EMODnet Thematic Lot n°3 - Physics

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EMODnet Phase III – Interim Report

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Disclaimer

Executive summary

EMODnet Physics (www.emodnet-physics.eu) is one of the seven domain-specific European Marine Observation and Data network projects that through the effort done under preparatory action (MARE/2010/02) and successive development (MARE/2012/10; EASME/EMFF/2016/006) and operational (EASME/2019/OP/0003) phases have been successful in designing, organizing and running operational services where ocean physics data and data products built with common standards can be found, viewed and downloaded in a way that is free of charge and free of restrictions of use.

EMODnet Physics unlocks, links, aggregates, and makes available ocean physics parameters and available themes are temperature of the water column, salinity of the water column, horizontal velocity of the water column, changes in sea level and sea level trends, wave height and period, wind speed and atmospheric pressure, water clarity (light attenuation), underwater sound (noise), inflow from rivers, and sea-ice coverage.

Time series, profiles, and sampled datasets are made available, as recorded by fixed platforms (moorings, tide gauges, HF radars, etc.), moving platforms (ARGO, Lagrangian buoys, ferryboxes, etc.) and repeated observations (CTDs, etc.). Available products are collections of in situ data, reanalysis and trends from in situ data, elaboration in space and/or time of in situ data and model output for a given parameter.

EMODnet Physics data policy is open and free and the user can discover, plot and download in situ marine data from European Coastal and National programs together with data collected by international programs and repositories (e.g. ARGO, International Arctic Buoy Program - IAPB, National Data Buoy Center - NDBC, PANGAEA, International Council for the Exploration of the Sea - ICES, etc.). To facilitate user experience and reach new user communities, EMODnet Physics portal and back-office infrastructure is undertaking many major developments and updates and it is moving into a new phase to facilitate central data aggregation and discoverability.

New smart adapters that connect data from sources have been designed and developed to link and ingest data products. Once ingested, harmonization and standardization procedures (common standards and using common vocabularies) are applied to make data ready for dissemination. Data from European repositories and infrastructures such as CMEMS-INSTAC and SDN-NODC are integrated with other available sources (ICES, PANGAEA, Permanent Service for Mean Sea Level - PSMSL, SONEL, Intergovernmental Oceanographic Commission - IOC, etc.) to make available the most comprehensive ocean physics catalogues.

This makes EMODnet Physics a leading infrastructure to support and accomplish with European Directives such as Marine Strategy Framework Directive (MSFD), Marine Spatial Planning (MSP), Water Framework Directive (WFD). Indeed, EMODnet Physics is well recognized as primary integrator for the river data and land-sea interface data that are very important for MSP and WFD. Moreover, EMODnet Physics is making avaialble useful and complementary data for many of the MSFD indicators e.g. D1 combines "climatic conditions" (i.e. temperature, salinity, ice cover, light attenuation, …) with

the information of the quality and occurrence of habitats and the distribution and abundance of species[1]; D2 states that "Food web components are also subject to environmental and climate variation"; D5 identifies in rivers and runoff of rainwater one primary source for the organic nutrients responsible for the eutrophication of marine waters; D6 needs the characteristics (physical, chemical and biological) of the sea bottom to assess the sea-floor integrity; D7 is about the hydrographical conditions that are characterized by the physical parameters of seawater: temperature, salinity, depth, currents, waves, turbulence, turbidity (related to the load of suspended particulate matter); D11 is about underwater noise and EMODnet Physics is disseminating the noise impulsive registry and it is participating to TG NOISE.

Established international collaborations provide access to coastal data in non-European areas (e.g. NOAA platforms for the US, IAPB platforms for the Arctic area, IMOS for Australia, SOOS for the Southern Oceans, etc.) and extend EMODnet Physics catalogues beyond European waters. This way, in less than one year of activities EMODnet Physics largely extended its database and it is now providing access to more than 800.000 platforms and hundred thousand datasets. For each connected dataset/platform, a dedicated platform page is available. These pages provide the user with metadata, plots, download features, platform products – e.g. monthly averages or wind plots – additional info and links, as well as statistics on the use of the data from that platform. Data quality information is available in connection with datasets. Available datasets are provided with metadata and are downloadable in multiple data formats (e.g. netcdf, csv, txt, etc.). Apart from this, EMODnet Physics is developing interoperability services to facilitate machine-to-machine interaction and to provide further systems and services with European seas and ocean physical data and metadata. These features range from widgets to WxS OGC (Open Geospatial Consortium) compliant services and since the end of the previous contract (1/4/2019) the system recorded about 75.000 manual download requests (where a request could cover one dataset or a batch of data) and more than 4.700.000 webservices transactions (more than 47.000 manual download and more than 4.400.000 webservices transaction since 01/08/2019).

[1] https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-1/index_en.htm

1. Introduction

The European Marine Observation and Data Network, EMODnet, is a long-term marine initiative implementing mechanism of the European Commission's Marine Knowledge 2020 strategy[2,3] to unlock the potential of Europe's wealth of marine data. Based on the principle of collecting data once and using it many times for many purposes, EMODnet is a network of organizations supported by the EU's Integrated Maritime Policy[6] linked by a data management structure. These organizations work together to facilitate the discovery and access to marine data and data products representing the following seven main themes: bathymetry, biology, chemistry, geology, human activities, physics, and seabed habitats. EMODnet provides a gateway to those marine data accompanied by their metadata and data products through a number of thematic portals and a central portal (www.emodnet.eu).

EMODnet Physics (www.emodnet-physics.eu) is one of the seven domain-specific projects that through the effort done under the ur-EMODnet preparatory action (MARE/2010/02) and successive development (MARE/2012/10; EASME/EMFF/2016/006) and operational (EASME/2019/OP/0003) phases have been successful in designing, organizing and running operational services where ocean physics data and data products built with common standards can be found, viewed and downloaded in a way that is free of charge and free of restrictions of use.

The available themes are: temperature of the water column, salinity of the water column, horizontal velocity of the water column, changes in sea level and sea level trends, wave height and period, wind speed and atmospheric pressure, water clarity (light attenuation), underwater sound (noise), inflow from rivers, and sea-ice coverage. More specifically, time series and datasets are made available, as recorded by fixed platforms (moorings, tide gauges, HF radars, etc.), moving platforms (ARGO, Lagrangian buoys, ferryboxes, etc.) and repeated observations (CTDs, etc.). Products are collection of in situ data, reanalysis and trends from in situ data, elaboration in space and/or time of in situ data and model output for a given parameter.

The EMODnet Physics originates from the advances made by the Global Ocean Observing System (GOOS) community - especially the European component (EuroGOOS) - in the development of physical operational oceanography capabilities. The consortium represents a strong cooperation between Copernicus Marine Environment Monitoring System (CMEMS) In Situ Thematic Centre (INSTAC), SeaDataNet network of NODCs, International Council for the Exploration of the Sea (ICES), and Joint Technical Commission for Oceanography and Marine Meteorology in situ Observations Programme Support centre (JCOMMOPS).

At the end of phase 3, March 2019, the EMODnet Physics data portal was providing access to 160.000 platforms and more than 800.000 datasets. Following the EU's digital agenda recommendations, EMODnet Physics was updated to implement OGC standards and INSPIRE that allowed users to find, view and download data and products using standard protocols (and from March 2017 to March 2019, the system recorded more than 140.000 manual data download requests, and more than 1.300.000 web services transactions).

[2] European Commission (2010). Marine Knowledge 2020 Marine Data and Observation for Smart and Sustainable Growth. Commission Communication COM(2010) 461, Publications Office of the European Union.
[3] European Commission (2012). Marine Knowledge 2020 from Seabed Mapping to Ocean Forecasting. Green Paper, Publications Office of the European Union, Luxembourg.

With this legacy, and collaborating with a wide network of experts, on 26 August 2019, the EMODnet Physics consortium (ETT[4], MARIS[5], IFREMER[6], SMHI[7], ICES[8]) started the new contract (EASME/EMFF/2018/1.3.1.8/Lot3/SI2.810790) to build upon the on-going EMODnet Physics, to extend its coverage with additional monitoring systems, to make available additional products and strengthen the underlying infrastructure and collaborations, to be open to receive data provided through the EMODnet Data Ingestion facility, to cooperate and interoperate with the other EMODnet thematic groups, to further develop an operational service where marine data is made interoperable and freely available, and to further develop data products based on observations of the sea, providing free and open access to these data products and to the observations on which these data products were built. More specifically, this project develops and maintains:

- a common method of access to data held in repositories;
- products constructed from one or more data sources that provide users with information about the distribution of parameters in time and space;
- free and open access to these data products and to the observations on which these data products were built
- procedures for machine-to-machine connections to data and data products;
- a web portal allowing users to find, visualize and download data;
- coherence with efforts of regional sea conventions;
- interoperability with data distributed by non-EU organizations;
- a process to monitor performance and deal with user feedback;
- a help desk offering support to users;

[4] ETT is coordinating the EMODnet Physics lot since early phases and it is deeply involved in EMODnet Data Ingestion (work package leader). It represents links to several EU projects in the field of oceanography and marine data management (JERICO-NEXT on H2020; AtlantOS on H2020 BG8, SeaDataCloud on H2020; JERICO S3 on H2020; EuroSEA on H2020, SO-CHIC on H2020, NAUTILOS on H2020 under negotiation) and to CMEMS operational (CMEMS NRT Dissemination Unit and CMEMS MY Dissemination Unit) the Service Evolution (INCREASE and LAMBDA for developing and operationally up-taking new data streams) projects.

[5] MARIS is the EMODnet Data Ingestion technical coordinator and it is representing the SeaDataNet network of NODCs. SeaDataNet (http://www.seadatanet.org) and is a Pan-European network of professional data centres providing on-line integrated databases of standardised quality. Data resources are quality controlled and managed at distributed data centres that are interconnected by the SeaDataNet infrastructure and accessible for users through an integrated portal. The data centres are mostly National Oceanographic Data Centres (NODCs) which are part of major marine research institutes that are developing and operating national marine data networks, and international organizations such as IOC/IODE and ICES. The data sets managed come from various sources and time periods. This imposes strong requirements towards ensuring quality, elimination of duplicate data and overall coherence of the integrated data set. This is achieved in SeaDataNet by establishing and maintaining accurate metadata directories and data access services, as well as common standards for vocabularies, metadata formats, data formats, quality control methods and quality flags

[6] IFREMER is representing CORIOLIS – the European Global Data Assembly Center and the Copernicus Marine Environment Monitoring System In Situ Thematic Assembly Center (CMEMS INSTAC). CMEMS (http://marine.copernicus.eu) is the operational marine application service of the COPERNICUS programme. The INS TAC – in situ thematic assembly centre –is in charge for the collection and harmonization of near real time data and historical data for the past 70 years. This data is used to feed models (forecast and reanalysis) or to calibrate/validate the outcome of models of the others production units. INS TAC is specifically designed (product naming, data formats, data flagging…) to serve the other CMEMS production units. The INS TAC was developed on top of the EuroGOOS – ROOSs concept and infrastructure, in agreement with the regional assemblies who agreed to share data from the same regional area (Baltic, Med, North Sea …) for common operational benefits. CORIOLIS (http://www.coriolis.eu.org/About-Coriolis) is a component of the French and European operational oceanography and hosts the European Global Assembly Data Center for various networks (e.g. ARGO, drifting buoys etc).

[7] SMHI acts as the EMODnet Physics coordinator deputy since early phases. Besides being involved in most of the ocean related European projects and initiatives (CMEMS, SeaDataNet, JERICO S3 and DS, etc), SMHI runs the BOOS - Baltic Ocean Observing System, is responsible for the Baltic data flow to CMEMS INSTAC and, untill it became an autonomous entity under the Belgian law, SMHI was hosting the EuroGOOS secretariat. SMHI is also involved in relevant working groups within ICES, WMO, HELCOM etc.

[8] ICES, International Council for the Exploration of the Sea coordinates and promotes marine research on oceanography, the marine environment, the marine ecosystem, and on living marine resources in the North Atlantic. ICES maintains some of the world's largest databases on marine fisheries, oceanography, and the marine environment, and its Data Centre is part of a global network of distributed data centers. The majority of data – covering the Northeast Atlantic, Baltic Sea, Greenland Sea, and Norwegian Sea – originate from national institutes that are part of the ICES network. The ICES Data Centre provides marine data services to ICES member countries, expert groups, world data centers, regional seas conventions (HELCOM and OSPAR), the European Environment Agency (EEA), Eurostat, and various other European projects and portals.

- a process to improve compliance with the INSPIRE Directive[9].

A network of parameter-product experts is supporting the core consortium to develop and make available specific thematic products such as absolute and relative sea level trends[10], river inflow[11], as well as extending and expanding the data coverage in coordination and collaboration with international programs and common standards[12].

In less than one year of activities EMODnet Physics largely extended its database and it is now providing access to more than 800.000 platforms and hundred thousand datasets. For each connected dataset/platform, a dedicated platform page is available. These pages provide the user with metadata, plots, download features, platform products – e.g. monthly averages or wind plots – additional info and links, as well as statistics on the use of the data from that platform. Data quality information is available in connection with datasets.

Table 1. Platforms on EMODnet Physics (01/07/2020)

ARGO Floats	CTDs	Drifting Buoys	FerryBox and Ship	gliders	sea mammals	mini loggers	moorings	radar	river stations	tide gauges
11061	779444	14623	322	226	2141	182	4065	156	680	3504

Available datasets are provided with metadata and are downloadable in multiple data formats (e.g. netcdf, csv, txt, etc.). Apart from this, EMODnet Physics is developing interoperability services to facilitate machine-to-machine interaction and to provide further systems and services with European seas and ocean physical data and metadata. These features range from widgets to WxS OCG compliant services and, since the end of the previous contract (1/4/2019) the system recorded about 75.000 manual download requests (where a request could cover one dataset or a batch of data) and more than 4.700.000 webservices transactions (more than 47.000 manual download and more than 4.400.000 webservices transaction since 01/08/2019). We also recorded a massive increase in the use of ERDDAP (see section 3). Matomo recorded more than 29.000-page visits since 01/04/2019 and 24.000 since 01/08/2019, while the number of users who filled the web-form to provide information about their use of data and/or field of activity is now more than 1.000 and keep increasing (with an average of about 35 filled forms per month).

[9] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).

[10] Centre National de la Recherche Scientifique (CNRS INSU) and British National Oceanographic Data Center (BODC) are involved to work on SONEL and PSMSL extensions to EMODnet Physics to provides high-quality continuous measurements of sea - and land levels at the coast from tide gauges (relative sea levels) and from modern geodetic techniques (vertical land motion and absolute sea levels) for studies on long-term sea level trends. Centro Euro Mediterraneo sui Cambiamenti Climatici (CMCC) is also contributing to sea level and ocean state products development.

[11] MARETEC-IST (University of Lisbon) team is the main developer of the MOHID modelling system (www.mohid.com) that is an integrated system for water flow modeling, hence river inflow data products. the oceanography group Istituto Nazionale Geofisica e Vulcanologia (INGV) manages Mediterranean now casting/forecasting and reanalysis activities for short and long term monitoring of the marine environment – the group is involved to work on high-resolution temperature-salinity product on the Po estuary region of interest.

[12] JCOMMOPS - the JCOMM in situ Observations Programme Support Centre (JCOMMOPS) is based on the existing DBCP, OceanSITEs, SOT, GO-SHIP, and Argo coordination mechanisms. The centre provides essential data and tools, as well as a centralized information and technical support facility, required for coordinating and integrating many of the existing operational ocean observing networks under JCOMM. BODC is hosting and maintaing the SeaVox vocabularies adopted by EMODnet Physics. The GeoHydrodynamics and Environment Research group (GHER), University of Liege, developed and updates the DIVA (data-interpolating variation analysis) that is the reference tool for spatial interpolation in different EMODnet projects as well as SeaDataNet.

2. Update on the Tasks

EMODnet Physics went through many updates. An incomplete list includes: development and update of products, update of interoperability layers (e.g. GeoServer - INSPIRE), ingestion of new datasets (e.g. data from smart sensors from fishing nets, nowcast data for wind speed and direction, nowcast data for waves, etc.), new platforms (Saildrones, OSIS, etc.), organization of thematic workshops to engage new communities, etc. These activities are keeping developing connections and increasing the EMODnet Physics network, facilitating links with other thematic lots and the ingestion facility as well as connections with non-EU parties.

Task 1. Develop a common method of access to data held in repositories

Data flow from repositories to EMODnet Physics was re-designed and re-organized to have a common procedure to access data held in federated repositories. More specifically we started developing smart adapters that connect data from sources (Figure 1). Once ingested, EMODnet Physics applies procedures to harmonize data (applying common standards and using common vocabularies to complete metadata) and makes the data ready for the dissemination through the EMODnet Physics dissemination channels/catalogues (i.e. mapviewer, ERDDAP, TDS, GeoServer, GeoNetwork catalogue)[13]. This approach facilitates the integration of more and new sources into the common system as well as facilitates the maintenance and update of those smart adaptors when sources modifies/updates interfaces themselves (e.g. CMEMS-INSTAC deploys a major updated annually and during last releases it modified the naming conventions, April 2019, and data organization, April 2020 – with an impact on the availability-synchronization of CMEMS INSTAC data in EMODnet Physics).

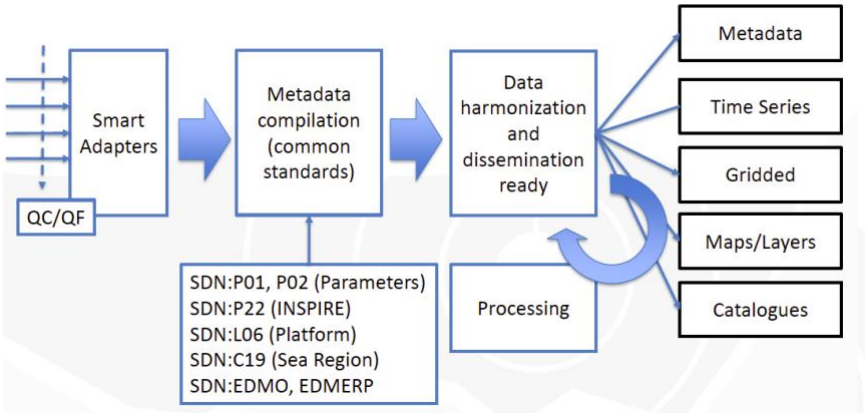

Figure 1. Data management flow in EMODnet Physics

This new concept and new infrastructure were tested and they are now operational with e.g. data flow for mini smart sensors on fishing vessels[14] (implementing an ERDDAP to EMODnet Physics), Antarctic Circular Expedition data (Zenodo-to-EMODnet Physics), Global Ocean Data Analysis Project - GLODAP and Surface Ocean CO_2 Atlas - SOCAT data (FTP-to-EMODnet Physics). Discussion on adoption of SensorML for complementary metadata sharing is progressing in synergy and collaboration with other initiatives (EMODnet Ingestion, CMEMS, GROOM II, EuroSEA, JERICOS3, SeaDataCloud).

[13] erddap.emodnet-physics.eu, thredds.emodnet-physics.eu, geoserver.emodnet-physics.eu, map.emodnet-physics.eu, catologue.emodnet-physics.eu
[14] https://www.emodnet-physics.eu/map/platinfo/pifvplot.aspx?platformid=1000346

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

EMODnet Physics products range from collection of in situ data, reanalysis and trends from in situ data, elaboration in space and/or time of in situ data and model output for a given parameter. As a consequence of task 1, EMODnet Physics catalogue was updated to list the many available products with information about the distribution of parameters in time and space. All data collected within a defined time and space window can be found, visualized and downloaded in a way that makes the physical location of the data source invisible to the user, allowing data from various sources to be assembled without further processing. The full list of the available items is in annex (Annex 10 - EMODnetPhysicsProductsAPIs_202007_R1).

As planned several datasets were linked-included in the EMODnet Physics collections, such as:

- About 480.000 CTDs from PANGAEA (www.pangaea.de) were linked to EMODnet Physics collection and are now available and discoverable through the EMODnet channels (e.g. Figure 1).
- CMEMS-INSITU_GLO_TS_REP_OBSERVATIONS_013_001_b (i.e. CMEMS INS TAC reanalysis of global observations, one of the input data products for EMODnet Physics), already including ICES Oceanographic DB[15], was updated with the latest temperature and salinity data from the World Ocean Database (WOD - IODC project and NCEI product). The package includes data covering global oceans from Jan-1950 to June-2019. This dataset is also used for updating the Coriolis Ocean Dataset for Reanalysis - CORA product. EMODnet Physics was updated with the latest CORA (v.5.2). Both the WOD and CMEMS products are updated periodically (six months/annually), a task for coming months of project is to include/link the original raw data into the EMODnet Physics collection.
- Ships Of Opportunity Program (SOOP) Database – includes original Surface Ocean pCO2 cruise data from the research ships and ships of opportunity cruises from 14 nations around the World. These datasets contribute to SOCAT[16] product that is now available in EMODnet Physics[17].
- the HFR team made some actions to present progresses towards consistent quality-controlled data to both CMEMS In Situ TAC and EMODnet Physics: the EU HFR Node is now managing data from 12 HFR networks (built of 35 radar sites, representing more than 2/5 of the European Network), and, by the end of 2020, it is expected to gather 20 networks (50 radar sites). To facilitate the provider to join the initiative a user-guide on how to synchronize data was delivered (May 2020) (Annex 2- SOP_HFR_GUIDELINE_v1.2.pdf).

[15] http://gis.ices.dk/geonetwork/srv/eng/catalog.search#/metadata/561291a5-f26c-43aa-8310-e59fb2208809
[16] https://www.socat.info/index.php/about/
[17] https://erddap.emodnet-physics.eu/erddap/search/index.html?page=1&itemsPerPage=1000&searchFor=SOCAT

Figure 2. PANGAEA data in EMODnet Physics

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

When we consider M2M connections we have to consider the M2M from source to EMODnet Physics and M2M from EMODnet Physics to users. As described in task 1, new and updated procedures for machine-to-machine connections (from source to Physics) have been developed and are under development. Figure 3 shows the time-age data flow and data sharing technologies (tools and formats) that EMODnet Physics is developing to harvest and link data.

Data age	technology	format
Real Time	SOS SWE	XML
Near real-time (NRT) data at in situ observatories at sea	Hourly/daily synch via ftp/thredds/erddap/APIs	CSV, netCDF (JSON, TXT)
Reprocessed NRT data (average/trends)	Internal processing/ periodic synch via APIs (REST)	CSV, netCDF, ODV4
Archived data derived from further elaboration and validation	Periodic synch via ftp/thredds	netCDF (CF, SDN)*
		Shape files

Figure 3. Data age handling in EMODnet Physics

Briefly, real-time data acquisition and dissemination is based on the latest implementation of the Sensor Web Enablement (SWE) and Sensor Observation Service (SOS) standards. These interoperable interfaces permit the insertion and retrieval of georeferenced observation data in a standardized format (XML). This new data stream management is done jointly, in collaboration with EMODnet Data Ingestion, and besides developing and deploying the SOS, the two projects are working and contributing on a set of standards to implement ISO/OGC

O&M features and SensorML for the Marine domain[18]. The acquisition of near real-time physical parameters is largely an automated process: EMODnet Physics collects data from its federated structure (see task 1) of providers and makes it available in the EMODnet Physics catalogue (ERDDAP)[19] and hence in the map viewer[20]. Typically, the transport format is NetCDF (CF Convention), as defined by the EuroGOOS DATAMEQ working group and the SeaDataNet technical working team, and includes metadata and data quality flags. Other common transport format for near real time acquisition are csv, txt, json. Data quality is flagged according to an automatic – unsupervised procedure at the data source. EMODnet Physics is operationally processing this data flow to generate map layers and extract in situ (monthly) trends, averages and peak values of the parameters. Historical validated datasets are organized in collaboration with SeaDataNet and its network of National Oceanographic Data Centers, which are supplying EMODnet Physics with products (climatology) on temperature and salinity of the water column. EMODnet Physics is also acting as in situ historical data collection broker between users and the NODCs. For the historical validated datasets (fixed stations – mooring, tide gauge) the metadata format is the CDIs (common data index) and the transport formats are ODV4 and NetCDF (CF convention). For the parameters (and platforms) that are not managed by its pillars (e.g. river outflow, water noise, sea surface currents as recorded by HF radars, etc.), EMODnet Physics is supporting, promoting and contributing to development of the data management chain by applying common standards and procedures. Other aggregated and validated thematic collections/products (e.g. PSMSL, SONEL, SOCAT, etc.) are linked and ingested from sources (according the indication of the product principal investigator) by means of smart connectors as described in task 1. An example of validated historical data products delivered as a shape file are the impulsive noise registry from Helcom and Ospar regional sea conventions.

On top of these data flows, EMODnet Physics implements its interoperability (M2M) layer and exploits different technologies and dissemination channels: ERDDAP - that implements FGDC Web Accessible Folder (WAF) with FGDC-STD-001-1998 and ISO 19115 WAF with ISO 19115-2/19139; THREDDS[21] - that implements OpenDAP, NetCDF Subset Service, WCS 1.0 Service, WMS 1.3.0 Service, ncISO: Dataset Metadata Services, OAI Metadata harvesting; GeoServer that implements several Open Geospatial Consortium protocols including Web Map Service (WMS), Web Feature Service (WFS), Web Coverage Service (WCS) and Web Map Tile Service (WMTS) and that was lately updated with the INSPIRE module; GeoNetwork that implements WxS, OGC, ISO standards. To extend further the users and use of its products, EMODnet Physics also implements web APIs, widgets and, if needed bespoken services e.g. DRL use cases, or JCOMMOPS OceanGlider automatic warning system that collects new glider deployment metadata from GDAC and feed the EGO/JCOMMOPS gap analysis monitoring system.
A pending action for coming months is to complete the update of the metadata descriptors in items and products available in the Physics GeoServer and GeoNetwork instances for implementing full INSPIRE compliance.

Task 4. Maintain and further develop a thematic web portal allowing users to find, visualize and download data and promote the data and data products of the portal

The EMODnet Physics web portal is on line and is making findable, accessible, visible and interoperable both data and data products. To facilitate the user experience, service responsiveness and performances, the EMODnet Physics portal and back-office infrastructure undertook a number of major developments and updates. The EMODnet Physics data portal was restyled and now offers customized pages and services for each type of recording platform and available product (e.g. a "data products"[22] menu page was published to facilitate the user to find and access to combined/gridded products). GeoNetwork, THREDDS, ERDDAP catalogues were reorganized/updated, new and additional layers were added to GeoServer interface, and new widgets and APIs were developed. Data and data products are accompanied by metadata covering information on ownership,

[18] https://odip.github.io/MarineProfilesForSWE/
[19] erddap.emodnet-physics.eu
[20] www.emodnet-physics.eu/map
[21] https://www.unidata.ucar.edu/software/tds/current/
[22] https://www.emodnet-physics.eu/map/Products/

data quality and data quality check procedures, as well as links to get more information on methods used for their constructions. EMODnet Physics data infrastructure gives access to in situ data collections (time-series, profiles and datasets) as recorded by fixed platforms (moorings, tide gauges, HF radars, etc.), moving platforms (ARGO, Lagrangian buoys, FerryBox, etc.) and repeated observations (CTDs, etc.). Temperature, Salinity and some chemical properties (e.g. Chlorophyll) are the most available parameters. Other products host/disseminated by EMODnet Physics range from reanalysis and climatology to specific maps (e.g. https://www.emodnet-physics.eu/map/Products/Wind/) and trends (see WP2 for details). On top of these products, EMODnet Physics is developing interoperability services to facilitate machine-to-machine interaction and to provide further systems and services with European seas and ocean physical data and metadata. These features range from widgets to WxS OCG compliant services. These tools are also serving the central portal and the European ATLAS of Seas.

Task 5. Ensure the involvement of regional sea conventions

EMODnet Physics is interacting and collaborating with RSC and TG NOISE on acoustic pollution. More specifically, EMODnet Physics is participating to TG NOISE (permanent invited member), ICES is a permanent invited member of TG NOISE representing the noise data hosting infrastructure for both HELCOM (Baltic area) and OSPAR (North West Shelf area). EMODnet Physics is also serving the advisory board of the QUITEMED2 projects that is aimed at supporting Member States in the Barcelona and ACCOMBAMS conventions to deal with MSFD D11. During past years, EMODnet Physics was able to ingest and make available operational platforms that records in situ SPL data, anyhow the amount of stations and available data was and is very limited because Member States were waiting for clear indication on how to fulfil procedures. Lately, TG NOISE delivered milestones in the definition of how to fulfil MSFD D11 and the activity is now moving into the monitoring phase and there is an open discussion between EMODnet Physics and TG NOISE on how to harmonize monitoring data flow with the EMODnet Physics metadata mapping needs. The expected outcome should be a map of monitoring areas/points with information on the monitoring programs and links to the available recorded data. The product is likely to be updated annually (or less frequent). Annex 11 – Noise_monitoring_asset_mapping describes the proposed product. To note that some Member States are still in the sites definition therefore we expect to have a product that, from a geo-coverage point of view, will be updated incrementally.

Task 6. Install a process to monitor performance and deal with user feedback

The subtask "deal with user feedback" goes together with task 7. Concerning the process to monitor performances, EMODnet Physics is implementing Matomo for collecting views on landing page and map page, it uses logs to extract the traffic/requests/manual downloads/interaction with services. In case of manual downloads from the Mapviewer (www.emodnet-physics.eu/map), authentication is requested if requested datasets are older than 60days and are related to coastal fixed stations and products host by CMEMS INSTAC. The number of users that filled the form (since 2017) is more than 1000 which helps in mapping the interests and the uses of the EMODnet Physics data (Table 7). In addition, EMODnet Physics team is daily supporting its users communities to understand and assess the fit-for-scope of the system, e.g. the main uses/users for HFR are for Search and Rescue service, glider users need to access data with a "glider mission" granularity etc. this helps the team to plan system update accordingly.

Task 7. Operate a help desk offering support to users

EMODnet Physics is already providing an on line help desk feature to deal with users. Any request gets an id to track and manage the feedback time. Table 7 lists the collected interactions (60 requests) that are mainly requesting technical support to use find and download specific data packages. Besides this "office" activity, EMODnet Physics is engaging is users with long-term plans e.g. new EMODnet Physics - SOOS MoU (Annex 3 - EMODnetPhysics_SOOS_MoU.pdf, Annex 4 - SOOS_Annual_Report_2019.pdf), involvement in the GOOS-AniBOS network (Annex 5 - GOOS_AniBOS.pdf).

3. Work Package updates

Table 2. Deliverables

Status of the Milestones and Deliverables listed in the workplan			
Milestone/Deliverable	WP	Date due [M] - M1 = Sept 2019	Status (Pending/Resolved)
D1.1 - Event - Kick-off meeting (Required)	WP1	1	Delivered - KOM took place 07-08/11/2019
D1.2 - Document - quarterly Progress Reports (Required)	WP1	2	Delivered
D1.3 - Document - quarterly Progress Reports (Required)	WP1	5	Delivered
D1.4 - Document - quarterly Progress Reports (Required)	WP1	8	Delivered
D1.5 - Document - quarterly Progress Reports (Required)	WP1	11	Delivered
D1.6 - Document - Interim Report (Required)	WP1	12	Delivered – this report
D2.1 - Document - Documentation and guidance on data flow harmonization (including machine to machine connections specs) (Required)	WP2	12	Delivered – the Document is available on zenodo[23] (Annex 9), the landing page provides users with links to EuroGOOS, CMEMS INSTAC and SeaDataNet for accessing to further data flow details, moreover there are links to GitHub page with examples and each of the dissemination channels landing page provides links or description of the specific technology. Anyhow, given the relevance of this documentation, we are planning to deliver a new consolidated guideline document by end of 2020.
D2.2 - Document - Report on data sources evaluation and methods of integration into the portal (Internal)	WP2	12	Delivered – internal list of data sources and ingestion/linking method
D2.3 - Document - 1st report on data products specifications, sources and methods of integration into the portal (Internal)	WP2	6	Delivered
D2.4 - Document - 2nd report on data products specifications, sources and methods of integration into the portal (Internal)	WP2	12	Pending – partially this report - we anyhow are working to deliver a standalone document. It will be released in November 2020

[23] https://doi.org/10.5281/zenodo.40174

D2.6 - Document - Report on M2M services (internal)	WP2	12	Pending – we are updating this documentation with the latest developments. It will be released in autumn 2020
D3.1 - Portal - Portal on line (Required)	WP3	1	Delivered - Portal on line from day 1
D3.2 - service - Monitoring tools (Required)	WP3	1	Delivered – Monitoring tools active from day 1
D3.3 - Service - EMODnet Physics catalogue v.1 (internal)	WP3	6	Delivered - update and review of the entries in EMODnet Physics GeoNetwork instance
D3.3 - Service - EMODnet Physics catalogue v.2 (internal)	WP3	12	Delivered - update and review of the entries in EMODnet Physics GeoNetwork instance
D4.1 - Service - Help desk service (Required)	WP4	1	Delivered – HD on line from day 1
D4.2 - Service - User feedback monitoring service (Required)	WP4	1	Delivered – user feedback monitoring and management active from day 1
D4.3.1 - Report - Statistics from HD service and user satisfaction (Required)	WP4	2	Delivered – as section of D1.2
D4.3.2 - Report - Statistics from HD service and user satisfaction (Required)	WP4	5	Delivered – as section of D1.3
D4.3.3 - Report - Statistics from HD service and user satisfaction (Required)	WP4	8	Delivered – as section of D1.4
D4.3.4 - Report - Statistics from HD service and user satisfaction (Required)	WP4	11	Delivered – as section of D1.5
D4.4.1 - Report - Progress and actions about the Involvement of RSCs (Required)	WP4	2	Delivered – as section of D1.2
D4.4.2 - Report - Progress and actions about the Involvement of RSCs (Required)	WP4	5	Delivered – as section of D1.3
D4.4.3 - Report - Progress and actions about the Involvement of RSCs (Required)	WP4	8	Delivered – as section of D1.4
D4.4.4 - Report - Progress and actions about the Involvement of RSCs (Required)	WP4	11	Delivered – as section of D1.5
D4.5.1 - Report - Progress update on promotion activities (Required)	WP4	2	Delivered – as section of D1.2
D4.5.2 - Report - Progress update on promotion activities (Required)	WP4	5	Delivered – as section of D1.3
D4.5.3 - Report - Progress update on promotion activities (Required)	WP4	8	Delivered – as section of D1.4
D4.5.4 - Report - Progress update on promotion activities (Required)	WP4	11	Delivered – as section of D1.5

Table 3. Planned Deliverables

Planned Deliverables			
Milestone/Deliverable	WP	Date due [M] - M1 = Sept 2019	Status (Pending/Resolved)
D1.10 - Document - quarterly Progress Reports (Required)	WP1	23	
D1.11 - Document - Final Report (Required)	WP1	24	
D1.7 - Document - quarterly Progress Reports (Required)	WP1	14	
D1.8 - Document - quarterly Progress Reports (Required)	WP1	17	
D1.9 - Document - quarterly Progress Reports (Required)	WP1	20	
D2.5 - Document - 3rd report on data products specifications, sources and methods of integration into the portal (Internal)	WP2	18	
D2.6 - Document - Update on M2M services (internal)	WP2	24	
D3.3 - Service - EMODnet Physics catalogue v.3 (internal)	WP3	18	
D4.3.5 - Report - Statistics from HD service and user satisfaction (Required)	WP4	14	
D4.3.6 - Report - Statistics from HD service and user satisfaction (Required)	WP4	17	
D4.3.7 - Report - Statistics from HD service and user satisfaction (Required)	WP4	20	
D4.3.8 - Report - Statistics from HD service and user satisfaction (Required)	WP4	23	
D4.4.5 - Report - Progress and actions about the Involvement of RSCs (Required)	WP4	14	
D4.4.6 - Report - Progress and actions about the Involvement of RSCs (Required)	WP4	17	
D4.4.7 - Report - Progress and actions about the Involvement of RSCs (Required)	WP4	20	
D4.4.8 - Report - Progress and actions about the Involvement of RSCs (Required)	WP4	23	
D4.5.5 - Report - Progress update on promotion activities (Required)	WP4	14	

D4.5.6 - Report - Progress update on promotion activities (Required)	WP4	17	
D4.5.7 - Report - Progress update on promotion activities (Required)	WP4	20	
D4.5.8 - Report - Progress update on promotion activities (Required)	WP4	23	

WP1 – Project Management

WP1 deals with the overall project management, the coordination of the activities, the monitoring of the status of the deliverable and developments, participation and reporting to the EMODnet Steering Committee and contractual authority. It covers the interaction with the other thematic lots and the Data Ingestion. The key topics of interaction are:

- **Physics and Biology** – Physics is collecting and making oceanographic data available, as collected by tagged sea mammals. Together with the physical parameters (typically temperature and salinity of the water column), EMODnet Physics also receives animal tracking as well as information on the animal (species), which are made available to Biology as map/GeoServer layers.
- **Physics and Chemistry** – thanks to its architecture and infrastructure, Physics is receiving some operational parameters (e.g. Chl, DOX, etc.) that are in the Chemistry domain. These parameters are offered by means of machine-to-machine interfaces. A further topic of collaboration is on river data management and coastal data, and Physics and Chemistry are designing common actions and joint products to match user-needs.
- **Physics and Seabed Habitats** – Seabed Habitats provided Physics with feedback from the user point of view on products such as Arctic ice contour, total suspended matter, river outflow products. This collaboration is important to improve the products and the services to make these products usable by third parties.
- **Physics and Human Activities** – the two lots are already collaborating on joint dissemination initiatives, moreover Human Activities products such as vessel density map, under water cables and off-shore facilities are helping Physics to provide the underwater noise community with useful data for asset mapping and gap analysis.
- **Physics and Bathymetry** – Bathymetry delivers the best estimate digital coastline by using, among others, mean sea level data. EMODnet Physics hosts one of the most complete sea level station databases and Bathymetry can rely on Physics M2M interfaces for an easy access to sea level aggregated datasets.
- **Physics and Data Ingestion** – this is a very important and fruitful collaboration. Besides cooperating on the ingestion and long-term safekeeping of the datasets towards NODCs, Physics and Ingestion teams are working together to establish permanent connections (data flow) with new operational oceanography data providers. A pilot for real-time data exchange using Sensor Observation Service (SOS) - Sensor Web Enablement (SWE) aiming at giving direct standardized access to selected data types from selected monitoring instruments is already in place (www.emodnet-physics.eu/realtime) and the two projects will keep developing and promoting these standards and methodology for facilitating and easing the interoperability with new data providers. For that purpose, together with 52North leading SWE expert and member of EMODnet Data Ingestion 2 consortium, a package including a SWE viewing service, guideline and SWE software package for oceanography site operators, supporting and enabling them to set-up an SOS Server with local data repository, adopting SWE data model, which then feeds into the client-viewer

service as part of the EMODnet prototype SWE viewing service, was consolidated and made available. The package is available in GitHub[24].

EMODnet Physics partnership has dedicated important efforts to build gateways to national, regional and thematic data repositories. A comprehensive network has been developed during the years and the actual project is involving about 300 institutes and data providers from all over Europe and beyond (Annex 1 - List of Contributors).

In collaboration with EMODnet Data Ingestion, a number of events were organized to promote the EMODnet goals and involve new communities and providers in the EMODnet data provision framework. EMODnet Physics is supporting actions on the adoption of common Quality Assessment - Quality Control protocols, by participating in dedicated meetings and projects. Indeed, EMODnet Physics is playing a strategic role with platform network operators and besides offering the umbrella to facilitate the data format, standards, methodology, etc. it is also facilitating the networking and cooperation between European and international teams. These actions find their best show off during ad hoc organized international technical and scientific events. One example is the organized Fishing for Data Workshop (planned to be held in Genova 19-21 May 2020, turned into a webinar because of the COVID-19 pandemic and related restrictions) – to present and promote the harmonization and sharing of data collected by means of smart sensors that can be plugged to the fishing nets. The meeting recorded more than 400 attendees (Figure 4) from Europe, Australia, United States and elsewhere and from both public (research institute, international organizations, etc.) and private (company) sector. Other examples are EMODnet sessions at MARTECH events[25] (with a focus on emerging data such as under water noise), FerryBox Workshops (last event took place in Genova, 24-26 April 2019 and recorded more than 60 attendees from all over the world).

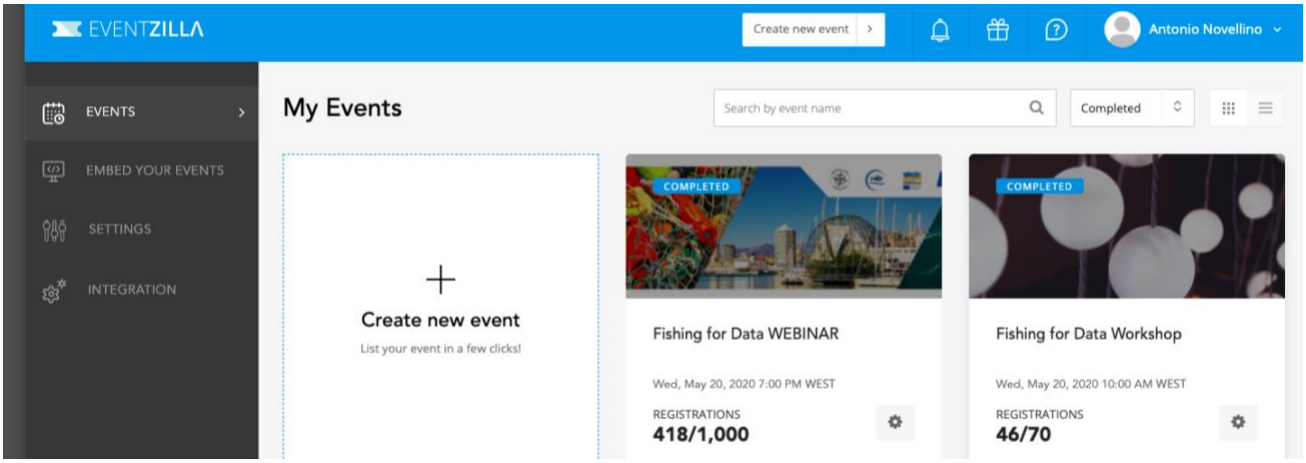

Figure 4. the event registration page shows 418 people registered to the webinar, Zoom logs (i.e. the adopted webinar platform) confirmed more than 400 attenders (split over the 2 host sessions).

EMODnet Physics is also co-coordinating the European effort for the design and development of new data flows. The achievements in the management of sea surface currents, as recorded by HF radars, is exemplary: initiated and supported by EMODnet Physics, the EuroGOOS HFR Task Team was able to attract and connect providers, moving the technology from R&D projects to a coordinated action. A few weeks after the EMODnet Physics – EuroGOOS workshop in 2014, the European HFR teams were internationally connected. A few months after, EMODnet Physics was already integrating and making available HFR data from Italy, Spain and Germany. The JERICO-NEXT project helped to develop standardized QC/QF to be applied by HFR data providers. The CMEMS INCREASE Service Evolution project contributed to push the use of HFR data operationally: CMEMS INSTAC is integrating the HFR data into its catalogue from April 2019. This effort enabled the design and set up of the

[24] https://github.com/52North/sensorweb-server, https://github.com/52North/sensorweb-server-helgoland
[25] http://www.martech-workshop.org/

European node for global HFR data management and exchange by adopting, adapting, updating and integrating outcomes from a joint effort to match community needs. The same coordination and networking approach are being applied to other data flows (e.g. operational river runoff), and platform networks (gliders, tagged sea mammals, fishing vessels) with results beginning to be evident. EMODnet Physics is listed as a co-promoter[26] for the implementation of the AniBOS (Animal Borne Ocean Sensors) network that has just been approved by GOOS as a new official ocean observation network. EMODnet Physics is participating to the definition and development of the new OceanGlider data format and data flow[27]. Quite important for the implementation of these coordination actions is the collaboration between EMODnet Physics and its partner infrastructure: CMEMS and SeaDataNet. The continuous interaction is improving the quality of the offered service, as it facilitates the unlocking of new and increased data that contribute to the improvement of the quality of in situ products, thereby reducing data duplication, cleaning metadata, facilitating access and use of data and products. Moreover, based on the formal interaction between these actors (e.g. a MoU between Physics and CMEMS is in place since August 2016 – Annex 6), new services and tools have been developed to serve and support each other e.g. EMODnet Physics has developed a user-friendly interface to view those data for its own users, developing updated widgets that have been used by CMEMS In Situ TAC to improve the viewing service developed for outreach and promotion activities[28].

As part of the project management the EMODnet Physics team is actively participating in international groups and committees in order to promote European standards and facilitate data, products and exchange of best practices. EMODnet Physics partners are members of the core teams and, as such, they are involved in various projects and programs (e.g. AtlantOS, JericoS3, SeaDataCloud, CMEMS INSTAC, CMEMS DU, etc.) creating links between the projects and EMODnet; with a particular focus on data flow management infrastructure and standards. The team is also serving on many Data Management boards (e.g. EuroGOOS DATAMEQ[29], SOOS DMCG[30], TT WISC[31], OceanGlider DMT[32], etc.). This is facilitating and increasing the cooperation among different communities across Europe and between Europe and non-European Countries, as well as increasing the amount of available data in EMODnet Physics and key European marine data infrastructures.

WP2 – Data Access and Data Products

The objectives of WP2 are the identification of specific additional data sources that contribute to the EMODnet physical parameters portfolio (Argo, profiling floats, gliders, radar, CTD from ships, river outflow, water noise, etc.), and the reduction of spatial and temporal gaps in cooperation and collaboration with the partner programs and projects in Europe (CMEMS INS TAC, SeaDataNet NODCs infrastructures, ICES, etc., as well as EMODnet Data Ingestion) and non-EU Countries. Part of this activity is the development of EMODnet Physics services with user-friendly interfaces for data and metadata uploading, data tracking and providing guidance and documents on preferred data, common data and metadata models. This WP includes Task 1 (Develop a common method of access to data held in repositories), Task 2 (Construct products from one or more data sources that provide users with information about the distribution of parameters in time and space), and Task 3 (Develop procedures for machine-to-machine connections to data and data products).

[26] 2020_AniBOS_Network.pdf (page 48)
[27] https://oceangliderdmtt.slack.com/archives/CFVCUFSKH
[28] http://www.emodnet.eu/emodnet-physics-enhances-services-cmems-situ-thematic-assembly-centre
[29] http://eurogoos.eu/data-management-exchange-quality-working-group-data-meq/
[30] Annual Report SOOS
[31] https://wiswiki.wmo.int/tiki-index.php?page=ET-WISC-2019
[32] https://www.ego-network.org/dokuwiki/doku.php?id=public:data

As described in Section 2, the data flow from repositories to EMODnet Physics was re-designed and re-organized to have a common procedure to access data held in federated repositories. More specifically we started developing smart adapters that connect data from sources (Figure 5).

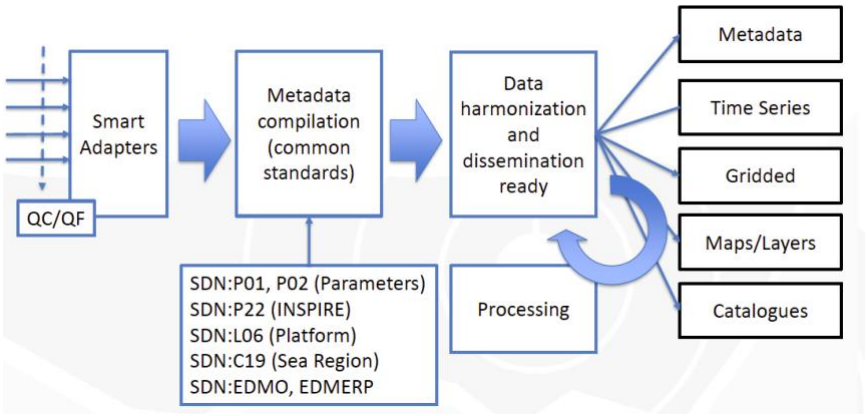

Figure 5. Data management flow in EMODnet Physics

These sources may be marine data integrators, marine data repositories, ocean observation programs, data assembly centers, marine institutes, oceanographic data centers, etc. The main (not exhaustive) list of sources is:

- CMEMS INSTAC (in situ measurement from EuroGOOS and ROOSs institutes)
- European Marine Institutes and National Oceanographic Data Centers (see annex)
- SeaDataNet (CDI and Climatology)
- GDAC (Coriolis)
- Global Sea Level Observing System (GLOSS)
- IOC Sea Level Station Monitoring (SLS)
- Permanent service for mean sea level (PSMSL)
- University of Hawaii Sea Level Center (UHSLC) - GLOSS Fast-Delivery Center
- Système d'Observation du Niveau des Eaux Littorales (SONEL)
- International Council for the Exploration of the Sea (ICES)
- Deep Ocean Multi-Disciplinary Ocean Reference Stations (OceanSITES)
- ARGO profiling float data
- Southern Oceans Observing System (SOOS)
- Global HF Radar Network
- Everyone's Gliding Observatories (EGO) and OceanGlider Network
- Marine Mammals Exploring the Oceans Pole to Pole (MEOP)
- Voluntary Observing Ship (VOS), Ship Of Opportunity Program (SOOP)
- Data Buoy Cooperation Panel (DBCP), Arctic Buoy Data (IAPB),
- Tropical Moored buoys: Pacific Ocean (TAO, TRITON), Atlantic Ocean (PIRATA), Indian Ocean (RAMA)
- PANGAEA - Data Publisher for Earth & Environmental Science
- European Multidisciplinary Seafloor and water column Observatory (EMSO)
- Global Ocean Surface Underway Data Pilot Project (GOSUD)
- US National Data Buoy Center (NDBC), Integrated Ocean Observing System (IOOS), National Oceanic and Atmospheric Administration (NOAA)
- Australian Integrated Marine Observing System (IMOS)
- Global Ocean Ship-Based Hydrographic Investigations Program (GO-SHIP)
- Global Ocean Data Analysis Project (GLODAP)
- Surface Ocean CO_2 Atlas (SOCAT)

These sources of data are making metadata and data available according different standards and different APIs, e.g. CMEMS-INSTAC is offering data via the CMEMS Dissemination Unit (CMEMS DU) and more specifically it implements a dedicated FTP folder for IN SITU data (Figure 6); SeaDataNet is providing Physics with CDIs via a dedicated API[33] that returns an xml with metadata and links to pass user request to the SeaDataNet Request Status Manager; Coriolis is making data available on a public IFREMER ftp folder; IOC offers html page with latest 30 days of sea level data from IOC-Tide Gauges, etc.

Figure 6. INS TAC – DU – FTP folder organization[34]

The smart adapters are software components that map the source dissemination channel (ftp, html rest, SOAP, etc.) and manage the metadata collection and mapping, as well as the data caching for feeding EMODnet Physics back-end data system (that is a combination of servers running Microsoft and Linux based tools and databases)[35].

Once ingested/connected data and data products are made ready for EMODnet Physics dissemination channels. EMODnet Physics products range from collection of in situ data, reanalysis and trends from in situ data, elaboration in space and/or time of in situ data and model output for a given parameter. The following list briefly describe the available products per themes.

- **Temperature and Salinity in the water column**

[33] http://slim-emodnet-physics.maris2.nl/station_services?sel=all
[34] https://archimer.ifremer.fr/doc/00324/43494/77361.pdf
[35] Given the increasing number of sources that have been started interacting with Physics, it was necessary to reorganize and redesign the collection procedure by splitting and customizing the entry point interface. The new modular structure also facilitates the need for maintenance and updates: i.e. when one of the sources apply major changes in the data/dissemination structure (as it is the case for CMEMS INSTAC for major annual - April releases), we only need to update the CMEMS-INSTAC adapter.

Temperature, in the water column, is a vital component of the climate system and its variability. Salinity observations contribute to monitoring the global water cycle, ocean density and mass, etc. These in situ data are an important input for many ocean phenomena models, to validate and calibrate remote sensing observations and to understand the ocean's role in the global climate system. In situ observation available in EMODnet Physics are taken from a variety of catalogues (e.g. CMEMS INSTAC, SDN, PANGAEA, SailDrone, TMEDnet, etc.) linking platforms with a large range of spatial and temporal scales. EMODnet Physics data collection includes: ~2.500 moorings offering very high temporal resolution at specific locations, but with spatial resolution limited by density of the array; ~220 gliders and ~2.100 tagged animals that achieve much higher spatial resolution depending on endurance and other instrument characteristics; ~10.000 profiling floats (ARGO) delivering temperature profiles (nominally 0-2.000 m); ~601.000 spots along the tracks of research voyages of ship-based Conductivity-Temperature-Depth (CTD) observations providing full depth temperature observations; ~11.500 surface loads and ~290 FerryBox repeated transects providing high-resolution sea surface temperature datasets. Based on the CORA (Coriolis Ocean Dataset for Reanalysis) CMEMS product. EMODnet Physics is making available a gridded (0,5 degree * 0,5 degree) monthly variation of the temperature, from early 1900 to 2019 (V5.2). Based on the SeaDataNet regional products (based on the SeaDataNet aggregated dataset - DIVA software v4.6.10 - mask: relative error threshold 0.5) it is making available regional temperature Climatology (1900-2013).

- **Horizontal velocity of the water column and Sea Surface Currents**

Ocean surface general circulation is responsible for significant surface transport of heat, salt, passive tracers and ocean pollutants. The existing surface current observing systems (moorings, Lagrangian drifters) capture much of this range. EMODnet Physics is combining these observations together with land-based HF radars observation that offer a high-resolution tool (with limited spatial coverage) for improved understanding of surface currents, eddies and air-sea fluxes, and exchange between coastal waters and the open ocean. After the inclusion of the HFR data into the CMEMS INSTAC products (April 2019), the EMODnet Physics HFR catalogue was re-organized to combine the EU HFR node - INSTAC data with other global sources to provide the user with one of the most exhaustive sources of HF Radar observations (more than 160 antennas) and make available both the total and the radial component of the HFR measurements. Based on this catalogue, EMODnet Physics is also delivering an operational product of surface currents direction and intensity.

- **Sea Level**

Sea level or "sea surface height" is considered an Essential Ocean Variable by the Global Ocean Observing System (GOOS). Sea level measurements along the coasts have been made since the XIX century by means of tide gauges. Today, tide gauges are still a key method to observe trends in mean sea level, assess extreme events, make tidal predictions and geodetic applications, support harbor operations and navigation. Furthermore, tide gauge measurements play an increasingly important role in the new warning systems for tsunamis and storm surges. Coastal inundation and storm surges can cause significant flood events and consequent destruction of property and infrastructure at the coast. Sea-level is then probably the single most important EOV, considering that its evolution over the next few decades is predicted to cause trouble to millions of people, especially in vulnerable areas. EMODnet Physics is integrating more than 400 European tide gauge stations, the 290 Global Sea Level Observing Systems (GLOSS) core network, and more than 1,300 Permanent Services for Mean Sea Level (PSMSL). Based on the PSMSL[36] collection, EMODnet Physics is already making available a relative sea level trend product and a sea level anomalies product. Based on the SONEL[37] product,

[36] The PSMSL database includes approx 2000 stations, however, many stations have historically only been measured for some months or years. The trend is available for stations with at least 30 years of measurements.

[37] SONEL aims at providing high-quality continuous measurements of sea- and land levels at the coast from tide gauges (relative sea levels) and from modern geodetic techniques (vertical land motion and absolute sea levels) for studies on long-term sea level trends, but also the calibration of satellite altimeters, for instance. Use yearrange filter in the viewparams parameter of the GetMap/GetFeature request. The value of the yearrange filter is the concatenation of the start and end year which values range are from 1900 to 2015. The minimum distance from start and end year is 30 years. For more info: https://github.com/EMODnet/EMODnet-Physics-Documentation/blob/master/WFS.md#layers-for-sea-level-products-data-from-psmsl-and-sonel

EMODnet Physics is linking an absolute sea level trend product available. In the PSMSL product, the mean sea level (MSL) trends measured by tide gauges are local relative MSL trends as opposed to the global sea level trend. These trends are not corrected for land movement. Tide gauge stations measure local sea level, which refers to the height of the water as measured along the coast relative to a specific point on land. The absolute seal level is processed by using the geodetic data from the GNSS stations (SONEL). SONEL serves as the GNSS data assembly center for the Global Sea Level Observing System (GLOSS), which is developed under the auspices of the IOC/UNESCO. It works closely with the PSMSL and the University of Hawaii Sea Level Centre (UHSLC) by developing an integrated global observing system, which is linking both the tide gauge and the GNSS databases for a comprehensive service to the scientific community. EuroGOOS Tide Gauge Task Team, PSMSL, SONEL, GLOSS, UHSLC, IOC-SSC, EMODnet Physics and CMEMS INSTAC are working in collaboration and coordination to improve the sea level data accessibility, have more consistent products (enriched with important metadata such as datum, sensor specifications and calibration (see minute from latest TG Task Team Meeting – Annex 7 - VIII_EuroGOOS_TGTT_MOM_20200701-02.pdf).

- **Water Clarity (light attenuation)**

Light attenuation is an important parameter for determining the photic zone, which is the zone with sufficient light for photosynthesis and thus relevant for total primary production as well as the distribution between pelagic and benthic primary production. Besides working on the in-situ data collection of water clarity data (making available a DB of parameters such as turbidity), EMODnet Physics is maintaining the Total Suspended Matter (TSM) product. TSM (unit: % of suspended particles, not dissolved) is a gridded product based on the CoastColour L2W Concentrations Data, obtained from the OC4 algorithm for clear and moderate turbid waters, and from the CoastColour v1 neural network. The L2W product is then remapped on a regular grid, maintaining 300m full resolution, in order to obtain products over the European sea basins and monthly averaged. The product covers the period 2003 – 2012.

- **Inflow from Rivers**

Rivers are the major pathways for material fluxes from land to sea. River runoffs exert a strong influence in their neighboring coastal area in several ways, modifying water stratification, introducing significant fluctuations in circulation patterns and modulating the impact of upwelling events. In the current context of a global decline of hydrometric networks, uncertainties include the river runoff reaching the coast and most of the water properties as temperature, salinity, etc. Via their supply of nutrients and sediment (e.g., nitrogen, phosphorus, silica) to marine ecosystems, they contribute to the maintenance of biological productivity in the coastal waters and hence to the renewal of living resources that will be available for exploitation by local populations. Indeed, the need for more inflow river data has been addressed by several technical working groups (EMODnet, CMEMS, EEA) and there is a growing interest in developing harmonized actions to tackle jointly this need. EMODnet Physics has started answering this need and it is offering river runoff products covering in situ data on river outflow (about 660 stations). Thanks to the collaboration with the LAMBDA CMEMS SE project, it was possible to develop and assess the relevance and usefulness of a new product, i.e. the River Proxy Runoff that offers an empirical model for estimating the estuarine mixing in order to allow river flows to include most of the tidal signal complexity and correct the salinity concentration reaching the coast.

- **Underwater Sound (Noise)**

The main source of continuous noise is human activity, and in particular shipping. According to the MSFD the Sound Pressure Level (dB Re 1microPa) should be averaged for the two one-third octave bands (respectively centered @ 63Hz and 125Hz – and additional frequencies TBD). EMODnet Physics is already integrating operational platforms that records in situ SPL data but the available data is still very limited. There is an open discussion with TG NOISE members to identify and include more data in the system. To note that situation is quite jeopardized in Europe: while in the Baltic and North Sea measurements and assessment are on-going (BIAS and JOMOPAS projects - Figure 7), in the Med only exploratory test have been done, anyhow considering

that we are moving into the new monitoring phase of MSFD, Member States are going to define their Marine Reporting Units for D11 and it will be possible to create a product with metadata about the monitoring site (point or bounding box), recording instrument (hydrophone), responsible authority (see also Annex 11). The access to data will be possible in a second stage (once monitoring is starting delivery data).

Figure 7. monitoring sites in the North Sea (JOMOPANS project)

EMODnet Physics is also maintaining its Impulsive Noise Registry: a regional impulsive noise registry gives support to the Regional Sea Convention in providing information that will feed regional assessments, and to the reporting by its contracting parties to MSFD descriptor 11.1.1 (Low and mid-frequency impulsive noise). The data are collated nationally from registers of licensed events such as pile driving, controlled explosions from naval operations and other activities that release energy. Starting from the already implemented regional registries of impulsive noise, EMODnet Physics harmonized and integrated the registry into one single discoverable interface. The ICES statistical sub-rectangles (10' latitude *20' longitude) were extended to cover the Mediterranean Sea, the noise event shape files were harvested from the HELCOM, OSPAR and ACCOBAMS hosting repositories, and the events falling into the block were considered to have the pulse event days per block.

- **Wave (height and period) and Wind (speed and direction)**

Sea State is the characterization of wave and swell, typically in terms of height, wavelength, period, and directional wave energy flux. These data are accessible in EMODnet Physics, integrating several data sources (Data Buoy Cooperation Panel, OceanSITES, regional observations in Europe – CMEMS INSTAC, US - IOOS, Australia – IMOS, etc.) into one single catalogue, and it is combining these data with nowcast data for an integrated presentation of the sea state. More specifically EMODnet Physics is offering a Wind product that covers the global domain with 10Km cell resolution (updated daily) and a Wave product covering the Mediterranean area (10Km cell resolution). Wave product is going to be extended to global coverage in coming months.

- **Ice cover**

EMODnet Physics is offering "Ice coverage" as an integrated product of the CMEMS SEAICE_GLO_SEAICE_L4_NRT_OBSERVATIONS_011_001 and in situ observing systems. The product allows the user to discover ice coverage, ice type, ice concentration both geographically (on the map) and as a time series for a fixed point. Moreover, where in situ platforms are present, the user can also access and view

measured parameters. The product covers both the Arctic and Antarctic Seas and is very well appreciated by SOOS community.

WP2 is also in charge for the development off the Machine to Machine interfaces. When we consider M2M connections we have to consider the M2M from source to EMODnet Physics and M2M from EMODnet Physics to users. Section 2 – task 3 describes the approach and developed services. As anticipated, above, a pending action for coming months is to complete the update of the metadata descriptors in items and products available in the Physics GeoServer and GeoNetwork instances for implementing full INSPIRE compliance.

WP3 - Portal Maintenance, Technical Development and Operation

The objectives of WP3 are to maintain, implement and extend the www.emodnet-physics.eu portal allowing users to find, visualize and easily download data and data products through an attractive and highly user-friendly interface (Task 4). The backend service of the portal has to implement compatibility with INSPIRE, EMODnet and OGC standards and requirements as well as interoperability with data distributed by non-EU organizations.

The portal is working 24 hours 7 days a week and as required by the tender specifications, it operates an on line service desk tool to help the user to use the system and collect feedback and comments. These comments (see Table 7) help the EMODnet Physics team to drive updates and plan new developments to facilitate end-user's interaction and match new needs and new user-feedback. The EMODnet Physics portal is composed of four main sections: a landing page, the mapviewer, the monitoring tools and the backend-services. Back-end services are working as described in task 1 and task 4 and Figure 1 and are managing and maintaining hundred thousands of datasets (Table 1).

The landing page, www.emodnet-physics.eu, provides background information, links to tools and services, and news about the data flowing into the system and about/from the EMODnet Physics community. The landing page was maintained and updated according indication from EMODnet Steering Committee (updates on harmonization of visual identity) and EASME/DG MARE (e.g. Brexit disclaimer).

The mapviewer, www.emodnet-physics.eu/map, is the primary tool for users to search, visualize and download data, metadata and products. For near real time (NRT) data, the map allows viewing/retrieving measurement points, values of data and information on the quality of data within a specified time, i.e. last 7 days, last 60 days, etc. (the system is pre-set to show platforms that provided at least one dataset for the past 7 days). The geographical area (space window) defines the area of interest within which the measurement points, values of data and quality of data are presented. The mapviewer fetches metadata and data from the back-office services and populates the EMODnet Physics Platform Page Product (E4P) that provides the user with metadata about the data originator, curator, download features, platform products, more info and links, as well as statistics on the use of the data from each platform. This is provided to more than 800.000 platforms (Table 1). The mapviewer also serves to visualize and retrieve data products such as time plots for specific parameters (e.g. monthly averaged temperature for data acquired during the specified time window). Sea level trends, ice coverage, water noise products are also accessible via the map interface. As planned, to facilitate the access and use of the products, the team is working on both the product pages (see e.g. wind product page) and on the products catalogue (i.e. map products page[38] and GeoNetwork catalogue[39]). These updates are facilitating the engagement of Physics users (Figure 8). Because of a bug in the Matomo tracking scripts eventually fixed

[38] www.emosnet-physics.eu/map/products
[39] catalogue.emodnet-physics.eu

at the begin of 2020, the mapviewer has been considered in the Matomo logs since then, anyhow this provided us with an evident indication that the mapviewer page is attracting at least 6 times more visits than the landing page.

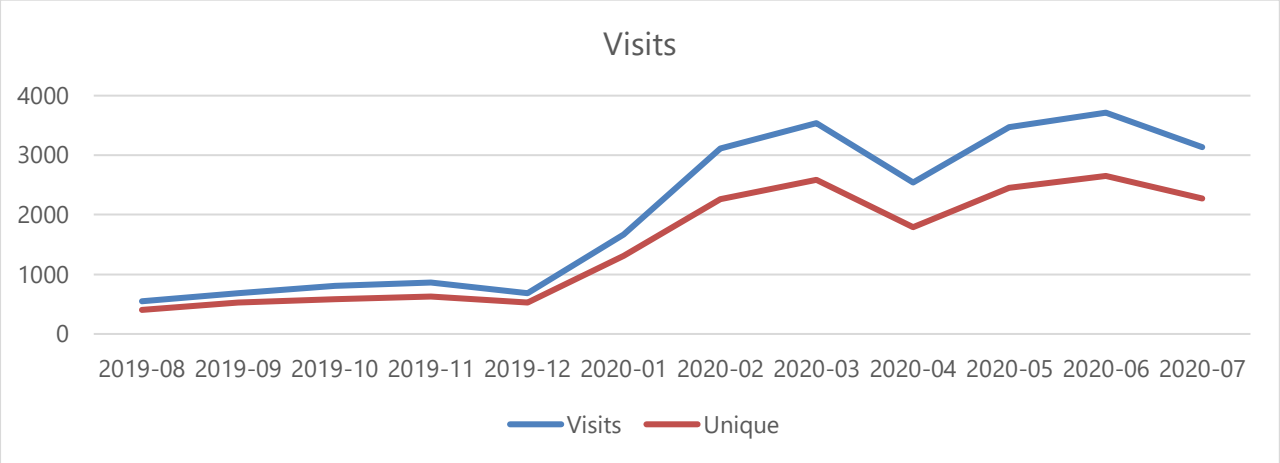

Figure 8. Matomo analytics

The monitoring is based on a combination of internal and external (Matomo) tools. More specifically, Matomo (dedicated EMODnet instance hosted by VLIZ – EMODnet Central portal) is used to track and provide information about portal visits, visit duration, etc., internal tools are used to track back-end interfaces use (log analysis - Figure 9), manage the help-desk requests (assign an unique id, track the request status), monitor the flow of data in the system, collect statistics on the most used/viewed data package, theme, platform, etc. as well as extract indicators for periodic reports and provide platform operators with periodic analytics on the use of their products from the EMODnet Physics dissemination channels. These tools are serving both WP1 and WP4.

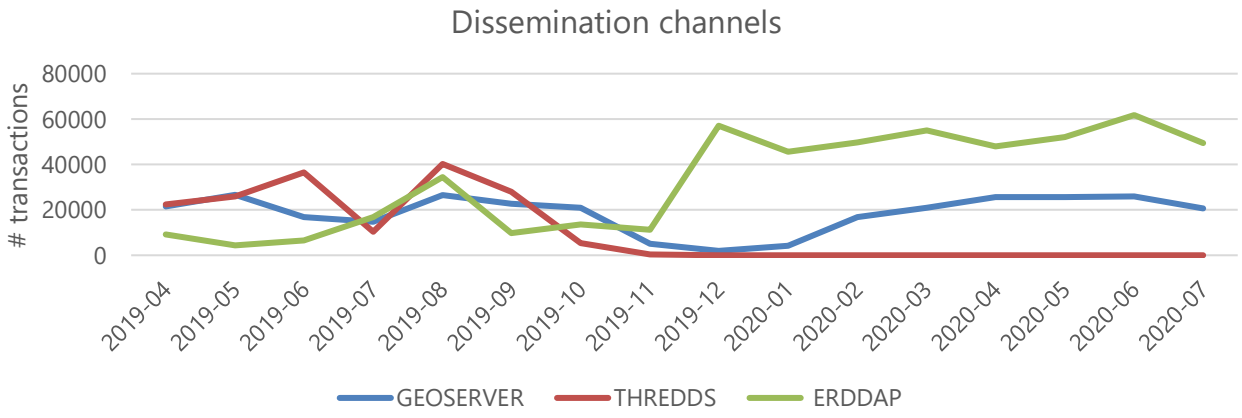

Figure 9. Transactions on the Physics back-end dissemination channels

All in all, WP4 is developing the EMODnet Physics portal in line with user needs and international trends: it is based on an architecture that enables flexible access and usage of data and already implements most of the "ingredients" (e.g. federated data access, many-to-many networking and interoperability, open data, acknowledgment of principal investigators etc.) of the future ocean data management and ocean data sharing tools (Annex 8 - Brett et al. Nature vol.582, 11/06/2020, p.181).

WP4 - Promotion, Interaction, feedback and assessment

WP4 is designed to fulfil task 5 (Ensure the involvement of regional sea conventions), task 6 (Install a process to monitor performance and deal with user feedback) and task 7 (Operate a help desk offering support to users). The goal is also to report on the effectiveness of the system in meeting the needs of users and other EMODnet portals, and assess the robustness of the EMODnet Physics portal system. WP4 also contributes to the EMODnet dissemination.

As planned the help desk service has been operated from day 1 of the contract (9.00 – 17.00 CET, Monday to Friday) and it is based on web-form and emails. The web tool helps the user to identify and describe the topic of the query (Figure 10), and in turn it permits to involve the right expertise for providing the feedback.

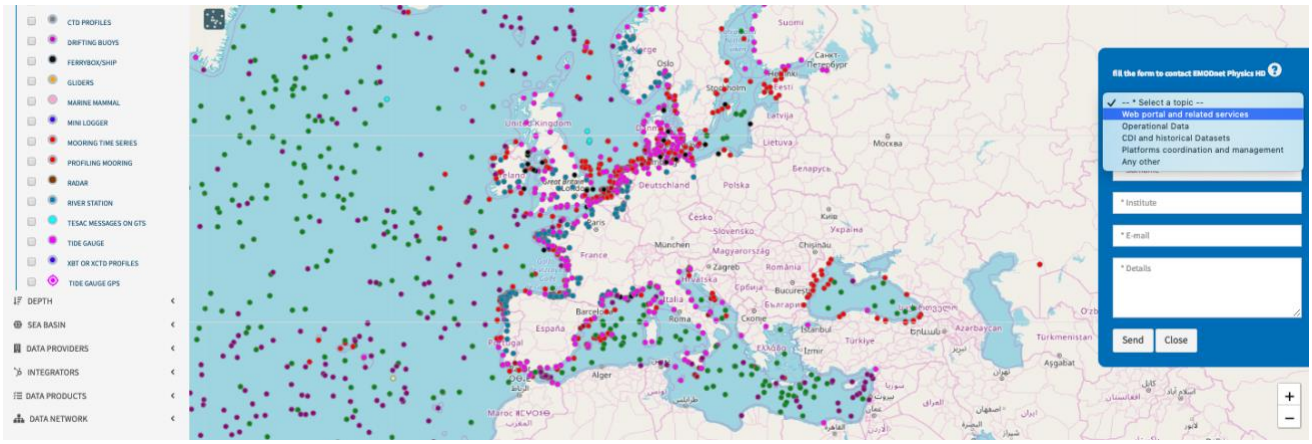

Figure 10. On line, help desk tools

Each entry gets a unique help ticket number in the help desk 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 that the request is under management. EMODnet Physics help desk service also collects query sent by email (contacts@emodnet-physics.eu). Since it is on line, the service collected and solved 175 requests (@31/07/2020). During the period covered by this report, the HD collected and solved 60 requests (Table 7). As anticipated in WP3, Matomo and logs are used to extract monitoring indicators such as:

- monthly page views;
- most popular page in past month and past year;
- number of data, and data products downloaded;
- types of user downloading data (where known) – public, private, research;
- databases connected to system;
- data records in total and available for download without restriction of re-use
- number of providers, type and amount of provided data and data products.

Information about the user interest and field of work are collected by web form for a very limited amount of data (coastal data older than 60days from platforms organized under the CMEMS INSTAC). This tool is operational since November 2018 and collected more than 1000 user profiles. Since the start of this contract there were 333 new entries. Figure 11 and Figure 12 show information about the users that filled the web-form (to remember that this is required only for a limited number of datasets – i.e. it is applied to about 28.000 platforms-datasets of the more than 800.000 platforms in the system) and indicates that the main sector is Research and Academia (more than 50%), interestingly the number of users from private sector is increasing (around 20%). Data are mainly used for Marine and Coastal applications. Registered users are not limited to European Countries (Figure 13 and Figure 14).

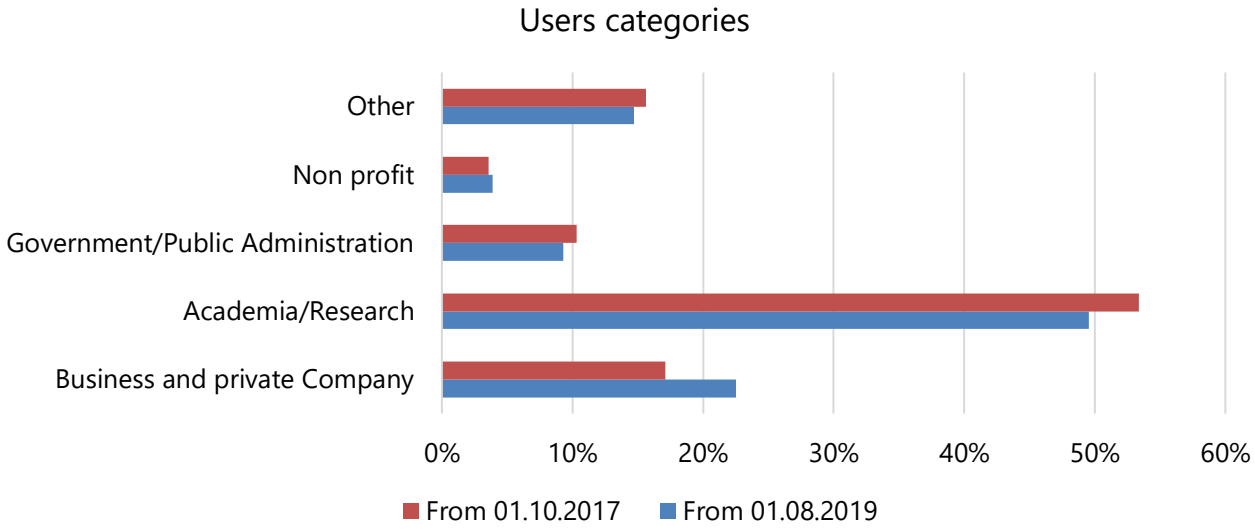

Figure 11. EMODnet Users Categories

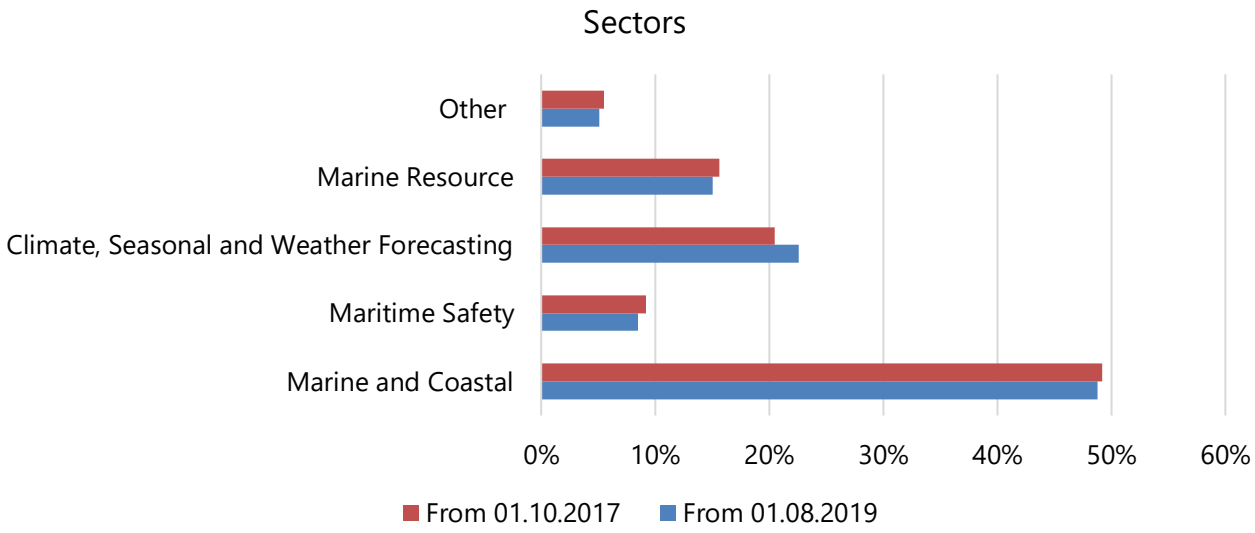

Figure 12. EMODnet Users Sector of interest

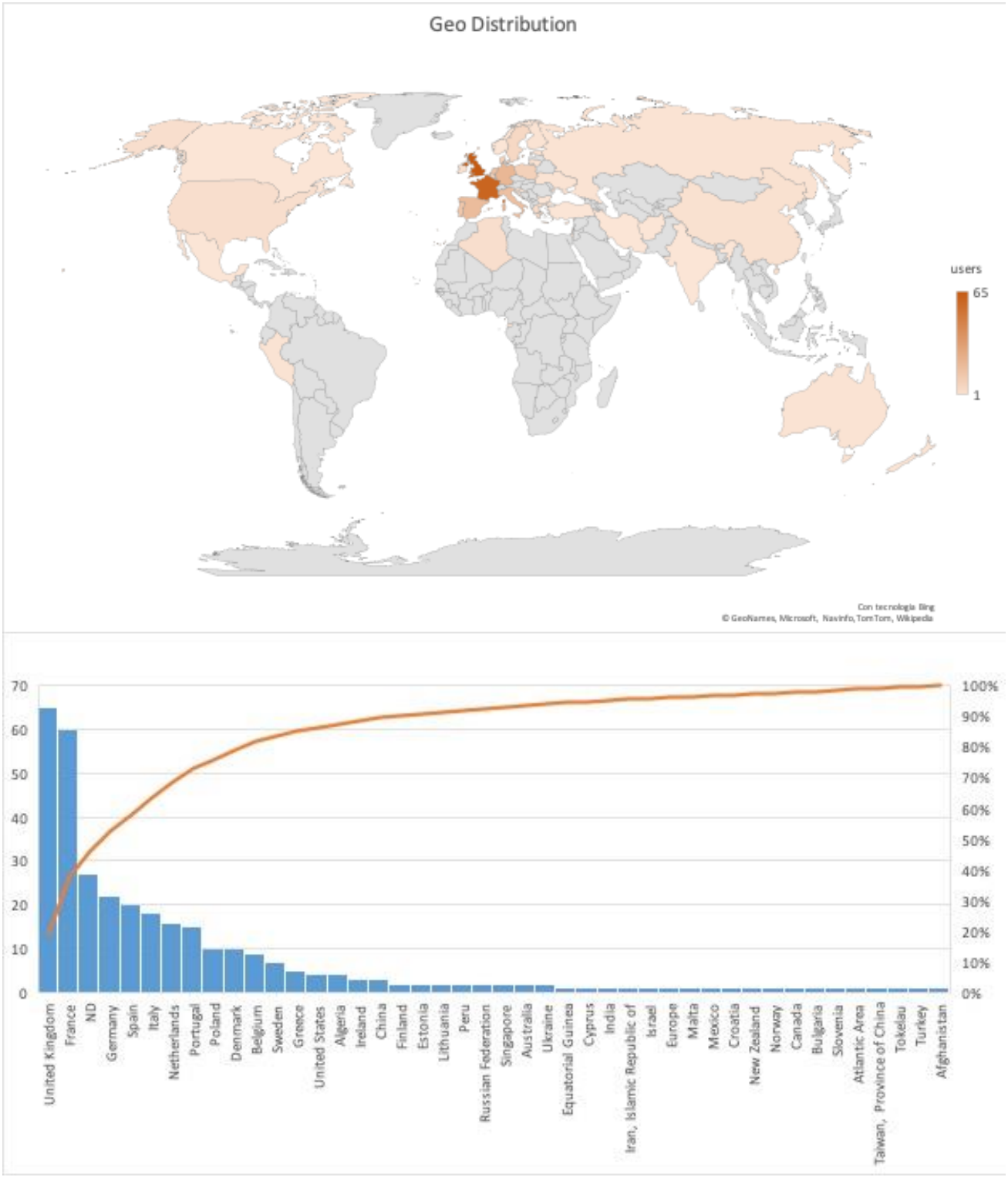

Figure 13. Distribution of the EMODnet Physics users that filled the web-form since 01/08/2019

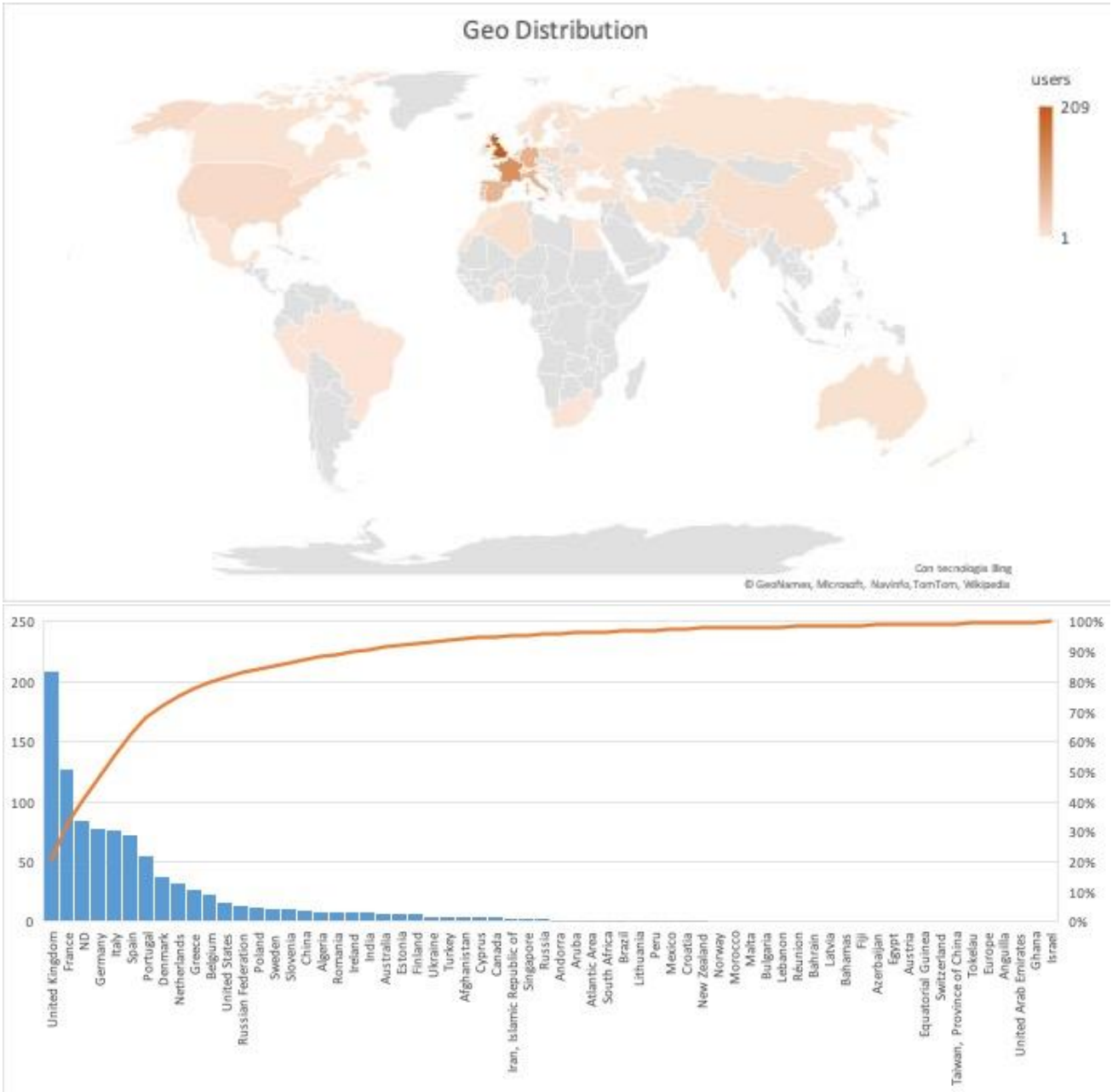

Figure 14. Distribution of the EMODnet Physics users that filled the web-form since 01/10/2017

WP4 is also dealing with the Regional Sea Convention engagement. As planned ICES is playing a key role to support EMODnet Physics in the collaboration with the Regional Sea Conventions and help the consortium to collect RSCs inputs, links, connections and feedback. Indeed, EMODnet Physics is interacting and collaborating with RSC and TG NOISE on underwater noise. EMODnet Physics is developing and maintaining underwater noise products (see WP2), and it is participating to TG NOISE (permanent invited member), ICES is a permanent invited member of TG NOISE representing the noise data hosting infrastructure for both HELCOM (Baltic area) and OSPAR (North West Shelf area). Moreover, the team established relationship and collaboration with parties supporting Member States in the Barcelona and ACCOMBAMS conventions to deal with MSFD D11. As anticipated, TG NOISE delivered milestones in the definition of how to fulfil MSFD D11 and the activity is now moving into the monitoring phase. Thanks to this network and collaborations, more data and results are expected in the coming year.

The team is also very active in the promotion and dissemination activities, Table 8. Attended events lists the attended and organized events. As described in WP1, the organization of dedicated events are key actions for the development of the EMODnet Physics network and goals, indeed 29 of the about 80 listed events were organized by the team.

4. Identified issues: status and actions taken

Table 4. Priority issues identified and communicated by EASME/DG MARE/Secretariat

A. Priority issue(s) identified and communicated by EASME/ DG MARE/ SECRETARIAT			
Priority issue	Status (Pending/Resolved)	Action(s) taken / remaining actions planned	Date due
Delivery of the updated EASME questionnaire on data protection situation	Resolved	Implemented the planned infrastructure security updates	17/12/2019
Brexit - Please review the content of your portal and make sure that it is reflecting that fact.	Resolved	The portal was updated with the provided link. Link is in the page footer. Page and link were operational starting from midnight 1st Feb 2020.	01/02/2020
Report on portal users	Resolved	We extracted the list of registered users and mapped per entity typology (private, government, etc.). To note that EMODnet Physics requires authentication for a very limited set of data (i.e. European coastal data) therefore the list is reporting on a limited subset of EMODnet Physics users.	07/02/2020
Annual Report 2019	Resolved	Added a couple of pages about EMODnet Physics activities for the 2019 Annual Report. We're ready for further interactions.	Delivered 06/03/2020
EMODnet Flyer	Resolved	Draft of doc by due date, final version/revision delivered 27/02/2020	21/02/2020
Description of standards we share with USA and particularly NOAA	Resolved	Brief overview of the adopted common standards (ERDDAP and ISO)	07/02/2020
INSPIRE Metadata issue - the Secretariat has been running some compliance checks and noted some remaining issues	Pending	We installed the GEOSERVER INSPIRE extension and two new just published layers are fully compliant with the checks. In coming period, we are going to fix the other products-metadata.	As soon as possible
EMODnet 7th TWG Action point 19: Physics and Chemistry to report on how they get the metrics of (OGC) web services for their portal	Resolved	Provided the list and links of the used tools.	31/7/2020
Provide EASME with documents about the collaboration agreements between EMODnet Physics and SOOS	Resolved	A package with endorsement letter and the latest SOOS annual reports	31/7/2020

		was organized and delivered	
Provide Secretariat with all the EMODnet Physics quarterly reports since phase 3 contract	Resolved	A series of packages with reports and annex to the reports were organized and delivered	31/7/2020
To publish all the EMODnet Physics quarterly reports since phase 3, and phase 3 interim and final reports	Pending	To upload on the EMODnet Physics landing portal (reports page)	31/8/2020
Indicator - Harmonization score. There are two items to fix: header size and search box.	Resolved	Indicators were changed.	31/7/2020

Table 5. Priority issues identified by Physics team

B. Issues / challenges identified by the thematic assembly group itself			
Priority issue / challenge	Status (Pending/Resolved)	Action(s) taken / remaining actions planned	Date due
CMEMS INSTAC update April 2019. CMEMS INSTAC released a major update of the infrastructure and conventions. This had a deep impact on the EMODnet Physics NRT data dissemination service and some of the platforms hosted by INSTAC (as well as some of the datasets) have had to be re-connected/re-mapped	Resolved	Update of all the machine-to-machine services between EMODnet Physics and CMEMS INSTAC.	31/10/2019
EMODnet Physics is providing the CMEMS INSTAC Dashboard with a widget service. With the CMEMS INSTAC update April 2019 new data type was introduced. The widget service adopted by CMEMS INSTAC for their dashboard/KPI services needed to be updated and extended	Resolved	Needed extensions and features were developed and the service was updated.	31/07/2019
SDN update – in line with the SDC project plan, the SDN infrastructure is now moving into the cloud. A new connection service between EMODnet Physics and SDC has had to be developed.	Resolved	Needed extensions and features were developed and the service was updated.	31/12/2019
EMODnet Physics is serving JCOMMOPS Glider manager with a service providing metadata on running missions. It was noted that the service was missing some of the mission details	Resolved	the service was updated to harvest the missing details from Coriolis	31/12/2019
DotNetNuke (DNN) vulnerability. DotNetNuke (DNN) is the EMODnet Physics landing portal CMS. While working on the security and data protection updates, we identified a vulnerability that would allow PHP scripts to modify sections in the portal pages.		Besides implementing the already planned actions to improve system and infrastructure security, the DNN was updated to last release, and the only open port is 443 (this limitation is a further guarantee of security). Now, as reported in the document EASME-webmaster data protection checklist, the EMODnet Physics security is ranked B[40] and cookies management is ranked A[41]	31/12/2019

[40] https://www.ssllabs.com/ssltest/
[41] https://webcookies.org/cookies/www.emodnet-physics.eu/27992876?886948

Duplicates in platforms We use the WMO as platform id. Lately some of the platforms with old 5-digit WMO codes are also delivered with the new 7-digit code. This impacts the name of the NetCDF files that are distributed and the user may find duplicates in the system	Pending	Cross check and cleaning/declaring of duplicates	We cannot set a deadline because the update of the WMO is not depending on EMODnet Physics. We can only check and correct when an issue is identified.
OpenDAP THREDDS issue. Problem to access the TDS catalogue via OpenDAP	Resolved	Conversion of the format for the identified dataset from netcdf 4 to netcdf 3	We closed the action in 4 days (13/12-17/12)
River parameter convention. River data were delivered by using inhomogeneous parameters naming convention	Resolved	Proper renaming-remapping of the parameters standard name (RVFL)	17/12/2019
Ingest and make available T-MEDNET data in Physics	Resolved	Designed of custom T-MEDNET data harvester	10/12/2019
Identify and fix why Matomo is not tracking views for the EMODnet Physics map page	Resolved	There was an issue with the Matomo script in the EMODnet Physics mapviewer page	31/3/2020
Updates to the Norwegian tide gauge network	Pending	In 2019 the Norwegian Hydrographic Service corrected a set of known errors in the tide gauge records. These updated refer to data back to 2007. New data have to be overwritten on previous ones.	As soon as possible. This task involves the support and collaboration of CMEMS INSTAC
Ingest and make available the Antarctic Circumnavigation Expedition (ACE) platforms	Resolved	ACE platforms are already available in Physics, we're working on metadata mapping of atmospheric and meteorological parameters to show them all	31/07/2020
CODIV-19 and Fishing for Data Workshop EMODnet Physics was organizing the Fishing for Data Workshop (19-21 May 2020). Due to the government recommendations and limitations to travels and to attend/held meeting in person it is not possible to held the meeting for the planned period.	Resolved	We organized a webinar (20 May 2020) to present and discuss the designed dataflow for ingesting data collected by smart loggers on Fishing vessels nets. The workshop is postponed to autumn (TBC).	20/05/2020
Update the method that is processing the monthly averages from operational data	Pending		Autumn 2020
Problems to access JIRA	Pending	We are still recording problems to access the common space on JIRA. For the time being we directly interact with central administrators to keep track of the progress on actions.	

5. Allocation of project resources

This EMODnet Physics project officially started 26/08/2019 and it is proceeding in line with the schedule. All the WPs have started and are delivering progress and results and the overall effort spent since the start of this phase is 50% of the total. Figure 15 is reporting the proposed Gantt, Table 6 an estimate of the resources for the requested categories.

Figure 15. Gantt chart

Table 6. Allocation of resources

Information on the allocation of project resources	
Categories	Resource usage[42] (%)
Making data and metadata interoperable and available	25%
Preparing data products	15%
Preparing web-pages, viewing or search facilities	25%
Managing user feedback	5%
Project management	12%
Outreach and communication activities	10%
Others	5%

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

6. User feedback (Contact us form, online chat & other communication means)

Table 7. User feedback

Overview of user feedback and/or requests received in this quarter							
Date	Organization	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
27/03/19	Berring Data Collective	Technical – support to download a limited package of data	Mail + call	1 week to deliver the package	Resolved	User contacted and support provided	
02/04/19	NIVA DK	Technical – support to find metadata and M2M services	HD service	1 day	Resolved	User contacted and support provided	
08/04/19	BRGM	Technical – support to have further metadata	HD service	1 day	Resolved	User contacted and support provided	
09/04/19	MERCATOR OCEAN	Technical – support to get some HFR missing data	HD service	1 day to give feedback	Resolved	User contacted and support provided	
12/04/19	GL Garrad Hassan Deutschland	Technical – support to download historical data	HD service	3 days to deliver the package	Resolved	User contacted and support provided	

12/04/19	National Technical University of Athens	Technical – support to get some further metadata on a subset of platforms	HD service	3 days to give feedback	Resolved	User contacted and support provided	
15/04/19	ISMAR	Technical – support to get some metadata on wind buoys	HD service	1 day	Resolved	User contacted and support provided	
17/04/19	Technical University of Denmark	Technical – support to download ARGO data	HD service	1 week to deliver the package	Resolved	User contacted and support provided	
29/04/19	CMEMS INSTAC	Technical – request for update of the widget service	HD service	1 week to close the activity	Resolved	Designed and developed the required update	
30/04/19	VLIZ	Technical – support to include noise maps into central portal	HD service	1 day	Resolved	Support and guidelines provided	
02/05/19	Met Office	Technical – support to automate the download of the daily Dutch HF radar data	HD service	1 day	Resolved	User contacted and support provided	
02/05/19	Regional Environmental Protection Agency of Calabria	Technical – support to find metadata	HD service	1 day	Resolved	User contacted and support provided	

20/05/19	Framian	Technical – support to find and download temperature and salinity data	HD service	1 day	Resolved	User contacted and support provided	
13/08/19	NIVA	Technical – support to find and download temperature and salinity data	HD service	2 weeks	Resolved	User contacted and support provided	
30/09/19	DG MARE	Technical – analysis of sea temperature variations	e-mail	Report in 15 days	Resolved	User contacted and support provided	
01/10/19	BSH	Technical – support to use the mapviewer filters	HD service	1 day	Resolved	User contacted and support provided	
04/10/19	DNV GL	Technical – support to download a specific dataset	HD service	1 day	Resolved	User contacted and support provided	
10/10/19	EMODnet Secretariat	Technical – support to download data from a platform	HD service	1 day	Resolved	User contacted and support provided	
22/10/19	Geo-4D	Technical - support on format to use downloaded data	HD service	1 day	Resolved	User contacted and support provided	
22/10/19	IOPAN	Technical – support to download CDOM data from a ferrybox	HD service	1 day	Resolved	User contacted and support provided	

26/10/19	Greid Académie de Créteil	Technical – support to download long term timeseries (sea level)	HD service	1 working day feedback - 4 days the data package	Resolved	User contacted and support provided	
31/10/19	Institute of Earth Sciences - The Hebrew University of Jerusalem	Technical – support to find and download atmospheric relative humidity near the sea surface in the Mediterranean	HD service	1 day	Resolved	User contacted and support provided	
11/11/19	Bentley	Technical – support to download river data	HD service	1 day	Resolved	User contacted and support provided	
03/12/19	Instituto Oceanográfico da Universidade de São Paulo (IOUSP)	Technical – support to download Saildrone data	HD service	1 day	Resolved	User contacted and support provided	
04/12/19	Colorado EDU	Technical – support to use EMODnet Physics API	HD service	1 day	Resolved	User contacted and support provided	
09/12/19	MERCATOR OCEAN	Feedback – some river data are using inhomogeneous parameters naming convention	HD service	1 day feedback – 1 week	Resolved	Update of the river metadata adapters and vocabularies	

16/12/19	BRGM	Technical – support to download wave data from your platform on La Revellata	HD service	1 day	Resolved	User contacted and support provided	
07/01/20	PLOCAN	Technical – request for updating (adding a platform to) the service sending monthly analytics from Physics	HD service	1 day	Resolved	We added the platform to the service	
07/01/20	Private person – request forwarded by EMODnet Seabed Habitat HD	Technical – support to download the temperature and salinity climatology data from Physics.	HD service	1 day	Resolved	We provided links and instructions to download the package from the TDS interface	
15/01/20	EuroGOOS	Technical – request for support in performing asset mapping for GOOS Regional Alliance	e-mail		pending	We extracted the preliminary report on the platforms type vs GRA	We are interacting with EuroGOOS and GRA officers to refine and complete the assessment.
21/01/20	Private user	Technical – request for wave data from 3 Greek stations	e-mail	1 day	Resolved	We provided the available data and instructions to find and collect further data from partner projects (e.g. SDC)	

23/01/20	SOCIB	Technical - request of historical HFR data from European systems covering the period 2016-2018	e-mail	1 day	Resolved	We provided the TDS Url where to find all the available HFR data in Physics.	
05/02/20	HZG	Technical – information about which plotting library we integrate in Physics	HD service	1 day	Resolved	HighCharts.	
06/02/20	DG MARE	Technical – information about which standards we share with US and NOAA	e-mail	1 day	Resolved	Info sent by email	
21/02/20	LIVE (request forwarded from EMODnet SH)	Technical – support to download salinity data for a given number of platforms	e-mail	19 days	Resolved	We were updating the catalogue and the cross-links were not working.	
27/02/20	Dokuz Eylul University School of Natural and Applied Sciences – forwarded from the EMODnet Secretariat	Information – possibility to have an internship with EMODnet partners	e-mail	1 day	Resolved	User contacted and support provided	

02/03/20	University of Genova - DICCA	Technical – support to download all the Mediterranean wave data to validate MFC model	e-mail	1 day	Resolved	We provided links to ERDDAP, instructions to use it, links to download the original netcdf files, instructions to use them	
05/03/20	EMODnet Secretariat	Technical – problem in the sea water velocity map	e-mail	12 days	Resolved	Time by time it happens that one of the HFR (usually SHOM) is delivering corrupted data and this corrupts the layer. Once identified the specific corrupted dataset, once removed from the backend services that generate the map, the problem is fixed.	
10/03/20	Tallinn University of Technology	Technical – support to download data from platformid=8427	HD service	1 day	Resolved	We provided links and instructions.	
16/03/20	Private user – others (forwarded from the EMODnet Secretariat)	Technical – support to access wave MFC data	e-mail	1 day	Resolved	EMODnet Physics is not hosting MFC data, the user was pointed to other projects.	

01/04/20	PLOCAN	Technical – to add the platform (id-99027) to PLOCAN statistics service	e-mail	1 day	Resolved	Added to the service	
15/04/20	CMCC	Technical - a problem in visualizing CTD profiles	HD service	1 day	Resolved	Provided the user with more details and examples.	
21/04/20	BSH	Technical – annual averages are also considering data flagged as bad data	e-mail		pending	We are going to updated the processing method that extracts monthly averages from operational data	Autumn 2020
23/04/20	Mercator Ocean	Technical – strange values in river data from Mondego Ponte Santa Clara Coimbra station	HD service	1 day	Resolved	Cross check the value and the system are showing what it is receiving	
05/05/20	Hexawatt	Technical – support to find wind and wave products	Central Portal	1 day	Resolved	Linked to datasets and products of potential interest	
05/05/20	Cetmar	Technical – support for understanding metadata	e-mail	1 day	Resolved	Provided the needed details.	
05/05/20	EMSA	Technical – support to use the underwater noise registry	e-mail	1 day	Resolved	Provided support and details on the product.	

15/05/20	Instituto del Mar del Peru	Technical – support to use and download data	HD service	1 day	Resolved	Provided the needed details.	
19/05/20	Finisterra S.A	Technical – support to find sea surface current data details in the Algarve area	HD service	1 day	Resolved	Provided the needed details.	
19/05/20	Bentley	Technical – problems in accessing data by M2M services	e-mail	4 days	Resolved	The problem was not in the M2M but at the level of connection with data source.	
03/06/20	unspecified	Technical – support to use the EMODnet Physics API	e-mail	1 day	Resolved	Provided the needed details.	
06/06/20	Cetmar	Technical – data provided were not visible in the portal	e-mail	9 days	Resolved	Bug in the data management of that source. Fixed	
29/06/20	Istituto Hidrografico	Technical – support to connect new and more IH data	e-mail	1 day	Resolved	Presented the overall EMODnet Data Ingestion strategy for both NRT and historical data.	
02/07/20	private user	Technical - support to use ERDDAP	HD service	1 day	Resolved	support and guidelines provided	

04/07/20	Sea science	Technical - support to download waves height in csv	HD service	1 day	Resolved	support and guidelines provided	as a feedback of the interaction we collected a need for more wave data
20/07/20	DHI	Technical - support to request and download tide gauge data in Madascar area	HD service	1 day	Resolved	support and guidelines provided	
20/07/20	EMODnet Secretariat	Technical - EMODnet MapProxy service down	e-mail	1 day	Resolved	service restarted and auto restart feature activated	
28/07/20	Marine Biology Research Group, University of Ghent (forwarded by EMODnet Secretariat)	technical - support to find sea surface temperature close to nuclear plants cooling areas	e-mail	1 day	Resolved	links to available products and datasets provided	
29/07/20	AZTI	Technical - support to create and export metadata for a given list of stations	HD service	1 day	Resolved	support and guidelines provided	

7. Meetings/events held/attended & planned

During the first year of project, despite the limitation of travelling due to the COVID-19 situation since early March 2020, the EMODnet Physics team joined (organized or attended) about 80 meetings/events (27 organized by the team). The following table lists the attended events (the first 6 events took place in the time between the end of the previous contract and the start of this project).

Table 8. Attended events

A. Meetings/events organized and attended				
Date	Location	Type event (internal or external meeting, training (workshop), etc.)	Meeting attended (A) / organized (O)	Short description and main results (# participants, agreements made, etc.)
2-3/04/2019	Rome, Italy	EMODnet Data Ingestion – general assembly	A	General Assembly of the EMODnet Data Ingestion project. Presentation and discussion of the joint actions to ingest more data
9-11/04/2019	Wien, Austria	EGU 2019 – ESSI 1.	O	https://meetingorganizer.copernicus.org/EGU2019/session/30893 - about 70 attenders
24-26/04/2019	Genova, Italy	FerryBox workshop	O	The goal of this workshop was to collect contributions related to underway measurements from outside of the FerryBox community (e.g. ICOS, SOOP-XBT) in order to enhance knowledge exchange and future cooperation. About 70 people attended and proactively participated to the event
7-10/05/2019	Liverpool, UK	SeaDataCloud TTG	A	SeaDataCloud Technical Team meeting – among the other topics we discussed about RT SOS SWE data flow, HFR data flow and the collaboration and connections between SDC and Physics
8-9/05/2019	Heraklion, Greece	EuroGOOS Annual Meeting	A	Annual meeting of the EuroGOOS members. Progress and synergies among the different projects were discussed.
21-29/05/2019	New Brunswik, NJ US	EGO Meeting & International Glider Workshop Meeting – follow up of the Genova International Glider meeting (scaled up to OceanGliders task teams: og-dm@jcommops.org.	O	dedicated side meeting, one full day in length, with 26 attendees, was held to keep working on OceanGliders1-0 format document and monitoring KPI
18-19/06/2019	Marseille, France	Oceans'19	A	https://www.oceans19mtsieeemarseille.org/
25/06-2/07/2019	Paris, France	IOC Assembly	A	IOC annual assembly.
11/06/2019	Zug, Switzerland	Meeting with NordStream	O	Discussion about synergies: ingestion of NordStream data and use of Physics data and data products.
2-3/09/2019	Gent, Belgium	EMODnet TWG	A	EMODnet Technical Working group
3-4/09/2019	Gent, Belgium	EMODnet SC	A	EMODnet Steering Committee meeting.
05/09/2019	Lulea, Sweden	Swedish National Data Ingestion session	O	EMODnet Program, with a specific focus on EMODnet Physics and EMODnet Data Ingestion were presented to Swedish authorities and Marine Institute to find synergies and to collaborate. About 30 attenders
4-5/09/2019	Gent, Belgium	Open Sea Lab	A	People from EMODnet Physics joined and helped with the practical activities of the Open Sea Lab http://www.emodnet.eu/emodnets-2nd-open-sea-lab-look-back
10/09/2019	Call	SOOS DMSC meeting	A	Data Management Steering Committee of the SOOS – EMODnet Physics is member and proactively participate to SOOS activities

16-22/09/2019	Hawaii, US	OceanObs'19	A	http://www.oceanobs19.net/ EMODnet Physics participated to some of the community papers[1]
18/09/2019	Call	Meeting on river flow data management	O	EMODnet River Task team meeting on activity review and plans.
25/09/2019	call	Management of MED noise data – call meeting	O	Call meeting with CTN – CTN-Marine Technology Centre to discuss about joint activities on noise data management. CTN is the coordinator of the QuietMED project, EMODnet Physics is in the advisory board of the proj.
3-4/10/2019	Umea (Sweden)	Swedish EMODnet data ingestion session	O	Progress on EMODnet program, its lots with a focus on Physics and Data Ingestion was presented to key Swedish marine institute to engage further their representative – about 15 attenders
16-18/10/2019	Brest (France)	SeaDataCloud General Assembly	A	EMODnet Physics, EMODnet Data Ingestion and SDC are strongly collaborating to improve data management (e.g. gliders, HFR)
05/11/2019	call	iAtlantic WP7 Pangaea-EMODnet meeting	A	Discussion on data flow from PANGEA to EMODnet. EMODnet Physics and PANGEA are already working on PANGEA data dissemination towards EMODnet Physics and more than 480000 datasets are available. During the meeting, we discussed how to apply the same approach to the iAtlantic data.
7-8/11/2019	Genova (Italy)	EMODnet Physics core team meeting	O	EMODnet Physics core meeting to review the state of action and plan activities for phase 4.
13-14/11/2019	S. Sebastian (Spain)	Workshop - HF RADAR TASK TEAM WORKSHOP	O	EMODnet Physics was one of the co-organizers of the WS. The meeting was open to all European HF Radar operators and looked for opening new challenges for the European Community around different work lines (Networking, Operations, Data Management, Applications, Governance).
13-15/11/2019	Paris (France)	H2020 SO-CHIC project KOM	A	EMODnet program and EMODnet Physics and Data Ingestion facility were presented and are going to be the key endpoints for the project public data.
18-22/11/2019	Helsinki (Finland)	3rd Polar Forum Workshop	A	The meeting was aiming at supporting information exchange, with the remainder of the week using a "hackathon" approach.
21/11/2019	Helsinki (Finland)	Workshop on Marine Data[2]	A	EMODnet Physics and its data management strategy and infrastructure were presented to attenders (about 30 people). Organizers were particularly interested in the outcome from the EMODnet Physics – SOOS collaboration and we are now discussing if the same approach can be developed on the Arctic area.
22/11/2019	call	EMODnet Physics and T-MEDNET data	O	Discussion on how to ingest and present T-MEDNET data in Physics.
27-29/11/2019	Brussels (Belgium)	H2020 EuroSEA project	A	EMODnet is one of the EuroSEA data integrators and together with the other key European infrastructures (CMEMS, SDN, etc.) there is an action to promote data findability, accessibility, interoperability and reusability (FAIR)
3-4/12/2019	Trieste (Italy)	Workshop - WORKSHOP "MODELLING AND OBSERVATIONS IN THE	A	EMODnet Physics was one of the sponsors and supporter of the workshop

		COASTAL MEDITERRANEAN SEA: PHYSICAL AND BIOGEOCHEMICAL PROCESSES		
4-5/12/2019	Trieste (Italy)	MONGOOS Annual Meeting	A	Annual meeting of the MONGOOS community. EMODnet Physics was in many of the presentations.
10/12/2019	call	NORD STREAM 2 project	A	Discussion on possible data delivery from the Nord Stream 2 project into EMODnet Physics and Data Ingestion
13/01/2020	Web	EMODnet Arctic map discussion	O	The main discussed topic was to set up an EMODnet Physics child portal focused on the Arctic area to stimulate data sharing in the region
15/01/2020	web	SOOS DMSC	A	SOOSmap updates, new data providers in the region, planning for Ocean Sciences presentation on SOOSmap and EMODnet.
17/01/2020	web	BOOS SC	A	General update on EMODnet, EMODnet Physics and DIP were reported.
21/01/2020	Lisbon, Portugal	CMEMS SE LAMBDA project user workshop	A	EMODnet Physics was invited to present the River Runoff data management and data APIs. EMODnet DIP platform was also presented. River runoff data are very important for both hydrological agencies and MFC operators.
22/01/2020	Lisbon, Portugal	EMODnet Physics River Runoff Task Team meeting	O	We discussed on how to include more data (going farer into the land domain – request from users) and how to take on and extend some of the LAMBDA results (e.g. River Proxy model and SSS SMOS).
27-29/01/2020	Bologna, Italy	DIVA user Workshop	A	The workshop was organized from and for the DIVA user community. DIVA is one of the scientific tools used by several EMODnet lots and linked projects (e.g. SDC) to develop gridded reanalysis products (e.g. climatology)
27-28/01/2020	Tromsö, Norway	Arctic ROOS	A	General update on EMODnet, EMODnet Physics and DIP were reported.
30/01/2020	Cartagena, Spain	QUITEMED2 middle term project review	A	EMODnet Physics is serving the AoB of the QUITEMED2 project. EMODnet Physics and QUITEMED2 collaborate on MSFD D11C1 and the MED-INR.
04/02/2020	Genova, Italy	Meeting with DICCA – University of Genova	O	The meeting was organized to discuss about the use of EMODnet Physics data for validating and initiating the DICCA MFC models and the possibility to link and re-distribute the DICCA products (WIND and WAVE MED nowcast)
04/02/2020	Dresde , Germany	ENVRI-FAIR General Assembly	A	EMODnet-Physics is identified with CMEMS and EMODnet-Chemistry as VIP users of the services that will be set up in the MARINE Domain by ENVRI-FAIR project
07/02/2020	web	SOOSmap web meeting	O	SOOSmap updates, new data providers in the region, planning for Ocean Sciences presentation on SOOSmap and EMODnet.
07/02/2020	web	Fishing for Data Workshop – organizing committee meeting	O	Meeting to organize the workshop.
12-13/02/2020	Brussel, Belgium	CMEMS-EMODnet-Chemistry meeting	A	The experience of collaboration between CMEMS and EMODnet-Physics was shared with EMODnet-Chemistry partners to discuss about potential mutual benefit (CMEMS – Chemistry)
13/02/2020	Genova, Italy	Meeting with ARPAL (Regional Agency for Environment Protection)	O	EMODnet, EMODnet Physics and EMODnet Ingestion were presented. We discussed on EMODnet Physics API to serve and support ARPAL activities and how to include 2 ARPAL

				wave stations (Capomele and Portofino) into the system.
15-20/02/2020	San Diego, US	Ocean Sciences	A	Practical examples in SOOSmap, EMODnet Physics, and other portals for how to make data sharing to work. Examples included research, teaching, public-private collaborations, and planning future fieldwork.
17-20/02/2020	Brest, France	Jerico S3 – KOM	A	JS3 is a partner project to make available more European coastal data.
06/03/2020	Copenhagen, Denmark	Fishing for Data Workshop – organizing committee meeting + ICES	O	Meeting to organize the workshop and discuss on data management flow and standards.
07/03/2020	web	Communication from DG MARE	A	DG MARE and EASME presented the future EMODnet strategy[1]
14/03/2020	web	Communication from DG MARE – follow up	A	Follow up of the previous web meeting
30/03/2020	web	Quarterly reports indicators and metrics	A	Meeting between EMODnet Physics and Secretariat to check and discuss on quarterly reports indicators and metrics.
30/03/2020	web	JERICO S3 – EMODnet Physics interoperability	O	Discussion on general structure of the JS3 Virtual Access and how to connect Physics to the JS3 VA and vice versa
08/04/2020	web	EMODnet Physics annual general assembly	O	During the meeting we discussed about the EMODnet Physics progresses and among the others, the collaboration and joint EMODnet Physics – EMODnet Ingestion activities. Joint activities are planned to link more real-time sources (by exploiting e.g. SOS SWE technologies), improve the links between portals and in particular between the ingested data list and Physics mapviewer, keep working on common events (e.g. Fishing for data webinar and platform networks workshops)
16/04/2020	web	In.vi.Tra Jenues KOM	A	In.vi.Tra Jenues is an Interreg IT-FR project aiming at offering training trans-national opportunities in the blue-economy. ETT presented its activities and the work in both the EMODnet Physics and EMODnet Ingestion as a framework to host and train a student. The selection procedure went well and in July-August 2020 a French student will work in the ETT – EMODnet development team.
17/04/2020	web	EMODnet-PACE WP5 KOM	A	One specific focus of the meeting was to identify new Chinese coastal data sources (HFR and Sea Level stations) to be linked by EMODnet Ingestion and Physics. While Chinese partners are not planning to open HFR data for the moment, it will be possible to access to their sea level stations and data for developing joint products.
20/04/2020	web	EMODnet – CMEMS coordination meeting	A	A MoU between DG MARE and DG GROW consolidated the interoperability between EMODnet and CMEMS for the physics and chemistry, and EMODnet Ingestion is central in the process to keep adding additional in-situ data to both the initiatives.
				https://webgate.ec.europa.eu/maritimeforum/en/node/4719
21-22/04/2020	web	EMODnet Steering Committee meeting	A	Key meeting outcomes are available in the marine forum:

				https://webgate.ec.europa.eu/maritimeforum/en/node/4543
23-24/04/2020	web	EMODnet Technical working Group	A	As horizontal platform for the thematic lots, Ingestion is key partner in the discussion.
				https://webgate.ec.europa.eu/maritimeforum/en/node/4720
27/04/2020	web	HFR TT – CMEMS INSTAC – EMODnet Physics and Ingestion	A	Technical meeting to discuss about joint action to engage more HFR providers. Part of the discussion was the organization of an HFR Workshop (planned in October 2020 – already moved in Spring 2021), back to back with FerryBox community for a more integrated coastal monitoring approach
27/04/2020	web	In.vi.Tra Jenues selection day	A	Follow up of the previous meeting.
04/05/2020	web	EGU ESSI 1.1 session	O	Although the meeting was remotely host and attended, discussions were quite good and potential links with EMODnet lots were presented. - https://meetingorganizer.copernicus.org/EGU2020/session/34713
06/05/2020	web	Meeting with LAMMA	O	A meeting was organized to discuss how LAMMA (http://www.lamma.rete.toscana.it/) can contribute to EMODnet Ingestion and be linked in EMODnet Physics. Follow up actions are planned in coming months.
20/05/2020	web	Fishing for Data webinar	O	More than 400 people proactively participated to the webinar showing high interest for the topic. EMODnet Ingestion and Physics are going to take lead on the development of this new type of data stream.
26/05/2020	Web	Fishing for Data Team	O	Follow up on the webinar and planning of actions
27/05/2020	Web	Hazrunoff final meeting	A	The project (www.hazrunoff.eu) studied the integration of sensing and modelling technologies for early detection and follow-up of hazmat and flood hazards in transitional and coastal waters. It used EMODnet Physics M2M services and contributed to EMODnet Ingestion activities to link more river data in the Iberian area.
27/05/2020	Web	Glider data flow	O	Meeting with the core glider community
29/05/2020	Web	Nord Stream II	O	Data discussions with Nord Stream II
02/06/2020	Web	15th Meeting of the MSFD Common Implementation Strategy - Technical Group on Underwater Noise (TG-Noise)	A	It is the periodic TG NOISE meeting to present and discuss on progress on D11 MSFD. The meeting introduced the new chairs and present outcomes from European projects working on the topic
04/06/2020	Web	Sustunable KOM	A	Novellino is serving the project AOB to facilitate the connection and ingestion of project produced data into the EMODnet infrastructure. https://www.sustunableproject.eu/
10/06/2020	Web	EU HFR node coordination meeting	A	The meeting was organized to discuss about action to streamline more data from the same sources, in particular it is under discussion the ingestion and inclusion of radial data from HFR stations (at the moment only totals are delivered)
16/06/2020	Web	Coastal workshop: EMODnet and CMEMS	A	The workshop was aimed at exchanging on EMODnet and Copernicus (CMEMS and land) services and developments in this thematic area.
23/06/2020	Web	CMEMS INSTAC AM	A	New EMODnet Physics datasets presented at the INSTAC AM

29/06/2020	Web	EMODnet, JCOMMOPS, CORIOLIS – Glider Data flow – tech meeting	O	As part of the EMODnet Physics and Ingestion activities there is a continuous interaction with network platform operators. This meeting was to recap on some pending actions on glider data management with a focus on streamlining data from the platform to GDAC (Coriolis) and NRT data integrators (EMODnet Physics, CMEMS), design the management of both recovery and delay mode data management to facilitate long-term stewardship of the data while exploiting the use of recent technologies such as SensorML to link more platform setting information. On discussed action is to organize a new international event in 2021 as follow up of the international glider workshop held in Genova in 2018.
1-2/07/2020	Web	Tide gauge Task Team	A	Physics presented on recent developments regarding tide gauge data and products
07/07/2020	Web	EU HFR Task Team	A	Discussion on developments regarding HFR data and new HFR based products
14/07/2020	Web	EMODnet Physics and MSFD D11	O	Call with F. Borsani (ISPRA – co-chair TG NOISE) to discuss about noise monitoring and reporting metadata
26-28/07/2020	Web	SOOS - DMSC annual assembly	A	Physics presented on recent developments and future strategies. Discussion touched the state of art of tools developed for the SOOS community, future service re-organization to match both the EMODnet strategy and keeping serving the SOOS community with improved and more user-need-matching tools.

Table 9. Planned events

B. 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
21-25/09/2020	web	10 years of EMODnet progress and achievement Webinars	A	The goal of the webinars is to bridge towards the main event (EMODnet Open Conference) and to celebrate and showcase 10 years of EMODnet progress and achievement
24-26/09/2020	La Spezia, Italy	33rd Mariperman	A	It is the annual event of the Italian Navy to PA services presentation and demonstration. The event hosts a scientific/dissemination session to present relevant projects and programs. EMODnet Physics will be present.
20-21/10/2020	web	Marine data to support aquaculture in the North Atlantic Workshop	A	The event is jointly organized by EATiP, DG MARE, DG DEFIS, Copernicus Marine and EMODnet with the goal to discuss and link new marine data in support to aquaculture activities
3-7/03/2021	Oostende, Belgium	EMODnet Open Conference and Jamboree 2nd Edition initially programmed from 21st to 25th of September 2020 will be postponed to Spring 2021.	A/O	Due COVID-19 situation the organizing committee decided to postpone the event to 2021
23-25/03/2021	Gothenburg, Sweden,	FerryBox Workshop	A/O	Due COVID-19 situation the organizing committee decided to postpone the event to 2021

23-25/03/2021	Gothenburg, Sweden,	HFR Workshop	A/O	Due COVID-19 situation the organizing committee decided to postpone the event to 2021
12-14/04/2021	Amsterdam, Netherlands	IMDIS Conference	A	Due COVID-19 situation the organizing committee decided to postpone IMDIS 2020 conference to 2021
May 2021(TBC)	Genoa, Italy	Fishing for Data 2nd workshop	O	The goal is to have the planned physical workshop that was postponed due the COVID-19 situation.
May-June 2021	Brest, France	EuroGOOS International conference	A	The conference provides a forum for a broad range of implementers and users of operational oceanography services, including marine scientists and technologists, private companies, and policymakers. The conference reviews the present ocean monitoring and forecasting capacities and oceanographic services, and identifies new science and technology priorities. It facilitates dialogue, experience sharing and future planning with both European and international partners and stakeholders, towards a more coordinated response to global challenges and societal needs related to seas and oceans https://eurogoos.ifremer.fr/
16-18/06/2021	Vigo, Spain	MARETECH Workshop	A/O	Due COVID-19 situation the has decided to postpone the IX International Workshop on MARine TECHnology

8. Communication assets

Table 10. Communication products

A. Communication products				
Date	Communication material	Short description (of the material, title, …) and/or link to the asset	Main results	Name of event at which material was disseminated (if applicable)
13/11/19	Presentation	Enable discovery, open access, view and download of the data generated and collected during the SO-CHIC project	EMODnet program and EMODnet Physics and Data Ingestion facility were presented and are going to be the key endpoints for the project public data. – about 20 people	Presentation @SOCHIC KOM
14/11/19	Presentation	Standardized Data Management (HFR)	Update on the HFR data management as defined to fulfil the needs of the key European data integrators and infrastructures – about 30 attenders	Presentation @ HFR Workshop
21/11/19	Presentation	P.Gorringe[43]	EMODnet Physics and its data management strategy and infrastructure were presented to attenders (about 30 people). Organizers were particularly interested in the outcome from the EMODnet Physics – SOOS collaboration and we are now discussing if the same approach can be developed on the Arctic area. – about 40 people	Presentation @ Arctic Data WS
05/12/19	Presentation	EMODnet Physics	Update on EMODnet Physics to the MONGOOS community – about 60 people	Presentation @ MONGOOS
21/01/20	Presentation	EMODnet Physics	EMODnet Physics was invited to present the River Runoff data management and data APIs. EMODnet DIP platform was also presented. River runoff data are very important for both hydrological agencies and MFC operators.	CMEMS SE LAMBDA project user workshop
13/02/20	Presentation	EMODnet Physics	EMODnet, EMODnet Physics and EMODnet Ingestion were presented. We discussed on EMODnet Physics API to serve and support ARPAL activities and how to include 2 ARPAL wave stations (Capomele and Portofino) into the system.	Meeting with ARPAL (Regional Agency for Environment Protection)
17/02/20	Presentation	EMODnet Physics	Practical examples in SOOSmap, EMODnet Physics, and other portals for how to make data sharing to work. Examples	AGU[44]

[43] https://polar-data-forum.org/wp-content/uploads/2020/01/12_Gorringe_EMODnet.pdf

[44] https://agu.confex.com/agu/osm20/meetingapp.cgi/Session/85151

			included research, teaching, public-private collaborations, and planning future fieldwork.	
08/04/20	Presentation	EMODnet Physics	EMODnet Physics annual general assembly – progress report presentation on the joint actions	EMODnet Physics Annual Assembly
21-22/04/20	Presentation	EMODnet Physics	Periodic report on EMODnet Physics activities.	EMODnet SC - TWG
26/05/20	Presentation	Oral presentation and video of the event	Engagement of the Fishing Vessels community – more than 300 attenders	Fishing for Data Workshop
27/05/20	Presentation	EMODnet Physics from data to services	EMODnet Physics and EMODnet Ingestion activities for river data management were presented to about 20 attenders. It was highlighted the importance of collaboration between services like EMODnet projects and topic specific projects that can demonstrate the importance of data accessibility and interoperability for developing advanced services (HazRinoff) while engaging more providers to share data to make it possible (via EMODnet)	HazRunoff Workshop
04/06/20	Presentation	EMODnet Physics and EMODnet Data Ingestion	The Advisors were asked to present their expertise and projects – EMODnet, EMODnet Physics and pillars, EMODnet Ingestion were presented to the about 30 participants	Sustunable project KOM
16/06/20	Presentation	EMODnet Physics	EMODnet Physics data and products for coastal users	Coastal workshop: EMODnet and CMEMS
	Tech note	A reanalysis of relative Sea Level trends - EMODnet Physics[1]	Tech note describing the adopted methodology to process sea level data and compute trends on recent time-baseline	NA
02/07/20	Presentation	EMODnet Physics	Sea Level data management and source in EMODnet Physics	EuroGOOS Tide Gauge workshop
27/07/20	Presentation	EMODnet Physics	State of art of EMODnet Physics infrastructure and services developments and future plans	SOOS DMSC

Table 11. Planned communication materials

B. Planned communication products			
Date	Communication material	Short description (of the material, title, …) and/or link to the asset	Main results expected
21/08/20	Slides	10 years of EMODnet progress and achievement	New and more users, new data and providers
24/09/20	Presentation	Mariperman	New and more users, new data and providers
20-21/10/20	Oral presentation	Marine data to support aquaculture in the North Atlantic Workshop	New and more users, new data and providers
3-7/03/21	Oral Presentation	EMODnet Open Conference and Jamboree 2nd Edition initially programmed from 21st to 25th of September 2020 will be postponed to Spring 2021.	New and more users, new data and providers
23-25/03/21	Oral Presentation	Ferrybox Workshop	New and more users, new data and providers
23-25/03/21	Oral Presentation	HFR Workshop	New and more users, new data and providers
12-14/04/21	Oral presentation	IMDIS Conference	New and more users, new data and providers
May 2021(TBC)	Oral presentation	Fishing for Data 2 workshop	New and more users, new data and providers
16-18/06/21	Oral presentation	MARETECH Workshop	New and more users, new data and providers

Table 12. List of known publications

List of known publications using EMODnet data or data products				
Date	Type and name of journal, conference, …	Publication title	Author(s)	Organisation(s)
29/11/19	Technical document (specification, manual)	Product User Manual for Copernicus In Situ TAC (PUM)	Carval Thierry, Chalkiopoulos Antonis, Perivoliotis Leonidas, De Alfonso Alonso-Muñoyerro Marta, Manzano Munoz Fernando, Jandt Simon, Ringheim Lid Sjur, Hammarklint Thomas, Marinova Veselka, Petit De La Villeon Loic, Pouliquen Sylvie, Crosnier L	Copernicus In Situ TAC
16/12/19	Journal - Ocean Science . doi: 10.5194/os-15-1761-2019	Non-linear aspects of the tidal dynamics in the Sylt-Rømø Bight, south-eastern North Sea	Vera Fofonova, Alexey Androsov, Lasse Sander, Ivan Kuznetsov, Felipe Amorim, H. Christian Hass, andKaren H. Wiltshire	Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven 27570, Germany; Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, List/Sylt 25992, Germany; Shirshov Institute of Oceanology, Moscow, 117997, Russia
15/10/19	Proceedings - SCA '19: Proceedings of the 4th International Conference on Smart City Applications	Techno-economic optimization of hybrid wind and marine current turbine connected to the grid: a case study in Ksar Sghir, Morocco	Rajae Gaamouche, Abdelbari Redouane, Prince Acouetey, Abdennebi ElHasnaoui	Mohammadia School of Engineers, Rabat; National Superior School of Mines, Rabat;
07/06/20	Journal - Quaterly Journal of the Royal Meteorological Society	Approaches toward improving the modelling of midlatitude cyclones entering at the lateral boundary corner in the limited area WRF model	Marc Imberger, Xiaoli Guo Larsén, Neil Davis, Jianting Du	Wind Energy Department, Technical University of Denmark – Risø Campus, Roskilde, Denmark
19/11/19	Journal - Ecology Volume101, Issue3, March 2020 e02942 https://doi.org/10.1002/ecy.2942	Do differences in developmental mode shape the potential for local adaptation?	L. L. Jupe, D. T. Bilton, A. M. Knights	Marine *Biology* and Ecology Research Centre (MBERC) University Plymouth

01/06/20	Journal - Ocean Engineering Volume 205, 1 June 2020, 107298, https://doi.org/10.1016/j.oceaneng.2020.107298	A novel model to predict significant wave height based on long short-term memory network	ShuntaoFan, NianhaoXiao, ShengDong	College of Engineering, Ocean University of China, Qingdao, 266100, China
01/08/20	Journal - Quarterly Journal of Engineering Geology and Hydrogeology, https://doi.org/10.1144/qjegh2020-031 August 2020, Volume 53, Issue 3	Mapping geological events in submerged areas	L. Battaglini, S. D'Angelo and A. Fiorentino	Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA)Via V. Brancati 48 - 00144 Roma
03/03/20	Journal - Front. Mar. Sci., 03 March 2020 https://doi.org/10.3389/fmars.2020.00129	Operational Modeling Capacity in European Seas—An EuroGOOS Perspective and Recommendations for Improvement	Arthur Capet, Vicente Fernández, Jun She, Tomasz Dabrowski, Georg Umgiesser, Joanna Staneva, Lőrinc Mészáros, Francisco Campuzano, Laura Ursella, Glenn Nolan and Ghada El Serafy	MAST-FOCUS, Liège University, Liège, Belgium; European Global Ocean Observing System (EuroGOOS), Brussels, Belgium; Department of Research and Development, Danish Meteorological Institute, Copenhagen, Denmark; Marine Institute, Ocean Science and Information Services, Galway, Ireland; ISMAR-CNR, Venice, Italy; Helmholtz-Zentrum Geesthacht Centre for Materials and Coastal Research, Geesthacht, Germany; Deltares, Delft, Netherland; Mechanical Engineering Department, MARETEC–Marine Environment and Technology Center, Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal; Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Trieste, Italy
01/02/20	Journal - Environment International, Volume 135, February 2020, 105367 https://doi.org/10.1016/j.envint.2019.105367	A Pan-European high resolution storm surge hindcast	T.Fernández-Montblanc, M.I.Vousdoukas, L.Mentaschi, P.Ciavola	Universitá degli Studi di Ferrara, Department of Physics and Earth Sciences, Via Saragat, 1. 44122 Ferrara, Italy; European Commission, Joint Research Centre (JRC), Via Enrico Fermi 2749, I-21027 Ispra, Italy

01/08/20	Journal of Sea Research, Volume 163, August 2020, 101914 https://doi.org/10.1016/j.seares.2020.101914	Spatial dynamics of eukaryotic microbial communities in the German Bight	P.A.A.Sprong, V.Fofonova, K.H.Wiltshire, S.Neuhaus, K.U.Ludwichowski, L.Käse, A.Androsov, K.Metfies	Alfred-Wegener-Institute, Helmholtz-Zentrum für Polar- und Meeresforschung, 27570 Bremerhaven, Germany; Alfred-Wegener-Institute, Helmholtz-Zentrum für Polar- und Meeresforschung, Biologische Anstalt Helgoland, 27483 Helgoland, Germany; Alfred-Wegener-Institute, Helmholtz-Zentrum für Polar- und Meeresforschung, 25992 List auf Sylt, Germany; Shirshov Institute of Oceanology, Moscow 117997, Russia
30/04/20	Journal - Ocean Sci. Discuss., https://doi.org/10.5194/os-2020-28, in review, 2020	Model uncertainties of a storm and their influence on microplastics / sediment transport in the Baltic Sea	Robert Daniel Osinski, Kristina Enders, Ulf Gräwe, Knut Klingbeil, and Hagen Radtke	Leibniz Institute for Baltic Sea Research Warnemünde, Seestrasse 15, 18119 Rostock, Germany

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

9. Monitoring indicators

Table 13. Comments on progress indicators

Comments on the progress indicators in the excel template		
Progress indicator (collected using Matomo)	Means of collecting figures	Comment
1 Status/Volume and coverage of all available acquired data	Logs	
1A) Volume and coverage of available data Please explain in the narrative if you don't use the provided sea-basin figures, why you do not use them, as from when, and what do you use instead and why?	Logs	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). For indicator 1.1 we report on the % variation of the platforms for the given basin. A reduction of the % may indicate that some planforms are not delivering data. For indicator 1.2 the unit of download is measured in platforms (in coherence with indicator 1.1) while the number of downloads is 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
1B) Usage of data in this quarter		The metrics for tracking the visualization and web services has been changed several times during past 2 years (as well as the monitored item e.g. during this reporting period we extended the number of products with WMS and WFS to be monitored. Trends should be evaluated on consistent and homogeneous datasets; therefore, it is not recommendable to compare figures from this year of project with previous contracts. To have information about trends we recommend to see the submitted quarterly reports (which metrics are more consistent).
2 Status/Total number and the coverage of all built & external data products		
2A) Volume and coverage of available data products	Logs	EMODnet Physics organizes data and products according the dissemination interface therefore the volume of data is not available for each single item. Most of the EMODnet Physics products have a global

		coverage. We are updating the monitoring system in order to facilitate the extraction according the new released indicators and tables.
2B) Usage of data products since the start of the project phase	Logs	we are recording the use of all the tracked interfaces and endpoints. For some we are resolving per single item/product (GeoServer, ERDDAP and THREDDS) while products map visualization is collected all together and it is not possible to have fine details per item yet. Trends will be available with next quarterly reports and final report
3) Organizations supplying/ approached to supply data and data products	Manual	During the period the approached groups joined network and started making available data/products. EMODnet Physics data policy is very simple and well agreed by contributors. Data is open and free. For a limited set of data, EMODnet Physics is asking for authentication, before delivering downloads to users (who did the data request selection on the mapviewer). M2M and dissemination interfaces (ERDDAP, THREDDS, GeoServer) are not requiring any authentication and are delivering all the available data without any restrictions.
4) Online 'Web' interfaces to access or view data	Logs	Web Services are organized per item-interface to facilitate the tracking of their use. ERDDAP, THREDDS, web APIs, Widgets, GeoServer are providing data and products without any authentication or restriction. Some of the data that are presented on the mapviewer require authentication (e.g. coastal data from European institution - data older than 60 days). All linked datasets are unrestricted.
6) Statistics on information volunteered through download forms	Web form	This indicator provides information about users that filled the EMODnet authentication web form. It is important to remember that the number of users here reported is only a limited number of the EMODnet Physics users and the form is asked to be filled only to users accessing for the first time to data that requires authentication (i.e. coastal data older than 60 days) - it is about 30K platforms of the 800K available ones. The majority of EMODnet Physics data are downloadable without any authentication.
7) Published use cases	Graphana (TRUST-IT)	Use cases are providing an example of how EMODnet Physics data can be used for both private and public downstream applications and the once developed by private entities are keeping being the most read (e.g. wave model, tourist navigation system). It looks like that the EMODnet use case are helping advertising of such application and companies, while promoting their services, are linking their users to the EMODnet cases.

9.1) Technical monitoring	Graphana (TRUST-IT)	The system is performing well
9.2) Visual Harmonization score	TRUST-IT	The portal is processing towards the common visual harmonization recommendations as required and agreed during EMODnet SC and TWG
10) Visibility & analytics for web pages	Matomo	EMODnet Physics mapviewer is by far the most used interface with a growing trend.
11) Visibility & analytics for web sections	Matomo	EMODnet Physics mapviewer is by far the most used interface with a growing trend.
12) Average visit duration for web pages	Matomo	The metrics are in line with the users use of the EMODnet Physics sections: while they spend a limited time on the landing (background, news…) they interact with the mapviewer and platform pages - these are the key EMODnet Physics products confirming the importance of the EMODnet Physics team in keeping developing and updating them. importantly the detected bug in the tracking of this page has been fixed.

The monitoring numbers reported as part of the progress monitoring of EMODnet performance are collected through Matomo. In some cases, numbers from other monitoring systems may also be reported (e.g. Awstats, Google Analytics). Each system uses different technical approaches and therefore has its strengths and shortcomings. Therefore, results are indicative and care should be taken with interpreting absolute numbers or comparing results from different tools. It is often more sensible to consider trends over time collected by the same monitoring tool.

10. Recommendations for follow-up actions by the EU

EMODnet is a long-term marine designed to reduce fragmentation of data sources, facilitating the discovery and access to marine data and data products for multiple uses, facilitate interoperability and free of restrictions on use of data and stimulate the its use by industry, policy and scientific data users. Thanks to its step-wise approach and achieved developments and results, the 2020 target was well achieved and it is recommended to move forward into a new operational phase. This applies to all the thematic projects and to EMODnet Physics in particular.
While its basic goals remain the same, the EMODnet Physics should move towards and contribute to increasing productivity of those working on marine issues, stimulating innovation in the blue economy and reducing uncertainty in our knowledge of the behavior of the sea by increasing the accessibility and interoperability of marine data beyond the European seas.
It should be an essential contribution to the data and information sharing provisions in the Marine Strategy Framework Directive and the Maritime Spatial Planning Directive. EMODnet Physics developed collaboration with TG NOISE and RSC for MSFD11, this should continue to move forward, moreover EMODnet Physics should promote more how to use its products for implanting Marine Report Units in other MSFD indicators.

EMODnet Physics should keep working to provide additional sources of in-situ data to the Copernicus program and together with Copernicus it should work on data provenience (by providing information about the principal investigator, the applied QC/QF procedures, other links and sources for the same data, etc.).

EMODnet Physics is supporting activities at the platform level (HFR, FerryBox, mammals…). EMODnet Physics identifies, together with platform operators, tasks that can have a big impact with a minor investment. Although it made significant progress towards reducing the gap between marine data availability and accessibility, there are a number of key actions (such as the inclusion of more research vessel data, glider data, Arctic Ocean and Black Sea data – 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. To note is that the other key European infrastructures (CMEMS-INSTAC and SeaDataNet) are also benefitting from this "unlocking" action.

Another example is the support for activities bringing together communities to discuss platform-specific data issues. EMODnet Physics took the lead on these by supporting and organizing dedicated workshops. These activities are crucial to maintaining momentum among platform operators. They bring communities together in order to address and solve various data issues.
EMODnet Physics started reaching out to and serving a wider user community, including the Southern Ocean Observing System, Swiss Antarctic Circumpolar Expedition, private organizations (e.g. Saildrone, Berring Data Collective, etc.), hence it should keep working (in collaboration with the EMODnet Ingestion facility) to be the primary entry point of these community's data.

It is recommended that EMODnet Physics continues and increases these activities so that the continuing momentum will contribute to a better, data-coordinated European observation system. Participating data providers are given the opportunity of presenting their observing capabilities and data that can be of interest for ingestion into EMODnet (as well as/in partnership with CMEMS-INSTAC and SDN). Any possible data-sharing issues are discussed, and active solutions are proposed. This has contributed to making available of 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.).

The land-sea interface, i.e. coastal zone, is an area of high interest: around one third of the European population live close to the coastal zone, it hosts important commercial activities and also support 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 MFC community is 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 products by integrating both in situ, remote sensing and model output products.

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 should move into the next time-domain: forecasts (and future trends). This is particularly relevant for some of the users-parameters of the EMODnet Physics domain (namely sea level, and ocean state in terms of wave, currents and wind)

11. Annex: Other documentation attached

Table 14. Annex

Annex Number	Name	notes	Dissemination level
1	Annex 1 - List of Contributors		PU
2	Annex 2 - SOP_HFR_GUIDELINE_v1.2		PU
3	Annex 3 - EMODnetPhysics_SOOS_MoU		CO
4	Annex 4 - SOOS_AnnualReport_2019		PU
5	Annex 5 - GOOS_AniBOS		PU
6	Annex 6 - MoU Physics-CMEMS		CO
7	Annex 7 - VIII_EuroGOOS_TGTT_MOM_20200701-02		CO
8	Annex 8 - Brett et al. Nature vol.582		PU
9	Annex 9 - EMODnetPhysics_MetadataFormatSpecification_v1.2		PU
10	Annex 10 - EMODnetPhysicsProductsAPIs_202007_R1	Updated	PU
11	Annex 11 - Noise_monitoring_asset_mapping	new	CO

PU = public available
CO = confidential, available upon request
RE = restricted

12. List of abbreviations and acronyms

AniBOS	Animal Borne Ocean Sensors
API	Application program interface
BODC	British National Oceanographic Data Center
BOOS	Baltic Ocean Observing System
BRGM	French geological survey
BSH	Federal Maritime and Hydrographic Agency (Germany)
CET	Central Europe Time
CMCC	Centro Euro Mediterraneo sui Cambiamenti Climatici
CMEMS	Copernicus Marine Environment Monitoring System
CNRS	Centre National de la Recherche Scientifique
CORA	Coriolis Ocean Dataset for Reanalysis
CTD	Conductivity-Temperature-Depth
DATAMEQ	Data Management, Exchange and Quality Working group
DBCP	Data Buoy Cooperation Program
DICCA	Dipartimento di ingegneria civile, chimica e ambientale - Università di Genova (Italy)
DIVA	data-interpolating variation analysis
DMCG	Data management coordination group
DMSC	Data Management Steering Committee
DMT	Data Management Team
EASME	Executive Agency for Small and Medium-sized Enterprises
EEA	European Environment Agency
EGO	Everyone's **Gliding** Observatories
EGU	European Geophysics Union
EMFF	European Maritime and Fisheries Fund
EMODnet	European Marine Observation and Data network
EMSA	European Marine Safety Agency
EOV	Essential Ocean Variable
EU	Europe Union
EuroGOOS	European regional alliance of GOOS
GDAC	Global Data Assembly Center
GLODAP	Global Ocean Data Analysis Project
GLOSS	Global Sea Level Observing Systems
GOOS	Global Ocean Observing System
GROOM	Gliders for Research Ocean Observation and Management)
HD	Help Desk
HF radar	High Frequency radar
HFR	HF Radar
HZG	Helmholtz-Zentrum Geesthacht (Germany)

IAPB	International Arctic
ICES	International Council for the Exploration of the Sea
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
IMOS	Integrated Marine Observing System
INGV	Istituto Nazionale Geofisica e Vulcanologia
INSTAC	In Situ Thematic Centre
IOC	International Oceanographic Commission
IODC	International Oceanographic Data Commission
IOPAN	Institute of Oceanology of the Polish Academy (Poland)
ISMAR	Istituto di Scienze Marine - Consiglio Nazionale delle Ricerche (Italy)
JCOMM	Joint Commission
JCOMMOPS	JCOMM in situ Observations Programme Support Centre
JERICO S3	Joint European Research Infrastructure of Coastal Observatories: Science, Service, Sustainability
KOM	Kick Off Meeting
M2M	Machine to machine
MOM	Minute of Meeting
MOU	Memorandum of Understanding
MSFD	Marine Strategy Framework Directive
MSP	Marine Spatial Planning
NBCP	National Buoy Cooperation Program
NCEI	National Centers for Environmental Information.
NIVA	Norwegian Institute for Water Research (Norway)
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Centre
NRT	near real time
OGC	Open Geophysics Consortium
PLOCAN	Plataforma Oceanica De Canarias (Spain)
PSMSL	Permament Service for Mean Sea Level
QC	quality check
QF	quality flag
REST	Representational State Transfer
SDN	SeaDataNet
SMHI	Sveriges Meteorologiska och Hydrologiska Institut (Sweden)
SOCAT	Surface Ocean CO_2 Atlas
SOCIB	Sistema d'observació i predicció costaner de les Illes Balears (Spain)
SOOP	Ships Of Opportunity Program
SOOS	Southern Ocean Observing System
SOS	Sensor Observation Service
SOT	Ship Opportunity
SPL	Sound Pressure Level
SWE	Sensor Web enablement

TDS	Thredds Data Server
TG NOISE	Technical Group NOISE
TSM	Total Suspended Matter
UHSLC	University of Hawaii Sea Level Centre
VLIZ	Vlaams Instituut voor de Zee (Belgium)
WAF	Web Accessible Folder
WCS	Web Coverage Service
WFD	Water Framework Directive
WFS	Web Feature Service
WMO	World Maritime Organization
WMS	Web Map Service
WMTS	Web Map Tile Service
WOD	World Ocean Database
WP	Work Package
WxS	Web X Service