EMODnet Thematic Lot n°3 – Physics

EASME/EMFF/2020/3.1.11/Lot4/SI2.838612

Start date of the project: 23/08/2021 - (24 months)

Centralisation Phase

Interim Progress Report (I.2022)

Reporting Period: 23/08/2021 – 22/08/2022

The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) 2021/1139 of the European Parliament and of the Council of 7 July 2021 establishing the European Maritime, Fisheries and Aquaculture Fund and its predecessor, Regulation (EU) No. 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund.

Contents

1. Introduction

EMODnet Physics is one of the seven domain-specific projects of the European Marine Observation and Data Network that has successfully designed, organised and run operational services providing ocean physical data and data products.

The available parameters cover temperature, salinity and currents profiles, sea level trends, wave height and period, wind speed and direction, water turbidity (light attenuation), underwater noise, river flow, and sea-ice coverage. EMODnet Physics products range from in situ data collections (time-series, profiles and datasets) as recorded by platforms (tide gauge, river stations, CTDs, etc.), to reanalysis, trends, and climatology. Data and data products are accompanied by metadata providing the user with information on what, where, when, who, etc. as well as quality check applied procedures. EMODnet Physics also implements standardized machine-to-machine procedures (ISO 19115-2/19139, OpenDAP, Web Coverage Service (WCS), Web Map Service (WMS), Web Feature Service (WFS), etc.) and runs a help-desk tool to deal with user feedback and needs.

During previous designing and implementation phases, EMODnet Physics set up a highly appreciated data management and discovery system, in line with its stakeholders requirements. With this legacy, representing and collaborating with a wide network of international experts in the marine domain, the EMODnet Physics consortium (ETT, MARIS, IFREMER, SMHI and ICES) moved towards the new centralization phase of the EMODnet program.
The main goals are expanding data coverage with additional monitoring systems, making available additional products and strengthening the underlying infrastructure and collaborations with the EMODnet Data Ingestion facility, other EMODnet thematic groups, Copernicus Marine Service and other European and international expert structures implementing the European Directives and Global Ocean Observing System.
This report presents milestones from this implementation phase, which briefly are:

- EMODnet Physics data infrastructures were updated, improving the overall system performance, facilitating service maintenance and support to central system.
- Tools for improving and updating machine-to-machine layers and interoperability according to common standards and directives, have been updated.
- New integrated and re-processed data products have been developed and the EMODnet Physics catalogue counts 552 items between products and data collections. A selection of those are elevated to web-page products to offer the user an advanced and easier experience to discover products in time, space and depth. These dynamic data product web pages are products themselves and maybe based on one or more catalogue items. Nowadays EMODnet Physics hosts 44 web-page-products, that are web accessible at https://produducts.emodnet-physics.eu/EP_MAP_PPPP_NNN (where the PPPP and NNN are the theme and progressive product index). More pages are under development.

- New datasets and observing platforms have been ingested and made accessible. More specifically 830 ARGO, 1232 drifting buoys, 225 tagged sea mammals, 310 tide gauges, 294 river gauge stations, 70 unmmaned vehicles (gliders, sailing drones, etc), 24 vessels (including fishing vessels, ferrybox and data from ocean race ships), and 178332 CTD profiles. Importantly, operational platforms (ARGO, drifting buoys, moorings, tide gauge, river stations) are delivering data on regular base (mainly daily): once a new platform is linked to EMODnet Physics the data stream continues as long as the platform is operational. During the period, the already connected operational platforms (i.e. about 1700 moorings, 150 HF radars, 230 river stations, 890 tide gauge, etc.) were keeping providing EMODnet Physics with new data, each of these provided EMODnet Physics with 365 days of data. It's important to remember that some platforms are collecting a single parameter (e.g. tide gauges and rivers gauge stations) hence they are contributing to a single thematic collection (sea level and river), other platforms are usually collecting more parameters (ARGO collects temperature and salinity; drifting buoys collects temperature, currents, atmospheric pressure; etc.) hence they are contributing to more thematic collections. The total[1] numbers of available platforms are 4325 moorings, 4041 tide gauges, 2599 sea mammals, 404 unmanned vehicles, 156 HF radars, 1173 river gauge stations, 420 vessels, 12739 ARGO[2], 16924 drifting buoys and 1027340 CTD profiles.
- New data flows e.g. from citizen science have been initiateded and analyzed.
- EMODnet Physics continued interacting with Regional Sea Conventions (RSC) and the European Union Technical Group on Underwater Noise (EU TG NOISE) on impulsive noise, addressing Descriptor 11.1 of the EU Marine Strategy Framework Directive (MSFD) and on continous noise, addressing Descriptor 11.2EMODnet Physics provided support to the Central team (technical and contents) to facilitate and speed up the centralizantion

Moreover, despite the worldwide restrictions due to the COVID-19 pandemic, the EMODnet Physiscs team kept being active in organising thematic workshops to engage with new communities, and expand the data provider and data user network. During the reporting period a number of Citizen Science initiatives have been confirmed (see e.g. European Marine Days 2022) as important providers of data, to fill the marine data gaps and improve time and spatial resolution of coastal areas.

The report also proposes some future looking ideas and recommendations.

[1] 14/09/2022 – the numbers includes both operational platforms and platfroms that are not working any longer (but delivered data for while).

[2] ARGO program is collecting about 400 data profile a day - https://argo.ucsd.edu/about/

2. Update on the Tasks

Task 1. Maintain and improve a common method of access to data held in repositories

One primary aim of EMODnet Physics is to provide single access to in situ operational data as collected by fixed and moving in situ platforms. During the EMODnet preparatory phases, EMODnet Physics has developed and continuously updated a common method to access this data that is organized in different repositories and data initiatives, and, according to the nature of the data-parameter, the repository can include and cover local data (e.g. a marine protected area, a port authority, …), national data (e.g. a National Oceanographic Data Center, National Environment Protection Agency, …), regional (e.g. EuroGOOS Regional Operational Observing Systems, a EU project), international (e.g. a global ocean observation monitoring program – OCEANOPS, ICES, etc). These repositories may apply different methodologies, data models and formats, data licenses, interoperability tools where EMODnet Physics has developed the tools to interact and interoperate with these repositories and join these federate sources into thematic data collections. For each source it may be required a special connection module that elaborates the source metadata and data and includes this information into the EMODnet Physics backend tools (see also Task 4). Deliverable D2.2 reports the updated list of the connected sources.

As an example, the EMODnet Physics operational Sea Level data from in situ platform "EP_ERD_SLEV_NRT_60m" data collection[3] includes operational data from sea level stations and includes data from the EuroGOOS Tide Gauge Task Team and Copernicus Marine In Situ, Global Sea Level Observing Systems (GLOSS) core network, JRC Tsunami Device Alert, IOC-SSC and UHSLC.

The organization of a common method to access data in repositories also includes the promotion of common vocabularies and metadata, the adoption of common standards and procedures to make data interoperable, the engagement of new communities and stakeholders to unlock data and fill gaps in time and space. Very importantly, since November 2021, the Marine In situ Collaboration Technical Working Group (MIC TWG), established between EMODnet Physics, EMODnet Ingestion and Chemistry, Copernicus Marine Service In Situ TAC, EuroGOOS office and EuroGOOS Task Teams, SeaDataNet/SeaDataCloud, is working on the further harmonization of standards, procedures and workflow for ingesting and sharing operational data. The TWG acts as a single entity towards newcomers and implements a common workflow to include new data in the operational exchange and elevate this data to be part of high-quality data collections.

[3] EP_ERD_SLEV_NRT_60m is available in EMODnet Physics dev-env and prod-env, and in the Central Portal, the sources collections are available in the EMODnet Physics dev-env.

More specifically new data sources may not always be fully compliant with applied standards (e.g. adoption of common QC/QA at source, adoption of standardized metadata, etc.) and the elaboration of such procedures cannot always be achieved with the operators, or only after a certain period of time that sometimes may conflict with the new-provider engagement momentum. To overcome any limitation, EMODnet Physics (via Ingestion) has implemented a workflow that allows to the link to original data ("as is") and include it into a preliminary collection and in parallel it triggers actions of the MIC TWG to be elevated and included in advanced QC/QF collections (e.g. NODCs, Copernicus Marine Service products, etc). Promoting this common basis also includes the organization of workshops with data providers and new platform network communities (e.g. citizen science projects, data from smart sensors in fishing nets). These events are to present and discuss the EMODnet scope, how providers can contribute and what metadata and data formats are required together with the long-term perspectives in support to the EMODnet evolution.

Task 2. Construct products from one or more data sources that provide users with information about the distribution and quality of parameters in time and space

EMODnet Physics products range from in situ data, to reanalysis, to trends, aggregations in space and/or time and model outputs. In situ data can flow operationally in near real time or in delayed mode, or can be delivered after processing. EMODnet Physics data and products can be searched, visualized and downloaded in a way that makes the physical location of the data source invisible to the user (although data provenience is always declared). Moreover, the system allows data from various sources to be assembled without further processing. All the EMODnet Physics products are made available free of charge and free of restrictions of use (under the CC-BY licence).

This activity also comprises generating a number of products and making optimal use of existing ones from the EMODnet Physics network (SeaDataNet, Copernicus Marine Service, ICES, SONEL, etc.). Product management is organized in thematic teams (see WP1) whose expertise will help in identifying if new products are fitting for purpose and how they can be used by a critical mass of beneficiaries.

EMODnet Physics is now offering 44 products. Deliverable D2.16 presents the EMODnet Physics products and the endpoints to discover and consume them.

Task 3. Develop procedures for machine-to-machine connections to data and data products

EMODnet Physics keeps working and optimizing the FAIRness of its data flow and data management. The FAIR concept relates to "Data and services that should be Findable, Accessible, Interoperable, and Re-usable, both for machines and for people, with emphasis on machines. However, as already anticipated (see Task 1) this demands well-described, accessible data that conforms to community standards. Machine-to-machine procedures consists of tools to implement connections from source-to-EMODnet Physics, and tools to implement interoperability from EMODnet Physics-to-third parties. A data source may make data available in different transport formats, different time granularity

(hourly data, daily data, etc.), in real time/near real time or delayed mode, by means of different data publishing services (FTP, OAI-PMH, webREST, etc.). EMODnet Physics uses microservices that implement connections from source-to-EMODnet (see also task 4). As part of this activity and in collaboration with EMODnet Ingestion, EMODnet Physics is working on the procedures and tools to implement machine-to-machine connections and it is supporting EMODnet Physics stakeholders to set up and implements such interoperability. More specifically, this consists in organizing and providing software tools for implementing operational data exchange. One commonly used technology is ERDDAP. Initiated as a NOAA project, nowadays promoted and adapted by IOC and its programs GOOS and IODE and used by an increasing community, where EMODnet Physics is one of the trusted ERDDAP technology developers. ERDDAP is an Apache based data server that offers an easy and consistent way to download subsets of gridded and tabular scientific datasets in common file formats and makes graphs and maps. Another technology is the Discovery Access Broker (DAB) – developed by CNR and already in use in several project initiatives (ODIP, SeaDataCloud, EMOD-PACE, etc.). The Discovery and Access Broker (DAB) of coordinated software components in charge of geospatial resource brokering with the aim of enabling interoperability amongst distributed heterogeneous data sharing systems. The end goal of DAB is to lower the entry barriers for both the two classes of System of Systems (SoS) i.e. providers and consumers (clients). Yet another tool for facilitating the machine-to-machine interoperability is the promotion of the Sensor Web Enablement (SWE) standards for Real Time data exchange. EMODnet Physics and EMODnet Ingestion have developed pilot actions to support operators to set up this standardized interface for managing and retrieving metadata and observations from heterogeneous sensor systems, and nowadays, the use of the SOS SWE approach for metadata management combined with the use of ERDDAP for RT data exchange represents an easily adoptable methodology to facilitate a fully documented RT data exchange.

Ongoing activities on task 3 are to ingest and include ARICE project data (https://www.arice.eu/), MELOA data project EuroFleets+ project data, extend the coverage of the river product (Norway, Scotland, France, and some Italian regions were recently included), Voice of the Ocean (VOTO), and there is an open dialog with EMANEDS – European Marina Networks of Environmental Data Stations – to support the group on interoperability and data flow towards EMODnet. These new sources are organized under EMODnet Physics collections according the methodologies and tools described in task 1 and 3, and on top of these collections, the system implements the EMODnet-to-third-parties machine-to-machine procedures including:
FGDC Web Accessible Folder (WAF) with FGDC-STD-001-1998 and ISO 19115 WAF with ISO 19115-2/19139, OpenDAP, NetCDF Subset Service, Web Coverage Service (WCS), Web Map Service (WMS), Web Feature Service (WFS), Web Coverage Service (WCS), Web Map Tile Service (WMTS), ncISO: Dataset Metadata Services, OAI Metadata harvesting.

Task 4. Contribute data, data products and content to a central portal that allows users to find, view and download data and data products

The EMODnet Physics backend was updated and re-organized in order to facilitate the centralization process. More specifically the EMODnet Physics infrastructure was organized in a development and testing environment and a production environment, where the previous infrastructure was downgraded to be the development and testing system while a new and clean production environment was set up to host data and products to be integrated in the central system.

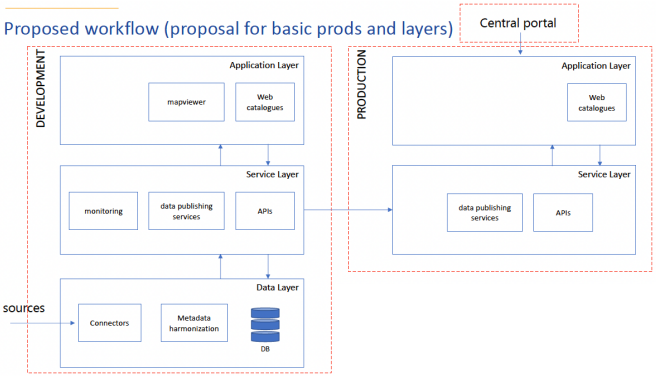

Figure 1. EMODnet Physics infrastructure and workflow towards the central system

The development and testing environment is composed of three logical layers: the data layer that implements the connection and harvesting of the metadata and data from providers and data integrators. This layer runs several scripts/microservices that have the instructions to parse a source. Sources may be ftp folders, web sites, ERDDAP catalogues, web API etc. This is the inner EMODnet Physics data access engine. At this level, EMODnet Physics checks if sufficient basic metadata are available, and pack the data into a dataset that can be consumed by the next layers. Service Layer organizes data into data publishing services (e.g. ERDDAP datasets, GeoServer Layers, etc), APIs, and runs monitoring tools (to check system availability and responsiveness). The service layer is the FAIR module and offers data and products for internal consumers (Physics and Central Portal – via the prod-env) as well as for external consumers. The application layer is constituted by the EMODnet mapviewer and the EMODnet GeoNetwork. The production environment only implements the service layer and the application layer, where the service layer hosts the datasets and products to be available in the Central Portal mapviewer. The prod-GeoNetwork lists the EMODnet Physics products and datasets to be published from the central resources.

Task 5. Contributing content to dedicated spaces in Central Portal

This task deals with the activities to support the Central Portal team to promote and facilitate the centralization phase and promote the harmonization of the EMODnet single identity. This goes with support to organize the static content into the emodnet.ec central space and it goes with promotional and dissemination action in joint events, meetings, etc. During the period the focus was

on fine tuning of the static contents for the central portal, contents for the 2021 EMODnet Annual Report, collection of uses cases.

Task 6. Ensure the involvement of regional sea conventions

Regional Sea Conventions (RSC) are structures that support Member States (MS) to coordinate among themselves on tackling actions on certain pressures and ecosystems. RSC are also an advisory/stakeholder board for the Marine Strategy groups for the implementation of the Marine Strategy Framework Directive (MSFD). The involvement and interactions between EMODnet Physics and RSC has been focused on underwater noise (one of the emerging areas of particular concern) within the framework of the Technical Group TG NOISE and by serving the advisory/stakeholder board[4] of regional MSFD projects (…). In line with these principles EMODnet Physics partners are proactively participating to the TG NOISE towards the EU threshold values for underwater noise and the assessment framework for EU Threshold values for continuous noise (MSFD I11 – D11).

Task 7. Contribute to the implementation of EU legislation and broader initiatives for open data

EMODnet partners have gained great experience in organizing/elaborating data into validated and aggregated data collections which can be used by stakeholders in the Marine Strategy Framework Directive (MSFD) implementation process. As part of the EMODnet community there is a direct communication with GES assessment experts of DG Environment, EEA, and regional Sea Conventions (OSPAR, HELCOM, UNEP-MAP, and the Black Sea Commission). This takes place by regular participation in the European TGs (e.g. TG NOISE, …). This activity is designed to meet stakeholders, help EU Member States fulfil reporting obligations (e.g. through engagement with TG-DATA, Member States Expert Group on Spatial Planning), maintain compatibility with European Open Data Portal, EOSC, Digital Earth or other EU wide initiatives. The activity also concerns interaction with other relevant EU initiatives and parties with a particular focus on disseminating data on coasts, aiming at establishing seamless data provision between coastal land and sea. In this framework, EMODnet Physics is contributing to a series of events and workshops (e.g. EuroSEA, European Marine Days, Copernicus Marine Service) on common standards and opendata (see Table 8 for the full list of events).

Task 8. Monitor quality/performance and deal with user feedback

EMODnet Physics uses Matomo for monitoring traffic on the landing page, map pages, ERDDAP and the catalogue. It uses logs to extract data requests - data downloads, and (since March 2021) volume of downloads. User profile (affiliation and scope of work) are collected by a webform (on voluntary

[4] Either the EMODnet Physics coordinator or ICES or both

base) that pops up in the mapviewer when downloading data[5] from a coastal station in European seas. Despite it represents a very narrow slice of the EMODnet Physics users, this tool helps in mapping the interests and the uses of the EMODnet Physics data (see Section 6). The web portal also embeds a help-desk tool to deal with user feedback and needs (see task 7). The user is requested to fill a webform and any request gets an id to track and manage the feedback time. This process ensures the request is taken by/forwarded to the right expert (best accuracy and smallest delay to give feedback)[6]. This service desk operates Monday-Friday working hours and is accessible by web tools. The service desk is organized in two level of user requests management infrastructure where a first level of interaction HDL1 provides the most exhaustive feedback within 24hours. In case HDL1 cannot deal with the user request, a second level of expertise, i.e. HDL2, is involved in the process with the aim to provide the user with feedback as soon as possible. The HDL2 is involving the full partners' network of experts and EMODnet Physics contributors. Each entry gets a unique help ticket number in the help desk system and a new record is stored in the help desk database. GRDP is applied to the management of the user requests. In addition, the strong cooperation and involvement of the team in thematic groups (e.g. EuroGOOS Working Groups and Task Teams) helps collecting stakeholders' feedback, understanding needs, assessing the fit-for-scope of the system, and implementing corrective actions.

Task 9. Maintain the existing thematic web portal for a maximum of six months from the start of the projects

In line with tender requirements, the current web portal is maintained as long as needed. As soon as the central portal is completed and contracting Authority requests for it, the current thematic portal will be phased out.

[5] Data is open and free
[6] A telephone number to collect the primary request would have been less efficient. According the designed workflow, if needed, it is the EMODnet expert to call back the user.

Table 1. Milestones and Deliverables - EASME/EMFF/2020/3.1.11/Lot4/SI2.83861

Status of the Milestones and Deliverables listed in the workplan			
Milestone/Deliverable	Date due	Status (Delivered/Delayed)	If Delayed: reason for delay and expected delivery date
D1.1 Kick off Meeting	30/11/2021	8 November 2021	
D1.2 Annual assembly	30/11/2022		
D1.3 EMODnet SC	30/11/2021	8-10 September 2021	
D1.4 EMODnet TWG	30/11/2021	8-10 September 2021	
D1.5 EMODnet SC	31/05/2022	27-28 April 2022	
D1.6 EMODnet TWG	31/05/2022	26 April 2022	
D1.7 EMODnet SC	31/08/2022		Planned 18/7
D1.8 EMODnet TWG	31/08/2022		Planned 18/7
D1.9 EMODnet SC	30/11/2022		
D1.10 EMODnet TWG	30/11/2022		
D1.11 EMODnet plenary event	31/12/2021	8-9 November 2021	The EMODnet Physics KOM was organized in two session, the first one was closed to core partner (D1.1) the second was a plenary with invited speech about previous and recent developments of the EMODnet Physics networks and collaborators
D1.12 EMODnet plenary event	30/06/2022	12-13 April 2022	IN SITU data ingestion WS. The event involved EMODnet (Physics, Chemistry and Ingestion), Copernicus Marine Service INSTAC and EurGOOS to discuss joint actions for facilitating nrt operational data ingestion
D1.13 EMODnet plenary event	31/12/2022		
D1.14 EMODnet plenary event	30/06/2023		
D1.15 Quarterly report Q3.2021	15/10/2021	Delivered 15/10/2021	
D1.16 Quarterly report Q4.2021	15/01/2022	Delivered 15/01/2022	
D1.17 Quarterly report Q1.2022	15/04/2022	Delivered 15/04/2022	

D1.18 Quarterly report Q2.2022	15/07/2022	Delivered 15/07/2022	This Report
D1.19 Quarterly report Q3.2022	15/10/2022		
D1.20 Quarterly report Q4.2022	15/01/2023		
D1.21 Quarterly report Q1.2023	15/04/2023		
D1.22 Quarterly report Q2.2023	15/07/2023		
D1.23 Annual progress report	23/08/2022	23/08/2022	This Report
D1.24 Final progress report	23/08/2023		
D1.25 Handover note	23/08/2023		
D1.26 EMODnet Physics note for Annual Report 2021	31/01/2022	Delivered (January 2022)	
D1.27 EMODnet Physics note for Annual Report 2022	31/01/2023		
D1.28 EMODnet Ingestion general assembly 2021	30/11/2021	21-22 September 2021	
D1.29 EMODnet Ingestion general assembly 2022	30/11/2022	16-17 April 2022	
D1.30 Guideline on data ingestion procedures for new real time and near real time streams v.2022	31/08/2022	Delivered – in attach to this report	
D1.31 Guideline on data ingestion procedures for new real time and near real time streams v.2023	23/08/2023		
D1.32 Use cases 2021	31/12/2021	CMCC delivered (Dec 2021) OGS delivered (Feb 2022)	
D1.33 Use cases 2022	31/12/2022	CSCS delivered (Feb 2022) OceanGlider delivered (Feb2022)	
D1.34 Use cases 2023	23/08/2023		
D1.35 Contribution to central space with background information and EMODnet Physics content	28/02/2022	In progress – tracked with JIRA	
D1.36 TGs - RSCs event attendance	31/12/2021	TG NOISE WS “towards EU thresholds for underwater noise”, 13-14 Sept 2021	

D1.37 TGs - RSCs events attendance	30/06/2022	TG NOISE WS: Towards EU threshold values for underwater noise (17/02/2022) 20th TG-NOISE – 22/03/2022	TG NOISE doc library[7]
D1.38 TGs - RSCs events attendance	31/12/2022	21th TG-NOISE – 24/05/2022	This event was attended by partners ICES and CTN.
D1.39 TGs - RSCs events attendance	30/06/2023		
D2.1. Data Inventory with gap analysis v.2021	31/12/2021	V.2021 attached to Q1.2022	EMODnet Physics_Inventory_v.2021.03
D2.2 Data Inventory with gap analysis v.2022	31/08/2022	Delivered – in attach to this report	
D2.3 Data Inventory with gap analysis v.2023	23/08/2023		
D2.4 EMODnet Physics Event/Workshop	31/12/2021	Delivered – (15/1/2022) - updates are described in the quarterly report Q4.2021 – Section 4	
D2.5 EMODnet Physics Event/Workshop	30/06/2022	Delivered – (15/4/2022) - updates are described in the quarterly report Q1.2022 – Section 4	This Report
D2.6 EMODnet Physics Event/Workshop	31/12/2022		Planned during the MetroSEA conference Milazzo – October 2022
D2.7 EMODnet Physics Event/Workshop	30/04/2023		
D2.8 Report on the maintainace and update of the EMODnet Physics smart connectors v.2022	31/08/2022	Delivered – in attach to this report	
D2.9 Report on the maintenance and update of the EMODnet Physics smart connectors v.2023	23/08/2023		

[7] https://circabc.europa.eu/ui/group/326ae5ac-0419-4167-83ca-e3c210534a69/library/89b98517-6283-4d3a-abd0-3a716661b370?p=1

D2.10 EMODnet Physics Handbook on data management	31/08/2022	Delivered – in attach to this report	
D2.11 Support to develop common strategy and guideline for adoption cloud technologies	23/08/2023		
D2.12 EMODnet Physics Metadata handbook and examples	31/08/2022	Delivered – in attach to this report	
D2.13 Report on dissemination system interfaces update v.2022	31/08/2022	Delivered – in attach to this report	
D2.14 Report on dissemination system interfaces update v.2023	23/08/2023		
D2.15 Updated list of EMODnet Physics products v.2021	31/12/2021	Delivered 15/1/2022	
D2.16 Updated list of EMODnet Physics products v.2022	31/08/2022	Delivered – in attach to this report	
D2.17 Updated list of EMODnet Physics products v.2023	23/08/2023		
D2.18 SSS v.2020	28/02/2022	Released[8]	
D2.19 SSS v.2021	28/02/2023		
D2.20 River Proxy V1.0	31/12/2021	Released[9]	
D2.21 River Proxy V2.0	31/08/2022	31/12/2022	This product has been postponed to end of the year to be able and include feedback from EMODnet Chemistry activities on rivers.
D2.22 River Proxy V3.0	23/08/2023		
D2.23 INS RVFL DB v.1.0	31/08/2022	Released[10]	
D2.24 TSM v.2021	28/02/2023		
D2.25 SLEV INS DB	31/12/2021	Released[11]	
D2.26 SLEV REL TRENDS	31/08/2022	Released[12]	

[8] https://prod-erddap.emodnet-physics.eu/erddap/griddap/CISC-BEC-SSS.html

[9] https://products.emodnet-physics.eu/EP_MAP_RVFL_001/

[10] https://prod-erddap.emodnet-physics.eu/erddap/tabledap/ERD_EP_RVFL_NRT.html

[11] https://prod-erddap.emodnet-physics.eu/erddap/tabledap/ERD_EP_SLEV_NRT_60m.html

[12] http://prod-geoserver.emodnet-physics.eu/geoserver/EMODnet/wms?service=WMS&version=1.1.0&request=GetMap&layers=EMODnet%3AEP_PSMSL_SLEV_REL&bbox=-157.86700315733998%2C-36.843100736862%2C174.76900349538002%2C65.673401313468&width=768&height=330&srs=EPSG%3A4326&styles=&format=application/openlayers

D2.27 SLEV ABS TRENDS	31/08/2022	Released[13]	
D2.28 SLEV REL ANOM	31/08/2022	31/12/2022	SONEL, which is the provider for this product is developing a new workflow to facilitate harvesting from Physics. Only lately it was possible to start this action and should be possible to close and include the new product by end of the year
D2.29 SLEV ATL ABS TREND	31/08/2022	Released[14]	
D2.30 RFVL v.1	28/02/2023		
D2.31 UWN ROI v.1.0	31/08/2022	Postponed	It will be released by end September – early October
D2.32 WAVE INS DB+ NOWCAST v.2.0	28/02/2022	Delayed	The product is not covering whole Europe (hence it is not ready yet) – At the moment we are receiving data for Med Sea (UniGE – DICCA), Iberican Atlantic (CoLAB Atlantic) and Irish Atlantic (Marine Institute). The product is still on development.
D2.33 WIND INS DB+ NOWCAST v.2.0	28/02/2022	Delayed	Will be published this quarter. V2.0 will have grid resolution of 10Km (UniGE – DICCA)
D2.34 ICE SIC v.2.0	31/08/2022	Released[15]	
D2.35 TGs - RSCs event attendance	31/12/2021	19th TG NOISE: 26 October 2021	
D2.36 TGs - RSCs event attendance	30/06/2022	20th TG NOISE: 22 march 2022	

[13] https://prod-erddap.emodnet-physics.eu/erddap/griddap/EMODNET_SEA_LEVEL_TREND.graph

[14] https://prod-erddap.emodnet-physics.eu/erddap/griddap/EMODNET_SEA_LEVEL_MONTHLY_MEAN_DESEASONALIZED.graph

[15] Arctic Seas:

http://prod-geoserver.emodnet-physics.eu/geoserver/EMODnet/wms?service=WMS&version=1.1.0&request=GetMap&layers=EMODnet%3Aice_edge_nh_annual&bbox=-4632266.5%2C-2364732.5%2C4185461.75%2C3981740.25&width=768&height=552&srs=EPSG%3A3995&styles=&format=application/openlayers

Antarctic Seas:

http://prod-geoserver.emodnet-physics.eu/geoserver/EMODnet/wms?service=WMS&version=1.1.0&request=GetMap&layers=EMODnet%3Aice_edge_sh_annual&bbox=-2624331.25%2C-2947571.75%2C3415682.5%2C3649295.25&width=703&height=768&srs=EPSG%3A3031&styles=&format=application/openlayers

D2.37 TGs - RSCs events attendance	31/12/2022	21st TG NOISE: 24 May 2022	
D2.38 TGs - RSCs events attendance	30/06/2023		
D3.1 Report on the SOS.SWE connected stations v.2021	30/11/2021	Delivered 15/01/2022	Annex to Q4.2021
D3.2 Report on the SOS.SWE connected stations v.2022	31/08/2022	Delivered – in attach to this report	
D3.3 Report on the SOS.SWE connected stations v.2023	23/08/2023		
D3.4 Handbook on procedure to set up SOS.SWE interoperability	23/08/2023		
D3.5 Report on new API v.2021	30/11/2021	Delivered 15/01/2022	Annex to Q4.2021
D3.6 new APIs v.2022	31/08/2022	Delivered – in attach to this report	
D3.7 new APIs v.2023	23/08/2023		
D3.8 handbook to use EMODnet Physics APIs v.2021	30/11/2021	Delivered 15/1/2022	Annex to Q4.2021
D3.9 handbook to use EMODnet Physics APIs v.2022	31/08/2022	Delivered – in attach to this report	
D3.10 handbook to use EMODnet Physics APIs v.2023	23/08/2023		
D3.11 Phasing out of EMODnet Physics Landing page	28/02/2022	Planned in Autumn 2022	
D3.12 Phasing out of EMODnet Physics mapviewer	30/11/2021	In progress – status is reported in the quarterly report – Section 1	
D3.13 EMODnet Physics catalogue v.2021	30/11/2021	Delivered 15/1/2022	Annex to Q4.2021
D3.14 Maintenance and update of EMODnet Physics catalogue v.2022	31/08/2022	Delivered – in attach to this report	
D3.15 Maintenance and update of EMODnet Physics catalogue v.2023	23/08/2023		
D3.16 Monitoring tools	28/02/2022	Given the centralization process the monitoring tools are going to be a combination of tools, some designed to let Physics and CP to interact and fix issues	

		(e.g. JIRA), some to report on indicators (matomo) some to monitor M2M (the central team is updating the tools to monitor the new EMODnet Physics Environment). Whenever needed new tools will be discussed and deployed.	

3. Work Package updates

WP1 – Project management, monitoring and reporting

Covering Task(s): task 5, task 6, task 8

WP1 is organized in 9 sub tasks and 39 deliverables. WP1 is designed to manage and coordinate all project activities, to ensure timely delivery and high quality of results and products, convene project meetings and deliver the reports, EMODnet Steering committee and EMODnet Technical Working group meetings, as well as other EMODnet related events organized by the Contracting Authority and the EMODnet Secretariat. This also includes contributing content to dedicated spaces in Central Portal (task 5) which were promptly delivered and the EMODnet Physics team is ready to switch to the central system. Management activities also deals with ensuring the involvement of regional sea conventions (task 6). Regional Sea Conventions (RSC) are structures that support Member States (MS) to coordinate among themselves on tackling actions on certain pressures and ecosystems. RSC are also an advisory/stakeholder board for the Marine Strategy groups for the implementation of the Marine Strategy Framework Directive (MSFD). Besides offering access to data and products that are propaedeutic for RSC assessments, EMODnet Physics keeps participating to TG NOISE and following the discussions on the definition of threshold values (TV) on impulsive and continuous noise (namely DL2 and DL4). TV are limits over which noise starts acting disturbance of marine mammals. This activity is quite intense since DL2 and DL4 should be agreed and adopted by MSCG and WG GES in October and November and become operational. Outcomes from the latest TG NOISE indicate that the noise registries where MS report their events according to three classes (multiple impulsive noise events, single impulsive noise events and non-pulse events) can already be helpful for the assessment. Crucial is that promotional activity on Member States to report in these registries. EMODnet Physics is already harmonizing the three regional registries (OSPAR, HELCOM and MED-ACCOBAMS) and a possible improvement could be the development of the pulse per day maps on a finer grid cells. Moreover, the partners ICES and CTN are actively supporting RCS in implementing tools for implementing EU legislation. One example is the recent change in the ICES Impulsive Noise data reporting format[16], that was agreed/suggested by HELCOM and is in the process of being agreed by OSPAR. CTN is coordinating the QUITESEAS project (legacy of the QUITEMED and QUITEMED2) to develop community base tools to implement DL2 and DL4 (D11C1, D11C2 of the MFSD). The monitoring quality/performance and dealing with user feedback (task 8) and stakeholders is a continuous activity and ranges from proactively participating to international groups (EuroGOOS Task Teams, Southern Ocean Observing System Data Management Steering Committee, Deep Ocean Observing System Data Management Working Group, SeaDataNet Technical Working

[16] https://www.ices.dk/data/Documents/NoiseRegistry/NoiseRegister.zip

Group, etc.), advisory boards (e.g. MyCoast project QuietSeas project, etc.), and techno-scientific and educational events (see Table 8) to keep dedicating effort to consolidate and extend the gateways to national, regional, and thematic data repositories.

To better accomplish the increasing number of stakeholders and user communities, WP1 organized internal thematic working groups to provide better thematic-communities focused services. The active groups are River (ETT, OGS, CNR-ISMAR, SMHI), Sea Level (CMCC, NOC-BODC, VLIZ), Water Currents (AZTI, IFREMER), Temperature and salinity in the water column (IFREMER, CISC-BEC, ETT, MARIS), Under water noise (ICES, CTN, ETT), Wave and Wind (UNIGE-DICCA, ETT), Water Clarity (CNR-ISMAR, MARIS). Although the ICE group was not activated, EMODnet Physics achieved to major milestones with (in situ) ice data stakeholder communities – MoU with the H2020 ARICE[17] project and an even closer collaboration with SOOS (Southern Ocean Observing System) community, H2020 SOCHIC[18] project and the Italian Arctic Data Center. Central in these interactions is the collaboration with EMODnet Ingestion. Lately, an open dialogue with H2020 MONOCLE[19] to interoperate on in situ water-leaving radiance. Importantly, WP1 also covers activities on the Marine In situ Collaboration Technical Working Group (MIC TWG)- see task 1.

WP2 – Data Access and Data Products

Covering Task(s): task 1, task 2, task 7

WP2 is organized in 5 sub tasks and 38 deliverables

WP2 is dealing with the core data management activities in EMODnet Physics and covers all the activities to keep feeding the EMODnet Physics data collections and identify and ingest new sources (in collaboration with EMODnet Ingestion and partner infrastructures) and link new sources. To engage and facilitate the ingestion, EMODnet Physics (and Ingestion) are providing guidance (Deliverable D1.30) and tools (e.g. ERDDAP Docker)[20] for preferred data and metadata formats. WP2 is dedicated to maintain and improve a common method of access to data held in repositories (task 1), but also adding new data (beyond the European borders) and making products from one or more data sources that provide users with information about the distribution and quality of parameters in time and space (task 2). WP2 also contributes to the implementation of EU legislation and broader initiatives for open data (task 7) such as INSPIRE, MSFD, European Open Data Portal, Digital Earth.

WP2.1 Expanding data in time and space

[17] https://arice-h2020.eu/

[18] http://www.sochic-h2020.eu/

[19] https://monocle-h2020.eu/

[20] https://github.com/EMODnet-Physics/docker-erddap-install

A continuous action is to identify additional data sources that contribute to the EMODnet Physics parameter portfolio (Argo, profiling floats, gliders, radar, CTD from ships, river flow, underwater noise, etc.), and to contribute to reduce the current spatial and temporal gaps in collaboration with European programs and projects (Copernicus Marine Service INSTAC, SeaDataNet NODCs infrastructures, ICES, EMODnet Data Ingestion, etc.) and non-EU Countries and initiatives. Once the source is identified, an ingestion workflow moves the data towards the two "ingestion phases": availability of the data "as is" on EMODnet Physics, inclusion of the data into a wider harmonized data collection.

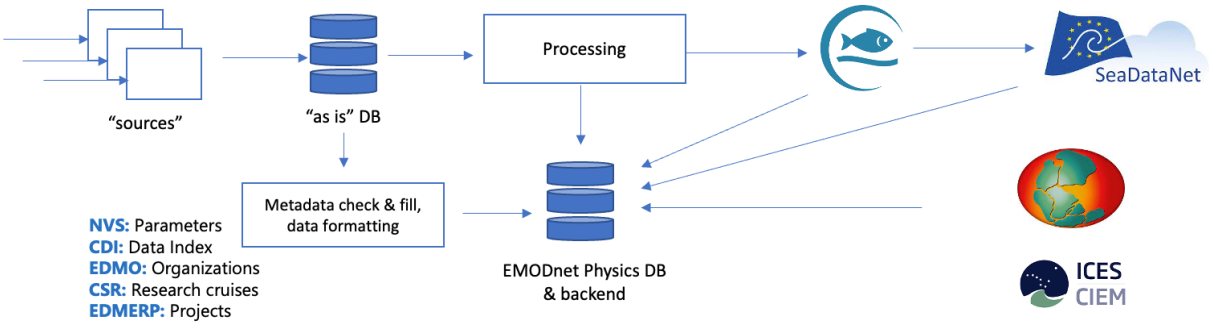

Figure 2. Simplified schema of the Ingestion process workflow

The full process follows the following steps:

- Source identification
- Analysis of the dataset, data transport format, data access protocol
- Mapping of the minimum set of metadata (time, datum, institute, platform type, parameters, units, etc.)
- Ingestion "as is" in the EMODnet DB → Data ingestion Phase 1 completed
- Deeper analysis, QC/QF, processing, … by INSTAC/NODCs
- Integration into QC/QF catalogues/products
- Ingestion "processed" in the EMODnet DB → Data ingestion Phase 2 completed

To facilitate the action, EMODnet Physics developed services and open tools (e.g. the ERDDAP docker[21]), user-friendly interfaces for data and metadata uploading, documents on common data and metadata models (see also Deliverable 2.12)

WP2.2 Common methods for ocean data management

[21] https://github.com/EMODnet-Physics/docker-erddap-install

EMODnet Physics makes available data on changes in sea-level, horizontal velocity of water column, ice cover, inflow from rivers, salinity of the water column, underwater sound (noise), temperature of the water column, water clarity (light attenuation), wave height and period and wind speed and direction. These data are collected by a huge variety of fixed and moving platforms that can deliver and make data available by means of many tools and services where EMODnet Physics, acting as an integrator and linker/broadcaster of federated sources, organizes these data into collections with links to original sources. One further goal of this activity is to keep working with the network platform operators to improve and harmonize the standards and the data flow scheme to set up common nodes to be linked to EMODnet Physics and make data available. Example of this specific action are the collaboration with OceanGlider technical team and actions on citizen science data[22]

WP2.3. information about the distribution of parameters in time and space

Metadata give a detailed insight of the availability and geographical extent of marine data and description of individual data sets and measurements with key fields (what, where, when, how, who etc.). Metadata for data produced within the Copernicus Marine Service INSTAC and SeaDataNet NODCs are fully described on the base of ISO 19115 and ISO 19139 requirements. OceanOPS maintains information on relevant data requirements for observations in support of GOOS, GCOS and the World Weather Watch of WMO. There is a joint effort between European Marine Data Infrastructures to support (new) stakeholders and better track metadata and information. The MIC TWG (see previous sections), Obaton et al. 2022 (EuroSea Deliverable D3.7), are important examples of this activity and its outcomes.

WP2.4. Contribute to the implementation of EU legislation and broader initiatives for open data

The EMODnet community has an open and direct communication with GES assessment experts of DG Environment, EEA, and regional Sea Conventions (OSPAR, HELCOM, UNEP-MAP, and the Black Sea Commission). This takes place by regular participation in the European TGs (e.g. TG NOISE, …). This activity is designed to meet stakeholders, help EU Member States fulfil reporting obligations (e.g. through engagement with TG-DATA, Member States Expert Group on Spatial Planning), make data and product in compliance with INSPIRE Directive; Maintain compatibility with European Open Data Portal, EOSC, Digital Earth or other EU wide initiatives. EMODnet Physics is keeping updating its products to support EU legislation and it is continuing its collaborations with other relevant EU initiatives and parties with focus on open data and interoperability (see also WP3).

WP2.5. Data Products

Central to EMODnet Physics scope is to produce products from one or more data sources that provide users with information about the distribution and quality of parameters in time and space. EMODnet

[22] https://maritime-day.ec.europa.eu/system/files/2022-05/european-maritime-day-programme-2022_en_2.pdf

Physics products ranges from collection of datasets to reanalysis, to gridded products etc., and may be discontinuous (in situ) in time and space or continuous (e.g. maps). Products are organized by the product-working groups (see WP1), may use of key existing products (e.g. SeaDataNet climatologies) or develop a specific product for EMODnet Physics (e.g. River DB). Products are also organized to be integrated into the central portal easily. Deliverable D2.16 lists the products available in EMODnet Physics.

WP3 – Catalogue, interoperability, service interfaces, and Central EMODnet

Covering Task(s): task 3, task 4, task 9

WP3 is organized in 4 sub tasks and 16 deliverables

WP3 works and optimizes the FAIRness of its data flow and data management. The FAIR concept relates to Data and services that should be Findable, Accessible, Interoperable, and Re-usable, both for machines and for people, with emphasis on machines. It works on the development of procedures for machine-to-machine connections to data and data product (task 3), uses these tools for contributing with data products and content to a central portal that allows users to find, view and download data and data products (task 4) and maintain the existing thematic web portal until it is required by contracting Authority (task 9).

WP3.1 EMODnet Physics machine-to-machine (M2M) and interoperability features

Interoperability is a two-way concept: it is from sources to EMODnet Physics and from EMODnet Physics to users. From sources to EMODnet Physics, the main goal is to facilitate adoption of common tools and vocabulary. One example is the activity to consolidate a docker version of ERDDAP for the EMODnet community that enables new providers (e.g. Voice Of The Ocean, MELOA project, Italian Arctic Data Center, etc). From EMODnet to users is about organizing data collections and products with publishing tools compliant to INSPIRE, OGS standards, and other easily consumable services (e.g. ERDDAP/ncWMS etc) by communities. Part of the activity is also linking consolidated databases (e.g. PANGAEA) and offer these collections in a way that matches the EMODnet users and stakeholders (e.g. ARICE[23] H2020 project and e.g. Polarstern[24] data, or the iAtlantic[25] H2020 project). Deliverables D2.8 and D2.13 present the full list of developed tools. M2M goes back-to-back with FAIRness that is a concept promoted in educational opportunities (e.g. summer schools)[26].

WP3.2 EMODnet Physics maintenance, update towards central integration and phasing out of current portal

In line with the tender specification and in coordination with the central portal team, EMODnet Physics maintained and updated the front-end and back-end services to facilitate the central integration. Besides updating the interoperability services to facilitate the consumption of the data-collections and products from the central system, one major development was the deployment of a new infrastructure that hosts the official and validated products and data-collection to be presented

[23] https://data.arice-h2020.eu/

[24]https://erddap.emodnet-physics.eu/erddap/search/index.html?page=1&itemsPerPage=1000&searchFor=polarstern

[25] https://www.iatlantic.eu/

[26] https://www.mitportugal.org/activity/2022-marine-robotics-summer-school/program/

on the Central portal (see Figure 1). By setting up this infrastructure it also designed the workflow that organizes the publication towards the Central portal by a multi tiers approach (aggregate and publish on EMODnet Physics dev-backend, publish on EMODnet Physics dev-front end, assess, publish on EMODnet Physics prod-backend, publish on EMODnet Central dev-system, assess, publish on EMODnet Central prod-system).

Table 2. EndPoints of the EMODnet Physics infrastructure

Development env. endpoints	Production env endpoints	Central portal dev
https://erddap.emodnet-physics.eu https://erddap.emodnet-physics.eu/ncMWS https://geoserver.emodnet-physics.eu https://geonetwork.emodnet-physics.eu https://map.emodnet-phyics.eu https://products.emodnet-physics.eu	https://prod-erddap.emodnet-physics.eu/erddap/ https://prod-erddap.emodnet-physics.eu/ncWMS/ https://prod-geoserver.emodnet-physics.eu/geoserver/ https://prod-geonetwork.emodnet-physics.eu/geonetwork/	https://emodnet.development.ec.europa.eu/geoviewer-new/

WP3.3 EMODnet Physics Catalogue

This task is complementing task 3.2 and ensure that meta-data are discoverable easily by the central portal for cataloguing and INSPIRE services. EMODnet Physics is running a GeoNetwork Instance which provides an easy-to-use web interface to search geospatial data and supports support ISO19115/119/110 standards.

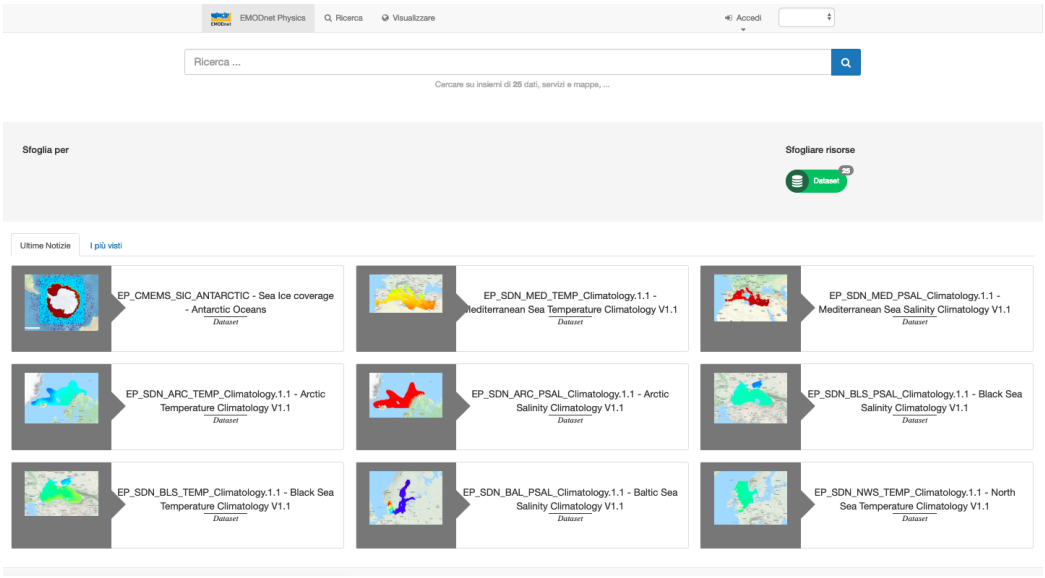

Figure 3. GeoNetwork catalogue for Physics

GeoNetwork is listing all the data-collections and products available in the EMODnet Physics domain. Deliverable D2.16 provides the full list of EMODnet Physics products.

WP3.4 Monitoring tools

EMODnet Physics monitoring includes both operating the Help Desk and monitoring of the system performances. The HD service has been operated from the beginning of the contract (9.00 – 17.00 CET/CEST, Monday to Friday) and it is based on a web form and emails. The web tool helps the user to identify and describe the topic of the query, and in turn it permits to involve the right expert for providing feedback. Each entry gets a unique help ticket number in the HD system and a new record is stored in the help desk database. Together with the ticket-number, the system generates an acknowledgment email that informs the user on the request status. EMODnet Physics HD service also collects queries sent by email to contacts@emodnet-physics.eu. The service has so far collected and solved 33 requests (@02/08/2022 - Table 7). Web page and service performances are monitored by Matomo (hosted @VLIZ – EMODnet Central portal) and GrayLog. These uses logs to track visits, services use, user behaviour on pages, most used pages, the volume of downloaded data, etc. and are instrumental for reporting (WP1) and operating/maintenance (WP2 and WP3) purposes. User profile (affiliation and scope of work) are collected by a webform (on voluntary base) that pops up in the mapviewer when downloading data from a coastal station in European seas. Despite it represents a very narrow slice of the EMODnet Physics users, this tool helps in mapping the interests and the uses of the EMODnet Physics data (see Section 6).

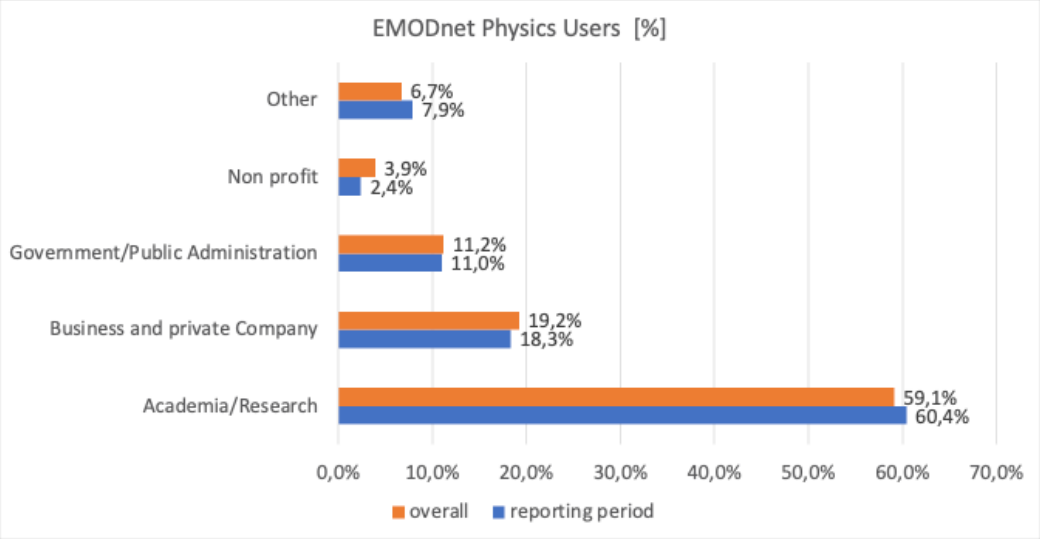

Figure 4. EMODnet Physics Users – the user can slect only one option.

This tool is operational since November 2018 and collected more than 1,400 user profiles, 164 of which during the reporting period. Figure 4 and Figure 5 show statistics on collected data. Users are mainly from Research and Academia (60%), private sector fluctuates around 19%. Data are mainly used for Marine and Coastal applications (85%), Climate and weather forecasting (more than 50%), followed by Marine resource and Marine safety. Registered users are not limited to the EU (Figure 6).

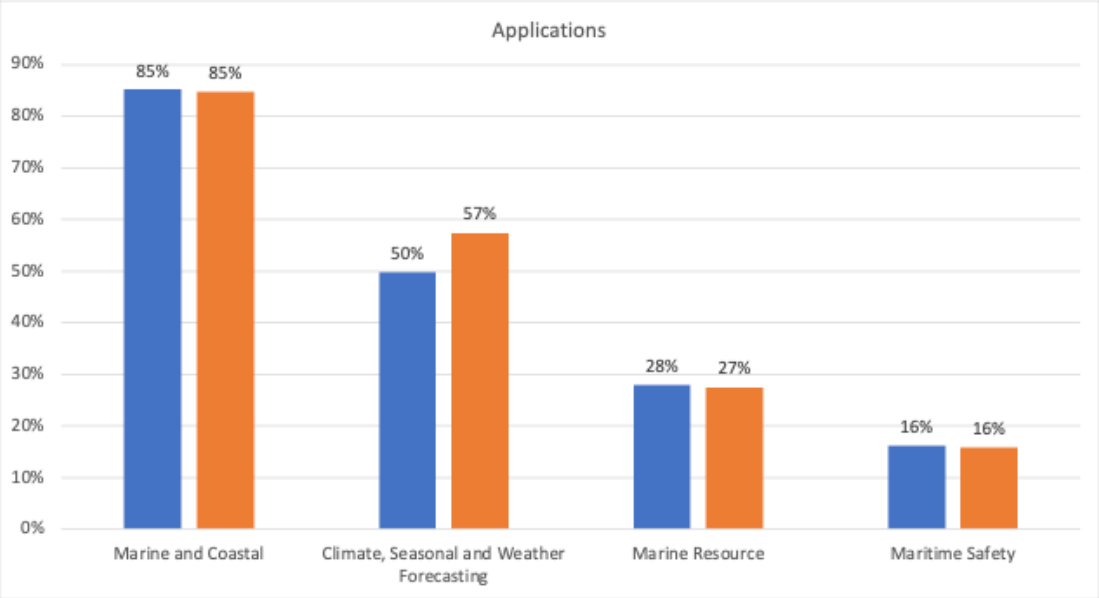

Figure 5. Application fields – User has multiple choice, the percentage is the amount of users declaring that application divided the total number of users for the period

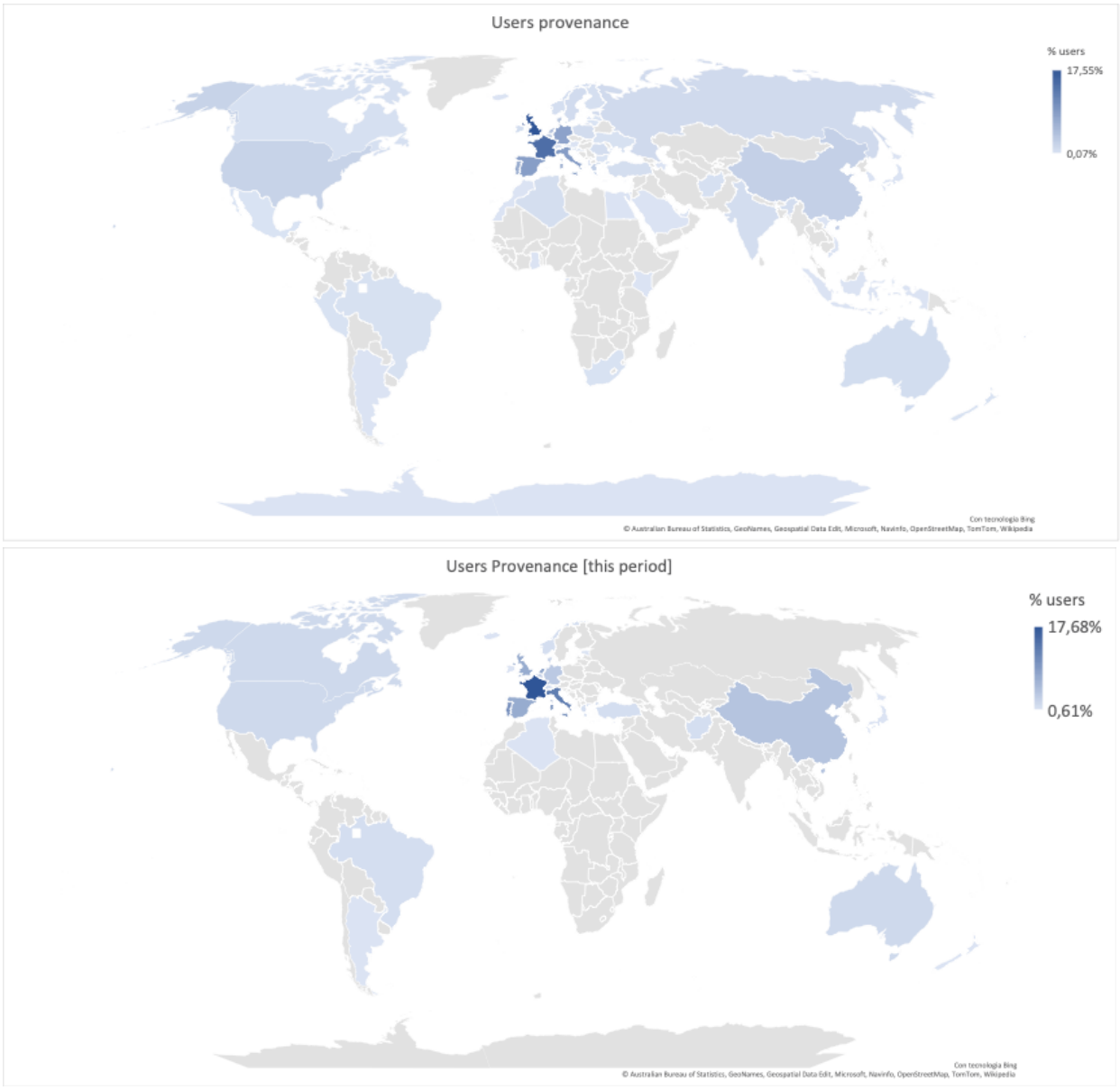

Figure 6. EMODnet Users provenance

4. Identified issues: status and actions taken

Table 3. Priority issues identified by CINEA/ DG MARE/ Secretariat

A. Priority issue(s) identified and communicated by CINEA/ DG MARE/ SECRETARIAT				
Priority issue	Status (Pending/Resolved)	Action(s) taken / remaining actions planned	Date due	Date resolved
Physics - Web Services MetadataUrl and DataUrl fields	In progress	Service check and update – continuous dialogue with secretariat/central portal tech team.	asap	03/01/2022
Products to be offered via OGC services	closed	Part of the Physics to central discussion. During the meetings we agreed to have a step wise approach and work on product (first) and on data (one theme per time, later)		
INSPIRE quality Service requirements	In progress	TWG is working on this issue.	asap	
The WMS service exceeds the 10-seconds response time required by INSPIRE	In progress	Keep working on this in collaboration with CP.	asap	
LegendGraphics for HFR WMS	Pending	Mapproxy does not support the legend graphics as requested. A custom development is needed. It is not planned yet.	asap	
Dashboard - Catalogue webpage tracking	closed	The endpoints to be monitored were updated		29/07/2021
Links to EMODnet Physics dashboards	closed	Dashboards were developed and used for monitoring the system under phase 2 and 3.1. Monitoring specifications have been changed hence these dashboards are not		12/10/2021
Content Inventory Physics	closed	Mapping of the EMODnet Physics static contents		15/11/2021

Portal Editors	closed	Provided		29/11/2021
Collect fields/forms used on Physics	Closed	Provided		29/09/2021
To report on number of downloads	closed	Provided		05/11/2021
Physics Grafana spotted tracking some pages	pending	Some of the monitored endpoints are changed and are going to be changed because of the centralization process, the agreement is to monitor what is possible/available as internim solution.		
Review the new CP mapviewer	pending	CP have to take over and follow up on provided comment		

Table 4. Priority issues identified by Physics group

A. Issues / challenges identified by the thematic assembly group itself					
	Priority issue / challenge	Status (Pending/Resolved)	Action(s) taken / remaining actions planned	Date due	Date resolved
	Update the platforms page with the same technology and responsiveness implement for the mapviewer	Closed	This is part of Taks 9. Most of the pages have been updated		31/03/2022

5. Allocation of project resources

Table 5. Resource allocation

Information on the allocation of project resources	
Categories	Resource usage[27] (%)
Making data and metadata interoperable and available	23,5
Preparing data products	11,5
Preparing web-pages, viewing or search facilities	12,9
Managing user feedback	9
Project management	20,9
Outreach and communication activities	20,9
Others	1,4

Table 6. Resource allocation

Categories	**Involved Tasks**
Making data and metadata interoperable and available	1,3
Preparing data products	2
Preparing web-pages, viewing or search facilities	2,9
Managing user feedback	8
Project management	4,5,6,7
Outreach and communication activities	4,5,6,7
Others	9

[27] Provide the workings of your calculations, *i.e.* percentage allocation of the total amount awarded.

6. User feedback

Table 7. User feedback

Overview of user feedback and/or requests received in this quarter							
Date	Organisation	Type of user feedback (e.g. technical, case study, etc.) and short description of the feedback received	Means of contact	Response time	Status of user query: resolved/pending	Measures taken to resolve the query	Status: if not (yet) resolved/pending, explain reason why and expected timeline
01/10/2021	Université du Littoral Côte d'Opale	request for help with data download	HD	0 days	Solved	Feedback by email.	
12/10/2021	CorPower Ocean	problem with dataset download	email	0 days	Solved	Feedback by email and server problem solved.	
12/10/2021	EnBW Energie Baden-Württemberg	request for help with data download	email	1 day	Solved	Feedback by email and server problem solved.	
14/10/2021	EuroGOOS	Arctic portal is down	email	0 days	Solved	Feedback by email.	
14/10/2021	Energinet	Problem with login	HD			Feedback by email.	
20/10/2021	Nautilus Energy	request for help with data download	email	1 day	Solved	Feedback by email.	
25/10/2021	Geoazur	issues with data download	HD	1 day	Solved	Feedback by email.	
26/10/2021	Norwegian University of Science and Technology	enquiry about wave data	HD	1 days	Solved	Feedback by email.	
09/11/2021	Deltares	login issue and data download enquiry	email	1 day	Solved	Feedback by email.	
10/11/2021	Bangor University	enquiry about tidal data	email	1 days	Solved	Feedback by email.	
22/11/2021	Institute of Geosciences Christian-Albrechts-Universität zu Kiel	data download enquiry	email	1 day	Solved	Feedback by email.	
26/11/2021	University of Genoa	wave data enquiry	email	1 day	Solved	Feedback by email.	

27/11/2021	Monitor My Ocean	Support to download data	HD	1 day	Solved	Feedback by email.	
18/12/2021	Private user	Support to download data	HD	1 day	Solved	Feedback by email.	
8/3/2022	CETMAR	Technical - change data source path	HD	1 day + in progress	Pending	Working on the mapping of the new source	
22/2/2022	Aktis Hydraulics	Support to download data	HD	1 days + 1 week	Solved	Feedback by email	
30/3/2022	TU Delft	Requesto for technical help	HD	1 days	Solved	Feedback by email.	
30/3/2022	XG - Xunta Galicia - Spain	Technical	HD	0 days	Solved	Feedback by email	
1/4/2022	Student	Support to download data	HD	1 days	Solved	Meeting to train	
4/4/2022	RPS	Metadata Access	HD	1 days	Solved	Feedback by email	
5/4/2022	RPS	Support to download data	HD	0 days	Solved	Feedback by email	
19/4/2022	University of Hull	Support to download data	HD	0 days	Solved	Feedback by email	
20/04/2022	Deltares	Technical problem on HR radar	HD	0 days	pending	Feedback by email	Individuated issue, fixing in progress
27/4/2022	VLIZ	Support to download data	HD	0 days	Solved	Feedback by email	
05/05/2022	CCMAR	Support to download data	HD	0 days	Solved	Feedback by email/ created API for data download	
10/5/2022	Helmholtz-Zentrum Hereon	Support for time series dowload	HD	0 days	Solved	Feedback by email	
13/5/2022	CENTEC	Suppory for platforms informstion	HD	3 days	Solved	Feedback by email	
20/5/2022	University of Manchester	Support to download data	HD	0 days	Solved	Feedback by email	
1/6/2022	University of South Florida	Support to download data	HD	1 day	solved	Feedback by email	
23/6/2022	COWI	Support to data visualization and download	HD	3 days	Solved	Feedback by email	
18/7/2022	Uni Oldenburg	Platform information	HD	1 days	resolved	Feedback by email	
2/8/2022	OGS	Web portal and related services	HD	0 days	resolved	Feedback by email	
2/8/2022	Leibniz Institute for Baltic Sea Research	Platform page isses	HD	0 days	resolved	Feedback by email	

7. Meetings/events held/attended & planned

Table 8. Meetings/events held/attended

A. Meetings/events Organized and attended					
Date	Location	Type event (internal or external meeting, training/workshop)	Indicate if a ppt was given (yes/no + short description)	Meeting attended (A) / organised (O)	Short description and main results (# participants, agreements made, etc.)
7-8/09/2021	On line	EMODnet SC		A	
20-24/09/2021	On line	Polar Data forum		A	https://polar-data-forum.org/ - PDF is a place where polar data holder get together and make more use of data. EMODnet Physics is supporting both the Antarctic (SOOS) and Arctic community and the team was involved in some of the tech brainstorming workshops.
21-22/09/2021	On line	EMODnet Ingestion Annual Meeting		A	
28/09/2021	On line	Physics – Central Portal KOM		A	Technical meeting to review and plan actions towards the centralization of the systems.
06/10/2021	Online	EMODnet Physics River team meeting		O	Periodic meeting with the expert team to review and plan internal actions
08/10/2021	Online	BluePlanet Forum		A	https://www.blueplaneteconomy.it/ - the event discussed about the Blue Economy and the tools and the service that can support it.
08/10/2021	Online	UniGe DISTAV collaborations WS	Yes	A	The workshop was to present on the collaboration between the DISTAV (Univerity of Genova) and key partners such ETT. EMODnet (Physics, Ingestion, Chemistry) were central in the presentation.

12/10/2021	On line	AtlantOS Ocean Hour - All-Atlantic Ocean Data Space		A	Workshop to discuss about standards and interoperability, how to best use data, collaborations. Etc.
19/10/2021	On line	NAUTILOS General Assembly		A	Annual meeting of the H2020 NAUTILOS project
25/10/2021	On line	Glider School	Yes	A	Presentation about how EMODnet Physics and Ingestion deal and make available glider data (about 30 students)
26/10/2021	On line	Annual MONGOOS meeting		A	MONGOOS partners are key contributors to EMODnet Physics.
26/10/2021	Online	TG NOISE		A	Periodic TG NOISE technical meeting
26/10/2021	On line	EMODnet Central Portal	Yes	A	Technical meeting on migration to the new central portal
29/10/2021	On line	EMODnet Ingestion/SBM Offshore		A	It's a follow up meeting with SBM Offshore in order to identify possible sinergies to facilitate the ingestion of data collected at Offshore sites. The focus was on temperature, salinity and other basic physics data.
03/11/2021	On line	SOOS DMSC	Yes	A	SOOS map is powered by EMODnet Physics and with the presentation we updated the team on Centralization process, schedule and the planning to keep serving the SOOS community
8-9/11/2021	On line	EMODnet Physics 4 KOM	Yes	O	Annual meeting with Physics core and extended teams.
11/11/2021	online	VOTO Data		A	Technical meeting to interoperate with VOTO
16/11/2021	Online	EMODnet Chemistry	Yes	A	Presentation on the joint EMODnet Physics and Chemistry activities on River
18/11/2021	Online	New GESLA presentation		A	Presentation of the new GESLA – Sea Level Anomalies – product presentation. The product is of EMODnet Physics interest. The product can be included in the EMODnet Physics catalogue.
25/11/2021	On line	2nd EuroSea Anniversary Webinar		A	EMODnet is one of the main EuroSEA stakeholder.

29/11/2021	On line	EuroGOOS 2nd Integration Workshop		A	
30/11/2021	On line	SOOS DMSC		A	Periodic Data management SC meeting. We presented and reported on follow up actions since previous meeting.
13/12/2021	On line	EMODnet Chemistry full group KOM		A	
17/01/2022	web	external	no	A	Arctic RCC, https://www.arctic-rcc.org/
24/01/2022	web	external	no	A	CMEMS INS TAC KOM - EMODnet Physics is attending the Advisory Board of CMEMS INSTAC
01/02/2022	web	internal	Yes, state of the art of EMODnet rivers service	A	EUROGOOS - Coastal Working Group
08/02/2022	web	external		A	Odyssey project launch
08/02/2022	web	external	no	A	Swedish ODF, Ocean Data Factory, workshop on data availability
08/02/2022	web	external	yes	A	Arctic ROOS GA - 8-9/02/2022
14/02/2022	Sopot, Poland + web	conference	yes	A	International Ocean Data Conference 2022 - The Data We Need for the Ocean We Want - https://oceandataconference.org/
17/02/2022	web	external	no	A	Intro TransEurope Marinas & EMODnet - to discuss about synergies between the two initiatives
17/02/2022	web	external	no	A	TG Noise thematic sessions "Towards EU threshold values for underwater noise"
24/02/2022	web	external	no	O	Meeting with Politecnico TO - MORELAB; ERG - to discuss about data availability, interoperability and use
01/03/2022	web	external	yes	A	SOOS DMSC - periodic meeting with the SOOS Data Management Steering Com. to discuss about interoperability and joint actions on data gaps
02/03/2022	web	external	yes	A	H2020 - ARICE project General Assembly - to brief up the Assembly about on going collaboration and future data interoperability goals

03/03/2022	web	internal	no	O	EMODnet HFR team meeting - reanalysis of data model and review of annual plan for involving other actors
03/03/2022	web	conference	yes	A	Ocean Science Meeting - EMODnet presented on its activities to engage industries and citizen scientists - https://www.aslo.org/osm2022/scientific-sessions/
04/03/2022	web	internal	no	A	EMODnet Central Portal technical team meeting with Physics
15/03/2022	web	external	yes	O	Meeting with Orsted on Offshore Wind and Ocean Data - EMODnet ingestion
22/03/2022	web	external	no	A	20th TGNOISE
24/03/2022	web	external	no	A	EuroSEA - Eulerian Observatories - meeting for Best Practice. EMODnet (Physics) is a key stakeholder in EuroSEA
24/03/2022	web	external	yes	A	EMODnet Physics presented on the "Marine Biology Live" to present on its actions on Citizens Science. MBL is a series of regular online talks organised by the Marine Biological Association.
25/03/2022	Copenhagen , Denmark	external	no	A	Meeting with Paralenz - to discuss on the physical data ingestion
28/03/2022	web	external	no	A	EuroGOOS - DATAMEQ - periodic meeting. EMODnet Phy is one of the member
30/03/2022	web	internal	yes	A	EMODnet Chemistry SC meeting - EMODnet Chemistry and Physics are jointly developing new river data products
05/04/2022	web	external	no	A	Best Practice in Aquaculture
08/04/2022	Sweden	external	yes	A	Swedish National Commettee for Ocean Decade
07/04/2022	web	internal	yes	A	DG MARE
12-13/04/2022	Genova, Italy		yes	O	Marine Insitu Collaboration - MIC TWG - to streamline data flow between main EU marine data operators and integrators
26/04/2022		internal	yes	A	EMODnet SC
28/04/2022		internal	yes	A	EMODnet TWG
09-10/05/2022	Malmo, Sweden	conference	no		Ocean Literacy - Ocean Decade Sweden - https://malmo.se/Welcome-to-Malmo/Sustainable-Malmo/One-Ocean---One-Planet-Ocean-Literacy-Action-2022.html.

9-13/05/2022	web + Cadiz, Spain	workshop	yes	A	EuroSEA workshops week + GA
19/05/2022	Ravenna, Italy	conference		A	European Marine Days - https://ec.europa.eu/maritimeaffairs/maritimeday/conference_en -
20/05/2022	Ravenna, Italy	conference	no	O	EU4Ocean @ EMD - https://european-maritime-day-2022.b2match.io/agenda?session=c2Vzc2lvbjoxMTI1OTA%3D&track_id=19933
24/05/2022	web	external	no	A	21th TGNOISE
26/05/2022	web	external	no	O	EMANEDS – European Marina Networks of Environmental Data Stations – to discuss about interoperability and data flow towards EMODnet
30/05/2022	Genova, Italy	meeting	yes	O	meeting with CIMA foundation (https://www.cimafoundation.org/) - to discuss about synergies
30/05/2022	web	internal	no	A	follow up on Centralization with CP team
16-17/6/2022	Athens, Greece	internal	yes	A	EMODnet Ingestion 3 - kick off meeting
16/06/2022	Genova, Italy	workshop	no	A	GESmartCity - Blue District - workshop to discuss about synergies between projects to support the municipality blue and smart projects - about 30 attenders
21/06/2022	web	external	no	O	EMANEDS – European Marina Networks of Environmental Data Stations – to discuss about interoperability and data flow towards EMODnet
21/06/2022	web	external	no	O	CCMALR - to discuss about interoperability
24/06/2022	web	internal	no	O	SONEL - follow up meeting on the integration of the new products and harmonization of data flow
01/07/2022	web	internal	no	A	follow up on Centralization with CP team
01/07/2022	web	internal	no	A	follow up on Centralization with CP team
05/07/2022	web	workshop	yes - EMODnet Physics status and activities for glider network	A	European Glider Data Management Workshop - https://www.groom-ri.eu/european-glider-data-management-workshop-agenda-2/ - https://docs.google.com/document/d/1hQSNbznH6sm5Eo1KjrkK1og1vQDOjRtwGa0xryANe54/edit#

04/08/2022	web	Conference	yes	A	*Open Science Conference* - SCAR OSC data session: Sharing science data FAIRly to support interdisciplinary research collaborations
SUM				A	**Total # of meetings Attendend = 54**
SUM				O	**Total # of meetings Organised = 12**

Table 9. Meetings/events planned

A. Meetings/events planned in the future				
Date	Location	Type event (meeting, training (workshop), etc.)	Meeting to be attended (A) / organised (O)	Short description and main expected outcomes
20-21/09/2022		workshop	A	Offshore Energy Northeast Atlantic, Arctic, North and Baltic Seas
21-22/09/2022	Brussels, Belgium	meeting	A	EMODnet TWG
26-30/9/2022	Naples, Italy	workshop	A	Naples Shipping Week
26-27/09/2022	Brest, France	meeting	A	CMS INSTAC GA
27/09/2022	Brest, France	meeting	O	MIC TWG
03-05/10/2022	Milazzo, Italy	workshop	O	https://www.metrosea.org/special-sessions
08-11/10/2022	Taranto, Italy	workshop	A	GreenBlueDays
19-20/10/2022		workshop	A	Offshore Energy Mediterranean Sea
November		workshop	O	HFR TT – EMODnet Physics GA

8. Communication assets

Table 10. Comminunication products

A. Communication products				
Date	Communication material	Short description (of the material, title, …) of the asset	Main results	Name of event at which material was disseminated (if applicable)
8/6/2022	https://www.linkedin.com/feed/update/ urn:li:activity:6940241693015216128/		10 reactions[28]	
13/6/2022	https://www.linkedin.com/feed/update/ urn:li:activity:6942050665946886144/		17 reactions	
16/6/2022	https://www.linkedin.com/feed/update/ urn:li:activity:6943110272244973569/		13 reactions	
30/7/2022	https://www.linkedin.com/feed/update/ urn:li:activity:6958778221446230017/		18 reactions	

Table 11. Planned communication

B. Planned communication products			
Date	Communication material	Short description (of the material, title, …) and/or link to the asset	Main results expected
	Video	Video on how Fisherman can use sensors and see data on EMODnet Physics. Teaser @ https://www.youtube.com/watch?v=yTS0WPWBQ7s	Engage Fishermen community
	Video	Video on how EMODnet Physics can support Citizen Science initiatives	

[28] In the first day of the post

Table 12. Publications A

C. (Co-)Authored peer-reviewed publications in this project phase					
Date of publication	Type of publication	Full reference	ISBN	DOI	Is it open access? Yes/No
	e.g. paper; conference proceedings; book chapter; …				
2021	Paper	Martinez et al., In-situ real-time underwater noise dataflow: from OBSEA to EMODnet. Bollettino di Geofisica, Vol. 62-Supplement n.1, 2021	ISSN 0006-6729		Yes[29]
2021	Paper	Novellino et al., River data management for coastal oceanography. Bollettino di Geofisica, Vol. 62-Supplement n.1, 2021	ISSN 0006-6729		Yes
2021	Paper	Corgnati et al., The European HF Radar node: two years distributing standardized and quality-controlled data to the major European Marine Data Portals. Bollettino di Geofisica, Vol. 62-Supplement n.1, 2021	ISSN 0006-6729		yes
2021	Paper	Gorringe et al., Southern Ocean data: A community effort to build a data ecosystem. Bollettino di Geofisica, Vol. 62-Supplement n.1, 2021	ISSN 0006-6729		yes

[29] https://imdis.seadatanet.org/content/download/151922/file/IMDIS2021_proceedings.pdf

2021	Paper	Novellino et al. EMODnet Physics from data to use cases. Bollettino di Geofisica, Vol. 62-Supplement n.1, 2021	ISSN 0006-6729		yes
2021	Paper	Thomas et al., How to stop re-inventing the wheel: a data management case study. Bollettino di Geofisica, Vol. 62-Supplement n.1, 2021	ISSN 0006-6729		yes
2021	Deliverable	Rubio et al., European High Frequency Radar network governance. EuroSea Deliverable 3.4		10.3289/eurosea_d3.4.	yes
2021	Deliverable	Poliquen et al., DMP data management plan. EuroSea Deliverable D3.1		10.3289/eurosea_d3.1.	yes
2021	Deliverable	Perez Gomez et al., New Tide Gauge Data Flow Strategy. EuroSea Deliverable D3.3		10.3289/eurosea_d3.3.	yes
2021	paper	Sotillo et al., River freshwater contribution in operational ocean models along the european atlantic façade: Impact of a new river discharge forcing data on the cmems ibi regional model solution. Journal of Marine Science and Engineering 9(4):401		10.3390/jmse9040401	yes
2021	paper	Delrosso et al., EMODnet preliminary highresolution temperature and salinity climatologies for the Northern Adriatic Sea. Advances in operational oceanography : expanding Europe's ocean observing and forecasting capacity. Proceedings of the 9th EuroGOOS International Conference. 3 – 5 May 2021, Online Event 2021, EuroGOOS. Brussels, Belgium. 574		10.13155/83160	yes

2021	Paper	Corgnati et al., THE EUROGOOS HIGH FREQUENCY RADAR TASK TEAM: A SUCCESS STORY OF COLLABORATION TO BE KEPT ALIVE AND MADE GROWING. Advances in operational oceanography : expanding Europe's ocean observing and forecasting capacity. Proceedings of the 9th EuroGOOS International Conference.		10.13155/83160	yes
2021	Paper	She et al., DEVELOP EUROGOOS MARINE CLIMATE SERVICE WITH A SEAMLESS EARTH SYSTEM APPROACH. dvances in operational oceanography : expanding Europe's ocean observing and forecasting capacity. Proceedings of the 9th EuroGOOS International Conference.		10.13155/83160	yes
2021	paper	Rubio et al., Building a reliable and standardized long-term data set of surface coastal ocean currents from the European HF Radars. dvances in operational oceanography : expanding Europe's ocean observing and forecasting capacity. Proceedings of the 9th EuroGOOS International Conference.		10.13155/83160	yes
2022	book	Manzella and Novellino, Oceanography: a recent scientific discipline with ancient origins. Ocean Science Data-Elsevier	ISBN: 978-0-12-823427-3	https://doi.org/10.1016/B978-0-12-823427-3.01001-X	no
2022	book chapter	Schaap et al., Data management infrastructures and their practices in Europe. Ocean Science Data, Elsevier.	ISBN: 978-0-12-823427-3	https://doi.org/10.1016/B978-0-12-823427-3.00007-4	no

2022	Paper	Campuzano et al., Framework for improving land boundary conditions in ocean regional products. Journal of Marine Science and Engineering 10(7)		10.3390/jmse10070852	yes
2022	Proceeding	Troupin et al., Gridding of high-frequency radar velocities using the Data-Interpolation Variational Analysis in n dimensions (DIVAnd), EGU General Assembly 2022, Vienna, Austria, 23–27 May 2022, EGU22-2371, https://doi.org/10.5194/egusphere-egu22-2371, 2022.		doi.org/10.5194/egusphere-egu22-2371	yes

Table 13. Publications B

D. Other/non-peer reviewed types of publications (co-)authored in this project phase					
Date of publication	Type of publication	Full reference	ISBN	DOI	Is it open access? Yes/No
	e.g. paper; conference proceedings; book chapter; …				

A simple search in google scholar shows more than 300 documents between papers and projects deliverables using/citing EMODnet Physics. https://scholar.google.com/scholar?hl=it&as_sdt=0%2C5&q=EMODnet+Physics&as_ylo=2021

We also used the "Publish or Perish" web scraper tool[30] (on google scholar) to list papers using "EMODnet Physics" as a search keyword. The result lists 300 papers (full list in attach).

For a compressive overview of publications referring to/making use of EMODnet data and/or data products, please consult Google Scholar.

[30] https://harzing.com/resources/publish-or-perish

9. Monitoring indicators

Table 14. Monitoring Indicators

Comments on the progress indicators in the indicators spreadsheet		
Progress indicator	Means of collecting figures	Comment
1. Current status and coverage of total available thematic data A) Volume and coverage of available data	Matomo/ server logs	EMODnet Physics input data is sparse and for this indicator we consider the "platform" as the "unit" of monitoring assessment. A platform is a logical entity that hosts data, where data maybe a single dataset (e.g. a profile in case of CTD), a timeseries (e.g. sea level station), a series of profiles (e.g. ARGO). The source for the indicator is the map.emodnet-physics.eu where sub-theme is the unique applied filter. For indicator 1.A we report on the % variation of the number of platforms for the given basin. For indicator 1.A we report on the % variation of the number of platforms for the given basin. For this indicator we are using bounding box shapes - EEA shapefiles - anyhow boxes for Caspian and Caribbean Seas are not in use yet and platforms in these regions are counted under Other Seas. For indicator 1.B the unit of download is measured in platforms (in line with indicator 1.A) while the number of downloads are measured in "requests". A request may be for a single dataset (e.g. 1 CTD) as well as a full time series (e.g. daily data for past XX years). For ice data, EMODnet Physics is integrating a satellite derived product covering the whole Arctic and Antarctic areas. This product can be only downloaded via WMS.
What is your opinion on the data coverage within EMODnet for your thematic?		EMODnet Physics is matching well the expectations. It is keeping including new data sources and linking (or developing, whenever not available/not matching expectations) sub-thematic products. Although coverage is already good, the action to keep adding datasets in time and space and linking new programs and initiatives (also beyond the European area) is crucial and needs the EMODnet Physics team and network to invest the maximum effort.

B) Usage of data since the start of the project phase		Indicator 1.B is reporting the amount of downloaded data from mapviewer (note that the amount in GB is an estimation based on the number of requests multiplied the average file size). As reported in 2B the overall amount of downloaded data from ERDDAP is about 561 GB. According indicators it seems the users use the mapviewer as entry page to check for values (charts) and use ERDDAP and GeoServer to download data (ERDDAP+map manual download - 2B col F; 1B col D). We are considering the number of views of the sub-theme pages as the number of downloads, and for each sub-theme we consider the % against the total of download. Concerning the use of the interfaces: ERDDAP is the most used. The use of WMS/WFS layers (GeoServer) is tracked and (only) reported under 2B. Users are starting using interfaces as we planned and this will facilitate the centralization of process (the overall idea is to inform users that the new mapviewer/ERDDAP/GeoSeerver are on/from the CP - that are linked to the EMODnet Phyics ones - and they should be able to adapt easily to this - it's only a change in the url endpoint). It is not possible to assess the trends (i.e. to compare analytics vs the results of the previous phase) because the system endpoints were re-designed and the monitoring tools presented limitations intracking the new infrastructure. See appendix for more details.
2. Current status and coverage of total number of data products A) Volume and coverage of available data products		EMODnet Physics data products may be both datacollections (e.g. PSMSL RLR) and products (e.g. gridded climatology) that in total are 552 dataitems (full list is reported in the Products20220801 sheet). These are available on the development infrastructure (ERD = ERDDAP, MAP = Mapviewer, GEO = GeoServer). Apart from the European Under Water Noise Register and the TSM that only covering Europe (100% of the availble information) the other products offer global coverage. To ease the centralization process, as interim and stepwise approach, the Central viewer is going to present a subset of those 552, while the Central catalogue will provide links to them all.
B) Usage of data products since the start of the project phase		The mapviewer and the products pages accessible under the "Products" section are monitored in terms of visits (by matomo). ERDDAP is monitored both in terms of visit to the erddap landing page (matomo) and in terms of transactions (downloads - by logs). THREDDS and GeoSERVER are both monitored in terms of logs. We record a quite good use of the services, ERDDAP is the most used interfaces. Monitoring endpoints for WMS and WFS services have been changed since last contract: now we monitor logs from GeoServer and ERDDAP/ncWMS, during last contract we

		were collecting logs of the WMS/WFS service landing page. Current methodology is cleaner: it is counting only transactions (the previous was counting any interaction) and thus is in line with recorded trends. Notably, while in the previous contract most of the download were manual and form the mapviewer, during this period we recorded a shift towards the use of ERDDAP.
3. Internal and external organisations supplying/approached to supply data and data products since start of the project phase		EMODnet Physics team is continously promoting the program and services to unlock new data flows towards EMODnet Infrastructure. This action is done in collaboration with EMODnet Ingestion and EMODnet Physics partners infrastructures (EuroGOOS, Copernicus Marine Service INS TAC, SeaDataNet, ICES) and usually tries to enstablish an operational data flow based on services (for long term sustainability and easiness of manteinance). In case of products (e.g. gridded maps) the delivery is scheduled periodically. This workflow enables a continous data flow into the EMODnet Physics system, and in this phase the effort is focused on adding, or extending datacollections that are not available (fully avaialble) elsewhere (e.g. rivers). This activity is in line with EMODnet Physics stakeholders needs and expectations, and usually it is EMODnet Physics approaching the providers. During the period there were also some initiatives (e.g. EMANEDS, MONOCLE) that approached EMODnet Physics, which, although they have not delivered data or products, they are very promising.
4. Online 'Web' interfaces to access or view data		EMODnet Physics organizes datacollections and products access by ERDDAP, GeoServer and GeoNetwork. GeoNetwork is the catalogue and redirects to collections in ERDDAP/GeoServer or both. ERDDAP manages timeseries and some gridded data (ncWMS). GeoServer hosts vectorial data, maps and trajectories. To support and ease the Centralization process, EMODnet Physics hosts a development environment - which is linked to sources and do checking, cleaning, processing of the flows - and a production environment, which hosts the best version of the datasets and products to be presented on the central portal.
6. Statistics on information volunteered through download forms		User profile (affiliation and scope of work) are collected by a webform (on voluntary base) that pops up in the mapviewer when downloading data from a coastal station in European seas. Despite it represents a very narrow slice of the EMODnet Physics users, this tool helps in mapping

		the interests and the uses of the EMODnet Physics data. This tool is operational since November 2018 and collected more than 1,400 user profiles, 164 of which during the reporting period. The spreadsheet only reports figure for the reporting period, while the textual part of this interim compares this figure vs the overall data. Users mostly are in Research and Academia (60%), private sector fluctuates around 19%. Data are mainly used for Marine and Coastal applications (85%), Climate and weather forecasting (more than 50%), followed by Marine resource and Marine safety. Registered users are not limited to the EU.
7. Published use cases		EMODnet Physics collected 21 use cases, 6 of which were published during this reporting period. All the use cases, in total collected 6125 views. The most viewed is the one on Med Wave Model (that involved a private company, which is likely using the case during its communication and mkt activities). Very interestingly some of the latest published use cases are collecting a very good hype (sea level product, support to deploy ERDDAP, etc). The collaboration between EMODnet Physics and Copernicus Marine Service is also very welcome with the second highest viewing score.
9. Technical monitoring		System is stable and available (uptime 100%). Response time seems not to have been updated to monitor the "prod-env" endpoint.
10. Visibility & Analytics for web pages		EMODnet Physics mapviewer is by far the most used interface with an steady trend. Catalogue is also quite well consumed. Charts are missing some data because, some endpoints were changed and the system was not able to distinct by (these) pages. CP team worked to fix it. Status quo.
11. Visibility & Analytics for web sections		It looks like that users directly go to the mapviewer bypassing the landing page at all. Combining indicator 9 and 10 stats we see that the map viewer is the most consumed page (9), while the webportal section (portal page link to the mapviewer - 10) is very little. This confirms that mapviewer is the most used and appreciated interface.

12. Average visit duration for web pages		Same comments as for sect.9 and 10

The monitoring numbers reported as part of the progress monitoring of EMODnet performance are collected through Matomo and/or Europa Analytics, unless reported otherwise.

10. Recommendations for follow-up actions by the EU

EMODnet is a long-term program designed to reduce fragmentation of marine data sources, facilitating the discovery and access to data and data products for multiple uses, facilitating data interoperability and accessibility and stimulating the use by industry, policy makers and scientists.
Thanks to its step-wise approach, the 2020 European Commission targets[31] for accessibility and interoperability of marine knowledge were achieved and it is now recommended to move forward into a new operational phase. This applies to all the thematic projects, but to EMODnet Physics in particular.
While the general goals remain the same, EMODnet Physics should move towards and contribute to increasing the productivity of those who work on marine issues, stimulating innovation in the blue economy sector and reducing uncertainty in our knowledge of the behaviour of the sea by increasing the accessibility and interoperability of marine data beyond the European seas.
EMODnet Physics should continue to be an essential contribution to the data and information sharing provisions in the Marine Strategy Framework Directive[32] and the Maritime Spatial Planning Directive[33] and fit-for-purpose catalogues and data-product collections should be organized. EMODnet Physics is hosting some of the most complete thematic data collections in the world (e.g. Sea Level, Surface Currents from HFR, etc).In the case of River Data, EMODnet Physics represents the most important operational data provisioning platform (ETOOFS report 2022)[34], making the system crucial for an increasing number of users. The increasing interest of a wider community and need for continuous updates (in terms of services and products) require a new kind of contract framework according which the team has not to bid for continuity every other year.
EMODnet Physics is supporting activities at platform level (HFR, FerryBox, Tide Gauge, etc.). EMODnet Physics identifies, together with platform operators, tasks that can have a large impact with a minor investment. Although significant progress towards reducing the gap between marine data availability and accessibility was made, there are a number of key actions (such as the inclusion of more research vessel data, glider data, data from the polar regions and from the Black Sea– with focus on the improvement of data harmonization and their access – data sampling, transmission, calibration, processing, archiving and retrieval of required variables) that must not be stopped. EMODnet Physics took the lead on bringing together communities to discuss platform-specific data issues by supporting and organizing dedicated brainstorming and pilot actions. These activities are

[31] Green Paper, Marine Knowledge 2020, from seabed mapping to ocean forecasting Brussels, 29 August 2012, COM(2012) 473 final.
[32] http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm
[33] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0089&from=EN
[34] E Alvarez Fanjul et al 2022

crucial to maintain momentum among platform operators. EMODnet Physics acts as the catalyst to bring communities together in order to address and solve various data issues and hence increase the amount of data shared and made available. This was the case for HFR operators, gliders operators, Fishermen, and now EMODnet Physics is approaching and engaging new important communities: citizen science projects and cryosphere researchers.

Any possible data-sharing issues are discussed, and active solutions are proposed. This has contributed to making available some of the most exhaustive in situ marine data collections (e.g. sea level, temperature and salinity in the water column, sea surface currents etc.). Notably, other key European infrastructures (Copernicus Marine Service-INSTAC, SeaDataNet network of NODCs) and European projects (EuroSEA, JERICOS3, etc.) are also benefitting from this "unlocking" and coordination actions.

The land-sea interface, i.e. coastal zone, is an area of high interest: around one third of the European population lives close to the coast, it hosts important commercial activities and also supports diverse ecosystems. Coastal zones are particularly vulnerable to climate change due to the combined effects of sea level rise due to global warming and potential changes in the frequency and intensity of storms due to extreme weather events. EMODnet Physics started integrating and making available near real-time river runoff and in situ river runoff trends (monthly and annual means). The Marine Forecasting Centres are welcoming this new data to improve the MFCs thermohaline circulation in coastal areas through improved classification of land-marine boundary conditions, with special regard to salinity fields. It is recommended to the EU to keep supporting this activity. Moreover, it should make available new and fit-for-purpose products for coastal applications by integrating both in situ, remote sensing and model output products.

EMODnet Physics should continue facilitating community data-sharing brainstorming and making available additional sources of in-situ data to EMODnet stakeholders and to the Copernicus programme.

It is also recommended that, together with Copernicus, EMODnet should work on data provenience and legacy (by providing information about the principal investigator, the applied QC/QF procedures, other links and sources for the same data, etc.).

EMODnet Physics started reaching out to a wider user community, including the Arctic Ocean, Southern Ocean Observing System, the Swiss Antarctic Circumpolar Expedition, private organizations (e.g. Saildrone, Berring Data Collective, Voice Of The Ocean, etc.), and new emerging data sources (e.g. citizen science data).

According to statistics and user feedback, EMODnet Physics is matching the needs of users consuming near-real-time data and long term (historical) time series, i.e. past and present. It is recommended to start working on including in-situ forecast information to enhance the user experience. This is particularly relevant to some of the parameters within the EMODnet Physics domain, such as sea level, wave, currents and wind.

From a management point of view the coordination team would benefit from a simplification in the reporting documentation and indicators.

11. Annex: Other documentation attached

Usage of data-products and monitoring tools.

EMODnet Physics products pages are one of the primary channels for users to consume EMODnet Physics products. The interactions with these product-pages is monitored in terms of page-access/page-views (simple but effective analytics tools). During the current phase, a central web-analytics monitoring (matomo) was adopted and while offering a common tool for extracting stats, it presented some limitation to be synch with the deployed updates of the system. Figure 7 shows the reason of the negative trend in the monitoring stats.
Between the end of previous phase and start of the current the product-pages endpoints were moved from subpages of the mapviewer to pages of the EMODnet Physics products endpoint: e.g. the WIND page, moved its endpoint from https://www.emodnet-physics.eu/map/Products/EP_MAP_WIND_001 to a more user-friendly and easier https://products.emodnet-physics.eu/EP_MAP_WIND_001. Unfortunately, although the monitoring team (TRUST-IT) updated the tool, matomo is not able to catch it (seems not to resolve the third level domain). According the feedback from direct interaction with stakeholders WIND, WAVE, RIVER and SEA LEVEL products are the most accessed. In the specific case of the WIND product we guess it stays around 100 visits per day that is a quite good traffic.

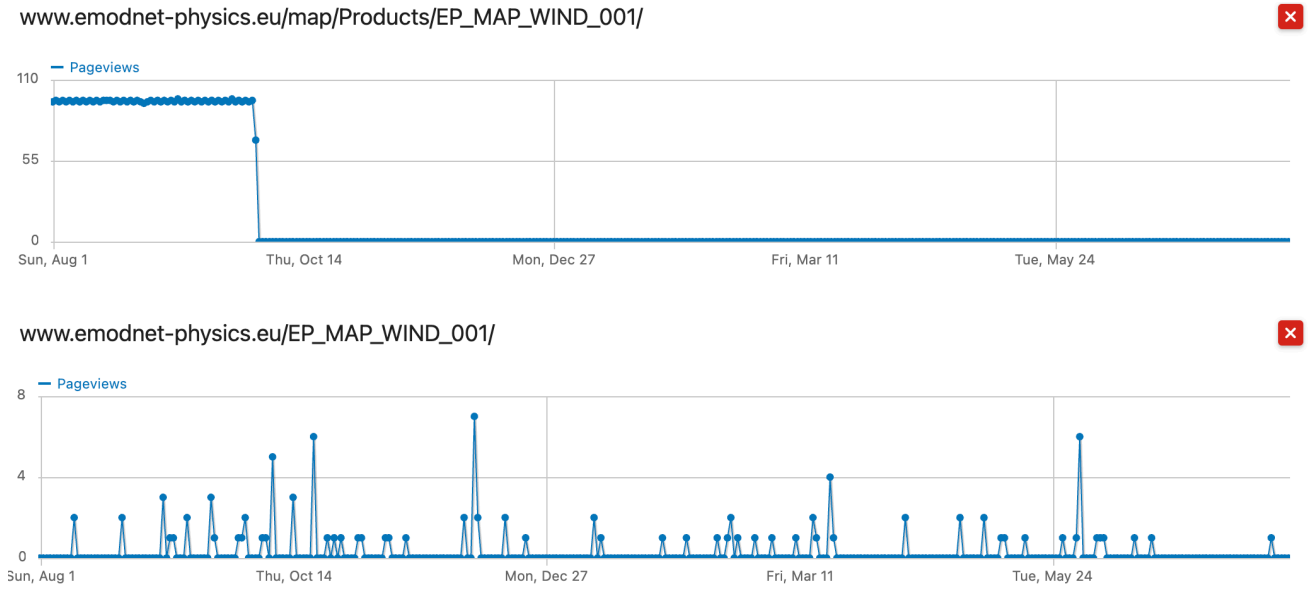

Figure 7. EP_MAP_WIND_001 monitoring analytics

List of Attached documents.

- D1.30 Guideline on data ingestion procedures for new real time and near real time streams v.2022
- D2.2 Data Inventory with gap analysis v.2022
- D2.8 Report on the maintenance and update of the EMODnet Physics smart connectors v.2022
- D2.10 EMODnet Physics Handbook on data management
- D2.12 EMODnet Physics Metadata handbook and examples
- D2.13 Report on dissemination system interfaces update v.2022
- D2.16 Updated list of EMODnet Physics products v.2022
- D3.2 Report on the SOS.SWE connected stations v.2022
- D3.6 new APIs v.2022
- D3.9 handbook to use EMODnet Physics APIs v.2022
- D3.11 Phasing out of EMODnet Physics Landing page
- D3.14 Maintenance and update of EMODnet Physics catalogue v.2022
- TOR MIC TWG v.2022