oceans and waters by 2030, enabling the EU to reach its Green Deal and Biodiversity 2030 targets. Identified as one of the Mission "enablers", the EU will build on "a digital knowledge system" to include a Digital Twin of the Ocean (DTO) allowing simulation of 'what if' scenarios, advancing ocean knowledge, informing evidence-based policy and offering a range of societal applications.

To effectively replicate the ocean's ecology, the DTO requires sustained flows of data on biodiversity and associated pressures. Despite myriad actors collecting biodiversity data, and the development of novel cost-effective monitoring technologies, much of these data are inaccessible or unusable for a variety of reasons, hampering the development of the DTO biological component and limiting its efficacy. Between September 2023 and February 2027, DTO-BioFlow Horizon Europe project will activate access to ("sleeping") marine biodiversity data and enable the sustainable integration of existing and new Artificial Intelligence processed and automated data flows from various sources to EMODnet and into the EDITO infrastructure serving the EU DTO.

Combining sustained data flows, models and new algorithms, DTO-BioFlow will develop and integrate the biological component of the DTO, including new digital tools and services. Policy-relevant use cases will demonstrate the benefit for marine ecosystems of continuous data streams flowing through EMODnet and usable by the EU DTO infrastructures and ultimate end-users. Mobilising the marine biodiversity community towards increasing the availability of biodiversity monitoring data into 2030, DTO-BioFlow and its outputs will support the Mission's actions to protect and restore biodiversity.

**Poster Theme:**
EMODnet and the Digital Era

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# 43. OBIS/EMODnet biology: high quality data, but not the complete picture

Data availability and coverage for Europe on OBIS (Ocean Biodiversity Information System) is high compared to other regions of the world. Thanks to rigorous quality checks conducted by OBIS nodes (like EMODnet/EurOBIS) before publication, OBIS provides an indispensable high-quality resource for biodiversity research and management in Europe and beyond. Nevertheless, a substantial portion of marine diversity is still absent from the OBIS database. Data analysis for the EU Horizon project "MPA Europe" showed that for European marine waters alone, more than 7,000 marine species are present in the Global Biodiversity Information Facility (GBIF), but are missing in OBIS. Of these, approximately 2,300 species are data deficient, having fewer than 10 records across the entire GBIF database. Conversely, OBIS currently includes more than 4,000 species that are not found in GBIF for Europe. This disparity spans various Phyla rather than being confined to a single group. Such gaps in coverage in the two major global biodiversity databases impact our capability to assess current biodiversity status and, consequently, our projections for future biodiversity trends. While OBIS and GBIF agreed on the principle to publish once harvest many times, where both OBIS and GBIF should harvest data simultaneously from the original data sources, in reality there are still data flow pipelines that only lead to one or the other.

As long as we have these differences, pipelines for seamless integration and quality controlling of marine data from GBIF and OBIS remain necessary in order to ensure that the most complete snapshot of Europe's biodiversity is easily accessible to support activities such as MPA Europe, which by 2026 aims to identify the most important marine areas to protect in light of CBD's 30x30 target.

**Poster Theme:**
EMODnet, Ocean Best practices and Interoperability

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# 44. EDITO-Infra and the Arrival of the Digital Era in Ocean Knowledge

The European Digital Twin of the Ocean, funded by the EU, is advancing user-centric, interactive tools rooted in next gen science and data. The EDITO-Infra project implemented by Mercator Ocean International (MOi) and the Flanders Marine Institute (VLIZ) is a cloud and HPC -based infrastructure delivering a data lake, containing homogeneous **European Marine Observation and Data Network (EMODnet)** and Copernicus Marine Services products. Harnessing cutting-edge cloud and HPC computing, the data lake promises swift, scalable storage and computing capabilities close to the data. The EDITO-Infra infrastructure has been designed to meet the needs of those who wish to combine the use of EMODnet and Copernicus Marine products for the purposes of developing Digital Twins.

Furthermore, EDITO-Infra aims to be interoperable with Destination Earth (DestinE), amplifying access to **EMODnet** and Copernicus Marine products for Digital Twins of the Ocean. This endeavor, underpinned by a collaborative and inclusive approach, aims to offer an EU-wide platform where localized ocean digital twins can be crafted and executed for diverse users.

By assimilating a vast array of both traditional and novel data sources, EDITO-Infra mixes the competence of ocean modeling, Cloud Computing, and High-Performance Computing (HPC).

This enables complex simulations such as assessing the ramifications of climatic shifts and human-induced stresses on oceanic systems, as well as creating scenarios to evaluate impacts of potential management strategies in blue economy sectors (such as fishing, shipping, and offshore energy production) for more effective decisions.

EDITO's outputs promise to further democratize marine data and knowledge, empowering global citizens to comprehend the intricacies of our ocean more profoundly. This insight fosters informed decision-making, reinforcing a shared commitment to management and conservation of marine ecosystems.

**Poster Theme:**
EMODnet for Digital Era

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# 45. The Ocean InfoHub Project (OIH) and the Ocean Data and Information System (ODIS)

The Ocean InfoHub Project supports a global network of distributed information and data resources related to the ocean. The project facilitates discovery and interoperability of existing information systems through the lightweight Ocean Data and Information System (ODIS) architecture. This enables users from Member States and other partners to discover and more easily access global oceans information, data and knowledge products for management and sustainable development. The Project has had a focus on co-design with three pilot regions in particular: Africa, Latin America and the Caribbean (LAC), and the Pacific Small Island Developing States (PSIDs), to meet their unique user community requirements. EMODnet is a founding partner and regional contributor to the Ocean InfoHub Project.

**Poster Theme:**
EMODnet and the Digital Era

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# 46. Updated EMODnet Geology deliverable: Decadal coastline migration and coastal type derived from quality-filtered satellite data

The current coastline-migration map based on satellite data has some shortcomings. It is accurate for sandy coasts but much less reliable for muddy and rocky coasts. Shadow effects, outliers and the presence of multiple shoreline indicators all cause uncertainty. Cliff behaviour in particular is notoriously difficult to determine using an automated procedure. Fixing or filtering uncertain data points and time series from our database is a first step in producing an updated map version that outperforms the one available on the EMODnet Central Portal today. It requires expert field knowledge on the behaviour of non-sandy coasts, as well as accurate and geospatially compatible maps on the spatial distribution of coastal types.

Because it represents just a single decade (2007-2016), the existing coastline-migration map is very sensitive to outliers. The new map, also for points spaced 500 m apart, covers four decades (1984-present: Landsat images, 30 m resolution), making it easier to quantify long-term trends. Aside from the standard behavioural categories 'landward change', 'stability' and 'seaward change', a fourth category 'unknown' has been added to show areas where the protocol doesn't work well or where coastline behaviour is too complex to represent in a single migration value and label. Such complexity can be captured in time series, which will be shown graphically on the portal through a dedicated web service, along with uncertainty.

The main quality filters applied to the shoreline-position series focus on large uncertainties, strange linear fits (based on RMSE), jumping shorelines (shadow effect of cliffs), latitude (potential ice cover), and removal of Sentinel data because of inconsistent georeferencing. The new maps include data on the Caribbean, southern Mediterranean and Macaronesian coastlines. The underlying database enables quantitative comparison between coastal type and coastline behaviour. An initial analysis confirms that cliff migration is the most difficult to determine. The EMODnet Geology maps and services will enable end users to zoom in on their specific areas of interest, and to compare these data products with their own local field information.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 47. EMODnet-geology: submerged landscapes across European seas

The EMODnet Geology project delivers integrated geological map products across all European Seas and now includes the Caspian and Caribbean seas. A dedicated work package works to compile and harmonize available information on submerged landscape features by integrating existing records of palaeoenvironmental indicators with interpretations of geomorphology, stratigraphy and type of sediment. The fully attributed GIS layer now comprises more than 43,000 features representing 27 classes of submerged landscape and palaeoenvironmental indicators including mapped and modelled palaeocoastlines, evidence for submerged forests and peats, and submerged freshwater springs across all European seas.

Sea level is known to have fluctuated by more than 100 m over repeated glacial cycles, resulting in recurring exposure, inundation and migration of coastlines not only across Europe but worldwide. Landscape response to these changes in sea level, and the preservation of these features on continental shelves around Europe, are an invaluable resource for improving our understanding of human history and environmental change over geological time, whilst also providing data for potential use in examining future sea-level rise scenarios.

This presentation will explore the use of these harmonised products to underpin ongoing regional work on palaeogeographic reconstructions at 20000, 9000, and 6000 years BP.

The current phase of the project has concentrated not only on development of pan-sea products reflecting landscape evolution across now submerged continental shelves but has also developed case study areas exploring links between palaeovegetation changes across continental shelves in the Baltic and western Mediterranean seas since Last Glacial Maximum.

**Poster Theme:**
EMODnet innovations in data, data products and services

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# 48. Marine Geology: de-risking the foundation of offshore wind Europe-wide

EU and UK renewable strategies aim to harness offshore wind as a sustainable energy resource as part of a carbon neutral future. Understanding geology, at and near the seabed, plays a critical role in the foundation design, and the laying of cables and pipelines for offshore windfarm siting. Geological constraints within the foundation zone can have cost implications: therefore, geohazard and constraint assessments are an important factor to mitigate against potential geo-challenges in the subsurface.

Over 21 Geological Surveys across Europe will deliver three digital map-based products incorporating existing data on the bathymetry, geology and geomorphology, depositional environments and hazards as part of a dedicated workpackage: "Coastal vulnerability assessment and optimised windfarm siting". This Geological Service for Europe (GSEU) Coast and Seas workpackage will repurpose products from the complementary European Marine Observation and Data Network (EMODnet) Bathymetry and Geology themes along with new datasets specific to offshore windfarm siting.

**Poster Theme:**
EMODnet and the Blue Economy

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# 49. All hands on deck to put your data to work

In six years, EMODnet's Data Ingestion Portal published over 1350 new datasets from over 190 data submitters from scientists, blue economy businesses and more. Marine data ingestion has never been easier! But what becomes of these data? This poster shows a compilation of 12 country cases collected by the EMODnet Ingestion roaring factory. Discover how old and recent data, even near real-time data, from various sectors strengthen Europe's marine open data network.

During this UN Decade of Ocean Science for Sustainable Development all eyes are on the data. More data for accurate science, smarter engineering and durable policy making. More data for a resilient ocean. Take part in our success story. Join the EMODNET community, and make your data work harder, for more impact at EMODNET-INGESTION.EU

**Poster Theme:**
EMODnet, Mission Ocean and Wider Society

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# 50. Satellite Sea Surface Salinity Products from Soil Moisture and Ocean Salinity mission

After more than 13 years in orbit, the SMOS mission has revolutionized physical oceanography by providing unprecedented spatial and temporal resolution salinity maps (25km - weekly). In this poster, we present the products available on EMODNET and those that will soon be accessible. These include a global product covering the period 2011-2021, with plans to extend the time series up to 2023. We also offer regional products for the Arctic, Southern Ocean, Baltic Sea, and Black Sea, currently accessible via the FTP (http://bec.icm.csic.es/bec-ftp-service), but soon to be available on EMODNET as well. This poster will showcase the main features and provide a quality assessment, primarily through comparisons with *in-situ* measurements.

**Poster Theme:**
EMODnet innovations in data, data products and services

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