



EMODnet



European Marine
Observation and
Data Network

EMODnet Thematic Lot n° 3 – Physics

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EMODnet Phase III – Interim Report

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Executive summary

EMODnet Physics (www.emodnet-physics.eu) is one of the seven domain-specific portals of the European Marine Observation and Data Network (EMODnet). EMODnet Physics is developing a single point of access to both near real-time and historically validated in situ data and products.

The acquisition of physical parameters is largely an automated process allowing the dissemination of near real-time information. In particular, EMODnet Physics is a stock-share portal, strongly federated to the Copernicus Marine Environment Monitoring Service - In Situ Thematic Assembly Centre. Historical validated datasets are organised in collaboration with SeaDataNet and its network of National Oceanographic Data Centres.

The EMODnet Physics portal is currently providing easy access to metadata, data and products of: wave height and period; temperature and salinity of the water column; wind speed and direction; horizontal velocity of the water column; light attenuation; sea-ice coverage and sea level trends (relative and absolute). Recently, EMODnet Physics started working on river runoff data, total suspended matter and underwater noise (acoustic pollution).

EMODnet Physics is continuously increasing the number and type of platforms in the system by unlocking and providing high-quality data from a growing network.

For each connected 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, more 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.

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. Interoperability services are provided by a GeoServer infrastructure that is OGC compliant. The WMS and WFS layers offer information about which parameters are available (where and who is the data originator, etc.). EMODnet Physics also provides SOAP - web services which allow linkage to external services with near real-time data stream and facilitate machine-to-machine data fetching and assimilation. EMODnet Physics is also offering plot widgets¹ to embed a parameter plot/chart into an external portal.

Data and data products are accompanied by metadata covering information on ownership, data quality and data quality check procedures, as well as links to get more information on methods used for their constructions. Furthermore, EMODnet Physics has created relationships to provide data access to – and preview for – coastal data in non-European areas (e.g. NOAA platforms for the US, IAPB platforms for the Arctic area, IMOS for Australia and others) and it is providing Regional stakeholders and international networks with tools to serve their users and communities. For example:

- it is powering and hosting the South Ocean Observing System (SOOS) data portal (<http://www.soos.aq/data/soosmap>) and SOOS is helping Physics to unlock and make more valuable data available;

¹ Widget syntax: www.emodnet-physics.eu/Map/Charts/PlotDataTimeSeries.aspx?paramcode=PPPP&platid=ZZZZ&timerange=YY; where PPPP is the parameter (e.g. TEMP = sea temperature), ZZZZ is the platform ID (e.g. 8427 is Arkona) and YY is either 7 or 60 (days)

- Euskoos – the Basque Operational Oceanography System enriched its data portal and data dissemination with the EMODnet Physics widgets (<http://www.euskoos.eus/radar-eu/>), etc.;
- the underwater noise theme is creating closer and stronger connections between EMODnet Physics and Regional Sea Conventions to help Member States fulfil MSDF I.11.

The portal is now covering all European Seas as well as the global ocean and it incorporates data from supplementary physical monitoring systems: Argo (all Argo data are available), gliders, and emerging measurement systems (i.e. HF radar). It provides access to about 30,000 platforms and all available data and metadata have the same standards and formats (e.g. NetCDF, csv).

1 Introduction

The Green Paper 'Marine Knowledge 2020: from seabed mapping to ocean forecasting' [COM(2012) 437 Final] was given a vision for unlocking the economic potential of Europe's marine observations and defined the "*concept of a European Marine Observation and Data Network (EMODnet), a network of marine organisations that would provide a single entry point for accessing and retrieving marine data derived ... from the hundreds of databases ... throughout the EU.*" The communication also added that a multi-resolution digital seabed map of European waters "*... should be accompanied by access to timely observations and information on the present and past physical ... state of the overlying water column. ... All this should be easily accessible, interoperable and free of restrictions on use. It should be nourished by a sustainable process that progressively improves its fitness for purpose and helps the Member States maximise the potential of their marine observation, sampling and surveying programmes.*"

Efforts made under the ur-EMODnet preparatory action and EMODnet Physics phase II have been successful in constructing a portal providing access to near real-time data and historical time series datasets on the physical conditions of European seas and oceans and to determine how well the data meets the needs of users from industry, public authorities and scientists.

It has been based on the three established pillars in the European Oceanographic Community: (i) the EuroGOOS-ROOSs (Regional Operational Oceanographic Systems); (ii) the Copernicus Marine Environment Monitoring Service (CMEMS), and; (iii) the SeaDataNet network of National Oceanographic Data Centres (NODCs). At the end of the preparatory action in 2013, EMODnet Physics was focussing on European Seas and providing access to 429 fixed platforms and 3 ferrybox lines, and offering in situ data on temperature, salinity, currents of the water column, light attenuation, sea level, waves and wind.

A strong effort was made in ur-EMODnet Physics to build consensus and support to the DGMARE initiative. From the beginning, EMODnet physics has created collaborative relationships to provide data access to – and preview for – coastal data in non-European areas (e.g. NOAA platforms for the US, IAPB platforms for the Arctic area, IMOS for Australia and others).

At the end of phase 2, in 2016, the portal was extended to the global Ocean and it is now providing access to more than 13,000 platforms giving more than 30,000 time series on temperature, salinity, currents of the water column, light attenuation, waves and wind. Sea level trends and ice (extent and thickness) were also added to the collection.

During the second phase, an increasing effort was also dedicated to the assessment of Quality Assessment – Quality Control procedures. QA-QC are essential components of oceanographic data management. They tell users of the data how it was gathered, how it was checked, processed, what algorithms were used, what errors were found, and how the errors have been corrected or flagged. Without them, data from different sources cannot be combined or re-used to gain the advantages of integration, synthesis, and the development of long time series. At the end of the second phase,

marine data from diverse sources (circa 80 institutions) were made more visible, accessible and interoperable, and while doing this EMODnet Physics was supporting actions on the adoption of common Quality Assessment - Quality Control protocols, by participating at dedicated meetings and projects.

With this legacy, and collaborating with a wide networks of experts, on 29 March 2017, the EMODnet Physics core consortium (ETT, EuroGOOS, MARIS, IFREMER) started the phase 3 contract 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 is developing and maintaining:

- a common method of access to data held in repositories and integrators in coherence with efforts of regional sea conventions and ROOS data systems;
- products constructed from one or more data sources that provide users with information about the distribution of parameters in time and space;
- procedures for machine-to-machine procedures compliant to OGC and de-facto standards to connect to and made available data and data products;
- a web portal allowing users to find, visualise and smoothly process the download of data and metadata;
- interoperability with data distributed by non-EU organisations;
- the process of monitoring performance and dealing with user feedback;
- help-desk offering support to users.

Further to wave height and period, temperature of the water column, wind speed and direction, salinity of the water column, horizontal velocity of water column, water clarity (light attenuation), changes in sea-level and ice cover, EMODnet Physics has to make available data and products for two new parameters, namely data from rivers and underwater sound.

During this first project year of activity, EMODnet Physics assembly was able to make available about 30,000 platforms and more than 400,000 datasets, to re-organise and renew the portal and its features, and to publish more than 350 map layers².

The acquisition of physical parameters is largely an automated process allowing the dissemination of near real-time information. In particular, EMODnet Physics is a stock-share portal strongly federated to the Copernicus Marine Environment Monitoring Service - In Situ Thematic Assembly Centre. EMODnet Physics is operationally processing this data flow to generate map layers and extract in situ

²<http://geoserver.emodnet-physics.eu/geoserver/web/wicket/bookmarkable/org.geoserver.web.demo.MapPreviewPage?1>

(monthly) trends, averages, peak values of the parameters. Historical validated datasets are organised in collaboration with SeaDataNet and its network of National Oceanographic Data Centres, 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 collections broker between the users and the NODCs. 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 developing and supplying the full data management, hosting and dissemination chain.

2 Highlights in this reporting period

1. EMODnet Physics is actively working on the community engagement at both European and International level. Some examples are: the collaboration with the South Ocean Observing System (SOOS), for which EMODnet Physics is empowering the data portal and the collaboration between the two, will bring and make available more data as recorded in the Antarctic area; the collaboration with EMODnet Data Ingestion (and the planning to join (National) workshops to unlock and ingest new and more data; the collaboration with PSMSL and SONEL to connect and make available (absolute and relative) sea level trends; the collaboration with SeaDataNet community and SeaDataCloud project to connect and make available Temperature and Salinity Climatology; etc.
2. In less than one year's activities, the system went through many developments and updates, of which a not exhaustive list comprises: the look and feel; development of new interoperability layers, e.g. ERDDAP; inclusion and connection of new datasets, e.g. CTD, XBTs; new platforms, e.g. river stations, underwater noise etc., together with the development of new products. EMODnet Physics landing and data portal was restyled and they are now offering customised pages and services for each typology of recording platform. In parallel, EMODnet Physics backbone interoperability infrastructure was empowered and enriched by extending the THREDDS catalogue, adding new and more layers on the GeoServer interface, adding the ERDDAP interface and further developing the widget features.
3. The data portal was enriched with both operational river data (river outflow) from about 130 stations. A preliminary in situ river runoff product (derived from the Global Runoff Data Centre database) and a gridded total suspended matter (derived from an Ocean Color product) product are available and accessible from the EMODnet Physics portal.
4. The Under Water Noise theme was identified as the topic for the engagement of the Regional Sea Conventions. EMODnet Physics participated in TG NOISE and had specific meetings with HELCOM and OSPAR. Making more operational data available (in terms of parameters and format that are close to MSFD I.11 requirements), offer a single European entry point to impulsive noise registries (MSFD I.11.1) and work on (regional) sound maps, are three key identified activities for Physics. Furthermore, the very first operational underwater noise data (i.e. Sound Pressure Level – SPL), and HELCOM and OSPAR impulsive sounds registry were included (ICES database) and are now available on the portal.
5. Follow up on the MoU with CMEMS. CMEMS INSTAC is one of the EMODnet Physics pillars: EMODnet Physics is using many of the CMEMS INSTAC products to plot, redistribute data and create new products. While doing this, EMODnet Physics is supporting CMEMS INSTAC to update the infrastructure, improve the quality of data and unlock and connect more providers and new data to this common backbone infrastructure. During this year, while continuing to work at the technical level, we started working on common communication strategy and materials to highlight the importance of collaboration, synergy and complementarity.

6. The coordination meetings with networks and both European and international initiative (e.g. SONEL, PSMSL, SOOS, DOOS, EuroGOOS Task Teams, etc.) permitted a better definition of the methodology to interoperate and cross-link with these infrastructure/programs. The main outcomes of these meetings are recommendations on how to streamline data flow and how to design the EMODnet Physics web interface to present and make available the datasets and products, fully compliant with the data/products originators' recommendations and expectations. These meetings are very important for a well synchronised and widely accepted EMODnet Physics portal and action developments.

7. EMODnet Physics data policy is open and free and, in agreement with its pillars and the provider network, the user can download in situ data without authentication in the case of operational data for the past 60 days, operational data from platforms participating in international programs (e.g. ARGO) and data from providers that specifically requested them. The user is asked to authenticate (CMEMS Service Level Agreement) for data older than 60 days and reprocessed/delay mode in situ data, and (SDN Service Level Agreement) for requesting CDI - historical data hosted by National Oceanographic Data Centres. Thanks to this policy, during the reporting period, EMODnet Physics registered, 43.104 manual data download requests (27,089 near real time, 16,015 reprocessed), more than 750,000 web services transactions and 941 CDI datasets requests. EMODnet Physics products (trends and maps) are available without authentication and they registered more than 4,000 views (Map page registered more than 30,000 views and the landing page more than 19,000 views).

3 Summary of the work done

A check of the planned actions and achieved developments indicate that the project is progressing well and in line with the schedule and planned actions. In one year of activities, the system went through many developments and updates. A not exhaustive progress list is: the look and feel; development of new interoperability layers, e.g. ERDDAPP; inclusion and connection of new datasets, e.g. CTD, XBTs; new platforms, e.g. river stations, underwater noise, etc. These, together with the development of new products (e.g. total suspended matter) and the inclusion of third parties products (e.g. SDN climatology, impulsive noise registries), are generating good dynamism of the portal features and facilitating links with other thematic lots, ingestion facility as well as connection with non-EU parties.

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

The acquisition of physical parameters is largely an automated process allowing the dissemination of near real-time information and EMODnet Physics, and is federated to the Copernicus Marine Environment Monitoring Service - In Situ Thematic Assembly Centre. 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 organised in collaboration with SeaDataNet and its network of National Oceanographic Data Centres, which are supplying EMODnet Physics with products (climatology) on temperature and salinity of the water column. EMODnet Physics is also acting as an in situ historical data collections broker between the users and the NODCs. 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 developing and supplying the full management, hosting and dissemination chain for operational data. For these new themes, EMODnet Physics is also integrating and connecting to established databases for data preservation (e.g. Global Runoff Data Centre, ICES database for impulsive noise registry, etc.).

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

The inclusion of data in the EMODnet Physics Portal is normally done with ad-hoc interfaces that differ from provider to provider. However, EMODnet Physics users have access to data with ISO standard tools and interfaces. Interoperability is achieved with the use of common vocabularies and the adoption of INSPIRE compliant services. All data collected within a defined time and space window can be found, visualised and downloaded in a way that makes the physical location of the data invisible to a user and that allows data from different sources to be assembled without further processing. EMODnet Physics provides viewing and download features for both in situ data, in situ products and data product maps. Each available dataset or product is presented together with its metadata and information about its temporal and spatial coverage. The web interface also offers tools to filter data according to age, depth, geographical coverage, physical parameters, etc. Data products for currents (radar), temperature (in situ NRT, in situ MEOP, gridded monthly men, climatology), salinity (in situ NRT, in situ MEOP, gridded monthly men, climatology), sea level (relative sea level trends from PSMSL, absolute sea level trends from SONEL), river input – total suspended matter, underwater noise, sea ice, are now available to users.

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

EMODnet Physics updated its machine-to-machine interfaces and now users can use web services, ERDDAPP, THREDDS, GeoServer layers, etc. To facilitate the use of the available services, documentation and details on available machine-to-machine interfaces were made available on github: <https://github.com/EMODnet-Physics/EMODnet-Physics-Documentation>

Task 4 Develop a web portal allowing users to find, visualise and download data

The portal has been completely re-designed according to new specifications agreed during and after the EMODnet Steering Committee. While updating the portal, new features were added and the user is now able to filter by data age and depth. Each platform and for each parameter, examples of scripts on how the user can connect/use widgets/download data are provided.

Task 5 Ensure the involvement of regional sea conventions

The Under Water Noise theme was identified as the topic for the engagement of the Regional Sea Conventions. EMODnet Physics participated in TG NOISE (and it is now an official permanent invited member to the board), and had specific meetings with HELCOM and OSPAR. Making available more operational data (in terms of parameters and format that are close to MSFD I.11 requirements), offer a single European entry point to impulsive noise registries (MSFD I.11.1) and work on (regional) sound maps are three key identified activities for Physics. Furthermore, the very first operational underwater noise data (i.e. Sound Pressure Level – SPL), and HELCOM and OSPAR impulsive sounds registry were included (ICES database) and are now available on the portal.

Task 6 Facilitate interoperability with data distributed by non-EU organisations

EMODnet Physics has created relationships to provide data access to – and preview for – coastal data in non-European areas (e.g. NOAA platforms for the US, IAPB platforms for the Arctic area, IMOS for Australia and others) and it is providing Regional stakeholders and international networks with tools to serve their users and communities, e.g. it is powering and hosting the South Ocean Observing System (SOOS) data portal (<http://www.soos.aq/data/soosmap>) and SOOS is helping Physics to unlock and make more valuable data available, Euskoos – the Basque Operational Oceanography System enriched its data portal and data dissemination with the EMODnet Physics widgets (<http://www.euskoos.eus/radar-eu/>), etc. EMODnet Physics is also supporting and contributing to the **Ocean Data Interoperability Platform (ODIP)** for an effective sharing of data across scientific domains and international boundaries. The EMODnet Physics activity in this task includes specific applications concerning big data, cloud computing and collaborative workspaces.

Task 7 Install a process to monitor performance and deal with user feedback

Progress indicators and monitoring services have been developed and EMODnet Physics is monitoring the portal use. It also includes Matomo scripts to let the EMODnet secretariat extract common and harmonised indicators. Based on this tracking tool, EMODnet Physics is now offering a monthly report (the user has to subscribe to receive it) with stats on its platforms use and downloads. The report is sent by email to providers to inform them about the use (number of hits, most viewed datasets etc.) of their platforms/datasets via EMODnet Physics. This is one of the most appreciated developed tool and since it was published EMODnet Physics is recording an increasing number of interested users. It is now serving: AZTI (Spain), SOCIB (Spain), IFREMER (France) and University of St. Andrews (UK). Registered on the service are NIB (Slovenia), PdE (Spain), UPC (Spain), OGS (Italy), HCMR (Greece), BSH (Germany), DMI (Denmark), MI (Ireland), IOPAS (Poland) and University Lisboa (Portugal). The deputy for the MEOP project, as well as the technical office of SeaDataNet and JericoNext project, are also registered on the service.

Task 8 Operate a help-desk offering support to users

As planned, the services were developed and EMODnet Physics is both operating a help-desk to deal with user feedback and need for support. The help-desk is based on an automatic e-mail/ticketing system working 24/7. Help-desk operators are informed about received requests and provide feedback during working hours (from 9:00 to 17:00 - Brussels time - Monday to Friday). Preliminary feedback is provided within 24h, in case of need, help-desk operators can forward/request help from the EMODnet Physics network of experts (and its pillars).

Since the help-desk entered service, EMODnet Physics collected 36 requests for help (Table 6). The requests were mainly asking for correction of metadata and helping to find and download specific datasets.

For efficient management of the project we added a project management task and organised four Work Packages (WP):

WP #	WP Title	Corresponding Tasks
WP 1	Project management	Task 9. Project management Task 5. Ensure the involvement of regional sea conventions
WP 2	Data Collection, Metadata Compilation, Data Access and Products	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 Task 6. Facilitate interoperability with data distributed by non-EU organisations
WP 3	Portal Technical Development and Operation	Task 3. Develop procedures for machine-to-machine connections to data and data products Task 4. Develop a web portal allowing users to find, visualise and download data
WP 4	Analysis, evaluation and feedback	Task 7. Install a process to monitor performance and deal with user feedback Task 8. Operate a help-desk offering support to users

Details on the WP activities and tasks are presented in Chapter 6.

4 Challenges encountered during the reporting period

Main challenge	Measures taken
Machine-to-machine connections and interoperability services	The development of the ERDDAP layer on top of the EMODnet Physics data took more than expected as the data format was not fully compliant with the catalogue. The ERDDAP development team (erddap@googlegroups.com) suggested a re-write of the netcdf files. EMODnet Physics is now equipped with a service layer that re-organises the variables and re-writes data to have them available on the EMODnet Physics ERDDAP server. The procedure is only applied to the latest 60 days near real-time data flow.
Interoperate with the OAI-PMH that is a widely used standard by both European entities (e.g. PANGAEA) and non-EU organisations	<p>The analysis of the system indicates that the PANGAEA system is not interoperable at the data level. PANGAEA is exposing metadata and it is literature results oriented.</p> <p>The PANGAEA information system is operated as an Open Access library aimed at archiving, publishing and distributing georeferenced data from earth system research. Each dataset can be identified, shared, published and cited by using a Digital Object Identifier, and metadata can be explored by interoperability services.</p> <p>While EMODnet Physics is designed with the measuring platform/station at the centre, the PANGAEA database is organised with the parameters at the centre and once data is registered in the PANGAEA system it is not straightforward to find the connection with the platform that generated the data.</p> <p>The interoperability/connection can only be developed on a selected list of datasets. Some data sets (e.g. data from Polastern and other vessels) are of interest to different communities and EMODnet Physics users/partners (SOOS, SDN etc.), therefore Physics will focus on these specific datasets.</p>
Extend the capacity of EMODnet Physics to integrate historical data hosted in unstructured databases (e.g. GOSHIP)	Many GOSHIP data are already integrated either in CMEMS INS REP products or in SDN. Some of these are already available in the system. We need to work on shortcuts to facilitate the user to find these datasets.
Develop a common method of access to data held in repositories	Copernicus INSTAC has developed its own data portal, http://www.marineinsitu.eu/dashboard . This created some confusion among users. After discussions with CMEMS INSTAC it was agreed to keep the CMEMS INSTAC viewing service as it provides visibility to the INSTAC activities and to increase the cross-links to better promote synergies and cooperation.

Table 1. Challenges

5 Allocation of project resources

The total budget of EMODnet Physics is 1,400,000 euros, divided as follow:

Task description	Total	Resource usage (%)
Task 1: Develop a common method of access to data held in repositories	110,000.00 €	80%
Task 2: Construct products from one or more data sources that provide users with information about the distribution of parameters in time and space	175,000.00 €	65%
Task 3: Develop procedures for machine-to-machine connections to data and data products	270,000.00 €	80%
Task 4: Develop a web portal allowing users to find, visualise and download data	280,000.00 €	70%
Task 5: Ensure the involvement of regional sea conventions	70,000.00 €	50%
Task 6: Facilitate interoperability with data distributed by non-EU organisations	140,000.00 €	65%
Task 7: Install a process to monitor performance and deal with user feedback	80,000.00 €	60%
Task 8: Operate a help-desk offering support to users	135,000.00 €	60%
OTHER GENERAL COSTS - project Management	140,000.00 €	65%
EMODnet Physics budget	1,400,000.00 €	

Table 2. tasks and resources split

If we arrange the task into categories, we have the following table:

Categories	Resource usage (%)
Making data and metadata interoperable and available (Task 1, Task 3 and Task 6)	75%
Preparing data products (Task 2)	65%
Preparing web-pages, viewing or search facilities (Task 4 and Task 6)	68%
Managing user feedback (Task 7 and Task 8)	65%
Project management (Task 9)	
Outreach and communication activities (Task 9 and Task 5)	58%
Others	-

Table 3. Categories and resources split

From the tables, it appears that during the first year, partners had to invest and spend 65-70% of the overall budgets for the 2 year project. This is almost in line with the activity plan which requires proportionally extra efforts in the first year for consolidating the common method of access to data held in repositories, design and start constructing products, developing the portal and related services (in particular the machine-to-machine interfaces and the help-desk and monitoring tools). Obviously, the need for management was high and intensive.

6 Work package updates

6.1 WP1 – Project Management

The general objectives of WP1 are the project management and the coordination of all project activities ensuring timely delivery and high quality of documentation, tools, results and products. Project management includes the collaboration with the other EMODnet activities and involvement of regional sea conventions. This work package includes Task 5. Ensure the involvement of regional sea conventions

Description:

- **Collaboration with the other EMODnet lots**

Since the very beginning of the current phase, EMODnet Physics planned joint activities and strong collaboration with Biology, Chemistry and Seabed Habitats.

Physics and Biology – Physics is collecting and making available oceanographic data as collected by tagged sea animals. Together with the physical parameters (typically temperature and salinity of the water column), EMODnet Physics is also receiving the track of the animals as well as information about the animal (species), that are made available as map/GeoServer layers to Biology.

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 the machine-to-machine interfaces. A further topic of collaboration is the river data management, and Chemistry designed a common strategy to deal with it and data providers: while Chemistry is focusing on nutrients, Physics works on the river flow (both near real-time data and historical data) and on the development of a total suspended matter product.

Physics and Seabed Habitats - the possibility was discussed to let Physics host and/or make available via web service hosted by Seabed Habitats, the Kinetic Energy on the Seabed and Light Availability on the Seabed products produced by Seabed Habitats. Technical details have yet to be defined and planned.

More recently, Physics and Human Activities started discussing the possibility to assimilate the coming Human Activity ship density maps for generating underwater sound-maps.

Physics and Data Ingestion – the two projects are working in tight synergy. Besides collaborating on the ingestion and long-term safekeeping of the datasets towards NODCs, they are cooperating to establish permanent connections (data flow) with new operational oceanography data providers. While near real-time data are streamlined towards the well-established EuroGOOS and CMEMS INS TAC integration facilities, Physics and Data Ingestion are developing a pilot for real-time data exchange using Sensor Web Enablement (SWE) with the goal of allowing direct standardised access to selected data types from selected monitoring instruments. A beta version of the viewer that is

presenting the RT data exchange from pilot/champion platforms has been recently published (www.emodnet-physics.eu/realtime).

Physics and Data Ingestion are also jointly organising a series of national workshops to present the EMODnet program, thematic activities (with a special focus on Physics), the ingestion facility, and to mobilise new providers to join the network and make their data available and accessible.

A first workshop was held in Galway (Ireland) to involve organisations working in Ireland, Northern Ireland and Scotland. A second workshop is already planned (26/4/2018) in Sopot (Poland)³ in collaboration with all the Italian thematic lots partners we set up and Italian EMODnet Day (8/6/2018) in Trieste. We also started planning an event for Portugal and Spain in early December. Moreover, we are working on a first network/platform oriented workshop: EMODnet Physics and Data Ingestion are organising an international glider-operators workshop (18-21 September 2018, Genoa, Italy) with the aim of sharing data management best practices and unlock more data. A second one for ferrybox operators is planned in spring 2019.

- **Engagement of the RSCs and underwater noise**

The main outcome of the interaction with HELCOM OSPAR and TG NOISE is that the specific EMODnet Physics theme of interest for RSCs is the underwater noise. The participation in the meetings (see table XX) was very useful to get an overall overview of TG NOISE, and OSPAR and HELCOM activities on noise data management and MSFD I.11. The meeting covered subjects from TG Noise scope, composition and rules of procedure, CIS, the implementation of operational monitoring for sea basins/sea conventions, the state-of-the-art of impulsive registries, and the outcome from pilot projects for ambient noise assessment. After the EMODnet Physics presentation, both OSPAR, HELCOM and Barcelona convention representatives expressed the intention of seeing/establishing a connection between their registries and EMODnet Physics (that can provide the “European” gate to these federated infrastructures). Making available more operational data (in terms of parameters and format that are close to MSFD I.11 requirements), offer a single European entry point to impulsive noise registries (MSFD I.11.1). Work on (regional) sound maps are three key identified activities for Physics.

In this framework, the HELCOM - BIAS project already developed a prototype to provide Member States with indicators compliant to MSDF I.11.2 requirements: the plan is that EMODnet Physics can follow up on the developed tools and help the HELCOM members to manage data flow and product accessibility by adopting and adapting the BIAS project results.

- **Coordination with MERCATOR - CMEMS**

Since August 2016, a formal MoU between EMODnet Physics and MERCATOR on the in situ data management and presentation is in place. The continuous interaction is improving the quality of

³ The workshop will discuss about recent OGC SWE standards, data model (SensorML), and protocols (SOS) to provide real time access to data. EMODnet program, EMODnet Physics, which builds upon CMEMS-INSTAC, EuroGOOS and SeaDataNet to streamline operational and historical data flow, and EMODnet Data Ingestion will be presented to facilitate the participation of Polish operators in the exchange of data.

the offered service, e.g. it is facilitating the unlocking of new extra data that are contributing to the improvement of in situ product quality, reducing data duplication, cleaning the metadata, facilitating access and use of data and products.

- **International cooperation**

The EMODnet Physics team is actively participating in international groups and committees in order to promote European standards and facilitate data, products and best practice exchange. Being EMODnet Physics officers, the members of the core team are involved in different projects and programs (e.g. AtlantOS, JericoNEXT, SeaDataCloud, CMEMS INSTAC, CMEMS DU, etc.) to make links between the projects and EMODnet with a particular focus on the data flow management infrastructure and standards. This is facilitating and increasing the cooperation of the various communities across Europe and between Europe and non-European Countries, as well as the increase of available data in EMODnet Physics and its pillar infrastructures.

The core team is serving WIS, WISC, etc. It is strongly engaged in IOC-IODE activities and the international interoperability efforts through ODIP.

After joining the Southern Ocean Observing System (SOOS) Data Management Steering Committee (DMSC), the EMODnet Physics team was invited to participate in the Deep Ocean Observing System (DOOS) Data Management Working group.

Since June 2017, EMODnet Physics is also offering/hosting the map viewer for the SOOS Portal (<http://www.soos.aq/data/soosmap>). This collaboration will bring more data into EMODnet Physics and serve different European organisations working in the southern oceans.

6.2 WP2 – Data Collection, Metadata Compilation, Data Access and Products

The objectives of WP2 are to identify 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 reduce spatial and temporal gaps in cooperation and collaboration with the underlying EuroGOOS ROOSs, CMEMS INS TAC, and SeaDataNet NODCs infrastructures, as well as EMODnet Data Ingestion. Part of this activity is to develop EMODnet Physics services with user-friendly interfaces for data and metadata uploading, data tracking, and to provide 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 6. *Facilitate interoperability with data distributed by non-EU organisations*.

Description:

EMODnet Physics is developing an **operational service where near real-time and historical validated marine data are made interoperable and freely available**.

More specifically, EMODnet Physics data policy is open and free and, in agreement with its pillars and the provider network, the user can download in situ data without authentication in case of operational data for the past 60 days, operational data from platforms participating to international programs (e.g. ARGO) and data from providers that specifically request it. The user is asked to authenticate (CMEMS Service Level Agreement) for data older than 60 days and reprocessed/delay mode in situ data, and (SDN Service Level Agreement) for requesting CDI - historical data hosted by National Oceanographic Data Centres

The acquisition of physical parameters is largely an automated process allowing the dissemination of near real-time information. In particular, EMODnet Physics is a stock-share portal strongly federated to the Copernicus Marine Environment Monitoring Service - In Situ Thematic Assembly Centre. The transport format is NetCDF (CF Convention), as defined by the EuroGOOS DATAMEQ working group, and includes metadata and data quality flag. Data quality is flagged according to an automatic – unsupervised procedure. EMODnet Physics is operationally processing this data flow to generate map layers and extract in situ (monthly) trends, averages, peak values of the parameters. Historical validated datasets are organised in collaboration with SeaDataNet and its network of National Oceanographic Data Centres, 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 the users and the NODCs. For the historical validated datasets (fixed stations – mooring, tide gauge) the metadata format is the CDI (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 developing and supplying the full data management, hosting and dissemination chain.

One specific focus for the next period is to make available in Physics more historical datasets as validated by NODC, in particular, repeated measurement by means of moving platforms on the same positions.

- **Sea Level**

Sea level is probably the single most important ECV, considering that its evolution over the next few decades is predicted to cause trouble to millions of people, especially in vulnerable areas.

By integrating more than 400 European tide gauge stations, the 290 Global Sea Level Observing System (GLOSS) core network, and more than 1,300 Permanent Service for Mean Sea Level (PSMSL), EMODnet Physics is offering one of the widest in situ data collections for sea-level data.

Based on the PSMSL collection, EMODnet Physics is already making available maps of relative sea level trends, and during the coming months, the portal will be enriched with maps of absolute sea level based on the SONEL product.

- **HFR radar data management**

In collaboration with SeaDataCloud, EMODnet Physics is working on the task “Ingesting, validating, long-term storage and access of HF Radar data” (June 2019). Thanks to the work done by EMODnet Physics II (in collaboration with EuroGOOS, JERICONEXT, and CMEMS SE INCREASE), CMEMS INSTAC

is now working on the integration of HFR data into the Currents product (2019). This joint effort represents an excellent example of how to close (not to create) the gap in the data flow from European platform operators to data infrastructures and integrators.

• **River Data**

The activity of EMODnet Physics is focusing on River Runoff and the development of a total suspended matter product. Whenever possible, links and joint activities are established with EMODnet Chemistry.

During the reporting period, EMODnet Physics developed a dedicated data infrastructure to manage river stations, and both near real-time (about 100 stations) and historical trends (in situ trends are an EMODnet Physics product and are computed from the Global Runoff Data Base data) are available. Key progress on the river data inclusion activities are:

- Ingestion of more and new operational systems: EMODnet Physics is now connecting platforms from Portugal, Spain, France, Germany, Belgium, Ireland, UK, and Italy⁴. Data structure follows that already adopted for the management of data coming from other networks: the transport file is netcdf v3.6 (and v.4.0), data is being stored in a data server with three folders according to data age: latest, monthly and history. CF convention/SeaDataNet P09 are used for parameters.
- In situ river outflow trends (computed on the Global Runoff Database) with data coverage until 31/12/2016.
- Total Suspended Matter TSM (conc_tsm, mg/l) is a product of 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 the 300 m full resolution, in order to obtain L3 products over the Seas basins and monthly averaged (at the moment the product is covering Italian Seas and we're working on covering all European Seas). TSM is in progress, already available for the Ligurian, Tyrrhenian and Adriatic Seas (2002-2016).

• **New ingested and connected platforms and datasets**

In collaboration with EMODnet Ingestion, the following datasets/platforms were ingested and are already connected and available in Physics:

- Near Real-time
 - 30 tide gauge stations, Italian TG network, ISPRA via GLOSS
 - 4 fixed stations, 2 gliders, 2 turtles, 2 FB, SOCIB
 - HFR data (Brest Bay: Pointe de Brézellec- Pointe de Garchine), SHOM
 - 23 Ferryboxes (StenaLines), SMHI
 - 10 fixed wind station, 2 HFR, IMR
- Historical data
 - >1100 sea mammals data, 2004 – 2015, MEOP DB
 - 3 fixed buoys (Civitavecchia, Gaeta), 2012 -2017, Uni. Tuscia
 - HFR data (Naples, Manfredonia, Trieste), CNR ISMAR, RITMARE project.
 - HFR data (MESA, vADE), 2014-2015, SMHI
 - Repeated CTD (Galway Bay), 2016-2018, MI

⁴ France, Germany, Belgium and UK are integrated via CMEMS INSTAC, which do not perform any QC/QF

6.3 WP3 – Portal technical Development and operation

The objectives of WP3 are to implement and extend the www.emodnet-physics.eu portal allowing users to find, visualise and download data and data products and their metadata. This includes the development of procedures for machine-to-machine connections to metadata, data and data products and services compatible with INSPIRE, EMODnet and OGC standards and requirements. The portal also has to develop monitoring tools of the website performance and usage.

This WP includes Task 3. *Develop procedures for machine-to-machine connections to data and data products*, and Task 4. *Develop a web portal allowing users to find, visualise and download data*.

Description:

Most of the portal pages were renewed, both for content and layout. Whenever possible the new specifications, as agreed during and after the EMODnet Steering Committee, were adopted. The new landing page is offering direct links to main services and (M2M) interfaces. The map page was reorganised to provide both temporal and depth filtering features. The platform page is presenting the metadata (data owner, provider, typology of platform etc.), plots for the latest 7/60 days (the user selects the variable), quick download features and trends/averages for the given parameter. Two plots for trends/averages are available: the time series (one point per month) and annual time series (each line is one year of recordings). Links to source products are indicated (and selectable) as well as the QF. A new section on "Documentation and M2M" is now collecting and presenting relevant information about the platform (e.g. which network it belongs to) and available machine-to-machine services (e.g. examples of how to call back the plots widgets, how to use ERDDAP catalogue, link to the THREDDS catalogue, etc.). All interfaces are linked and the user can easily pass from one catalogue/service to the other and select and use the one that most suits his needs.

A new section to offer and manage map products (temperature, salinity, currents, sea level trends, ice coverage, river and water noise) is also available.

- **EMODnet Physics machine-to-machine (M2M) and interoperability features**

To facilitate the use of the available services, documentation and details on available machine-to-machine interfaces were made available on github: <https://github.com/EMODnet-Physics/EMODnet-Physics-Documentation>.

1. From EMODnet Physics to end-users

Service	Description	Examples
permaURL	All platforms	http://www.emodnet-physics.eu/map/platinfo/piradar.aspx?platformid=10273 http://www.emodnet-physics.eu/map/platinfo/pidashboard.aspx?platformid=10273 Service description @ http://www.emodnet-physics.eu/map/spi.aspx
API REST/SOAP	Latest 60 days of data	www.emodnet-physics.eu/map/Service/WSEmodnet2.aspx www.emodnet-physics.eu/map/service/WSEmodnet2.asmx
OGC WMS, WFS,	Postgresql + Geoserver	geoserver.emodnet-physics.eu/geoserver/web examples and service description @ www.emodnet-physics.eu/map/service/GeoServerDefaultWMS www.emodnet-physics.eu/map/service/GeoServerDefaultWFS
THREDDS (OpenDAP, WMS, WCS)	Latest 60 days + HFR data + Ice	thredds.emodnet-physics.eu/thredds/catalog.html
ERDDAP	Latest 60 days	erddap.emodnet-physics.eu
widgets	All plots	www.emodnet-physics.eu/Map/Charts/PlotDataTimeSeries.aspx?paramcode=TEMP&platid=8427&timerange=7

Table 4. machine-to-machine services

2. From providers to EMODnet Physics

In collaboration with Data Ingestion, we are working on Sensor Web Enablement and SensorML templates for identified sensors/platforms.

A first draft of the SWE profiles is now published at <https://odip.github.io/MarineProfilesForSWE/>. This site includes a story that narrates how projects, people, technologies and vocabularies were brought together to formulate meaningful and semantically rich profiles for the marine domain. The related EU-projects that have funded this effort are listed under the above-mentioned URL.

Examples of sensors described with SensorML following the SWE Marine profiles and can be found at:

- A model of an Aanderaa oxygen optode:
http://linkedsystems.uk/system/prototype/TOOL0969_/current/
- An instance of an oxygen optode:
http://linkedsystems.uk/system/instance/TOOL0969_prospect/current/
- An instance of a Wind Monitor-JR:
http://europa.ogs.trieste.it/OGS_SOS/SensorML_3_0/Sensor_V3_E2M3A_WIND.xml
- An instance of SBE 37-SMP-ODO MicroCAT high-accuracy conductivity and temperature recorder: http://europa.ogs.trieste.it/OGS_SOS/SensorML_3_0/Sensor_V3_E2M3A_CT.xml

- **Interoperability with data distributed by non-EU organisations**

EMODnet Physics is connecting data to and from a number of international initiatives and presenting them in the Physics portal. Below some examples where Physics is actively linking and collaborating on the global scale.

Many of the platform specific tasks Physics is working on, in some cases together with EuroGOOS Task Teams, are representing the European voice on the global scale and directly contributing to a better coordinated global observation system. EMODnet Physics, in combination with EuroGOOS, is the vehicle to contribute to an asset mapping within the GOOS GRAs (GOOS Regional Alliances), http://goosocean.org/index.php?option=com_content&view=article&id=83&Itemid=121, an activity that is making more data available on the global scale and ingested to the physics portal. Other activities where European platform oriented activities and Physics link to international initiatives are with HF Radars, GOSUD (ship observations), <http://www.gosud.org/>, Marine mammals data via the MEOP consortia, <http://www.meop.net/>, underwater noise via Lido, Listening to the deep ocean environment, <http://www.listentothedeep.com/> and quiet oceans, <http://www.quiet-oceans.com/>. Further Physics is working with the European glider community via Ocean Gliders. In this case Physics is hosting an international glider data management conference in September 2018 to increase the cooperation and collaboration in Europe and beyond and by this increase the amount of glider data in Physics and at the same time agree on data standards for Europe taking into account standards and protocols used in other, global, initiatives. EMODnet Physics connects data from IMOS/AODN (Australia), <http://imos.org.au/>, IOOS (US), <https://ioos.noaa.gov/>, and other regional initiatives. In fact, the US is one of the most frequent downloaders of data and information from the physics portal. These activities strengthen the EMODnet role as the European marine data provider and increase collaboration on the global scale. Physics is working in close collaboration with SOOS, the Southern Ocean Observing System where Physics have set up a mirror portal for SOOS, SOOSMap, <http://www.soos.aq/data/soosmap>, acting as a shopping window for SOOS data and information. This has created a fine momentum in the region by increasing the data sharing activities by identifying new data sources and adding them to the portal and contributed to a better organised SOOS. This is a win-win where Physics offers the portal and SOOS populates it, thus increasing the amount of data from the region also available to EMODnet Physics.

Finally, EMODnet Physics has been invited to be members of DOOS, Deep Ocean Observing Strategy, <http://www.deeпоceanobserving.org/>, data team promoting open access to deep ocean data and information products to support science and societal needs on the global scale.

6.4 WP4 – Analysis Evaluation and Feedback

WP4 is aimed at reporting the effectiveness of the system in meeting the needs of users and other EMODnet portals, assess the robustness of the developed information system and operate the help-desk to deal with user feedback and need for support. This WP includes Task 7. *Install a process to monitor performance and deal with user feedback*, and Task 8. *Operate a help-desk offering support to users*.

Description:

As planned, the services were developed and EMODnet Physics is operating a help-desk to deal with both user feedback and the need for support. Since the help-desk entered service, EMODnet Physics collected 36 requests for help (Table 6). The requests were mainly asking for correction of metadata and helping to find and download specific datasets.

As planned, EMODnet Physics is also collecting (number of hits, amount and type of data used, etc.) and reporting:

- 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);
- databases connected to the system;
- number of providers, type and amount of provided data and data products.

EMODnet Physics dashboard was reorganised and integrated with some new features. The new entry point is <http://www.emodnet-physics.eu/map/service/Dashboard/default.aspx>.

Based on this tracking tool, EMODnet Physics is now offering a monthly report (the user has to subscribe to receive it) with stats on its platforms use and downloads. The report is sent by email to providers to inform them about the use (number of hits, most viewed datasets etc.) of their platforms/datasets via EMODnet Physics. This is one of the most appreciated tools developed, and since it was published EMODnet Physics is recording an increasing number of interested users. It is now serving: AZTI (Spain), SOCIB (Spain), IFREMER (France) and University of St. Andrews (UK) registered with the service, NIB (Slovenia), PDE (Spain), UPC (Spain), OGS (Italy), HCMR (Greece), BSH (Germany), DMI (Denmark), MI (Ireland), IOPAS (Poland), University Lisboa (Portugal). The deputy for the MEOP project, as well as the technical office of SeaDataNet and JericoNext project, are registered with the service too.

To get even more information about the users downloading the data that request authentication (e.g. coastal data older than 60 days), we introduced a web form to be filled-in (once only) before proceeding with the data request. Users are asked to provide some details about their entities and their use of data.

Table 5 is summarising data as collected since the service was published (November 2018), full details are presented in Chapter 10.

<i>Organisation type</i>	<i>% users</i>	<i>Main use cases and application areas</i>
Academia/Research	61%	Marine and Coastal
Business and Private Company	16%	Marine and Coastal
Government/Public Administration	11%	Marine and Coastal - Climate, Seasonal and Weather Forecasting
Not for profit	3%	Marine and Coastal
Others	8%	Climate, Seasonal and Weather Forecasting

Table 5. Data for 241 users (who updated their profile)

7 User Feedback

Date	Name	Organisation	Type of user feedback (e.g. technical, case study etc.)	Response time
20/02/2018	Ghada Alqallaf	COWI - international consulting group	Support to download a specific dataset in CSV format	Within the day of request.
12/02/2018	rajae gaamouche	ENIM - Ecole Nationale d'Ingénieurs de Metz	Support to download HFR data	1 week to identify and fix the bug.
01/02/2018	André Fortunato	LNEC - Laboratório Nacional de Engenharia Civil	Info about the vertical datum in the tide gauge stations	Follow up in 1 day (datum was not shown but present in the file. Now it is also presented on the platform page)
16/01/2018	Scory Serge	Royal Belgian Institute of Natural Sciences	Wrong metadata in some Belgian stations	1 day and corrections in 2 days
16/01/2018	dodet guillaume	IUEM University Institute European De La Mer	Support to understand differences in some datasets and file naming convention	Within the day of the request
15/01/2018	Aleksandra Mazur	University of Gothenburg	Support to download specific datasets	Within the day of the request
11/01/2018	Marcus Znacchi	University of Plymouth	Request for further documentation for atmospheric data in Physics	First follow up within 1 day, in parallel the request was forwarded to platform owner. They were able to answer partially.
20/12/2017	Esther Minning	Cardiff University (UK)	Looking for tidal stream information around the Isle of Wight	1 day (no further feedback from the user)
15/12/2017	bennis anne-claire	M2C, Morphodynamique Continentale et Côtière Caen University, France	Looking for data of wave buoy 62103 for September 2017	2 days with the support of Met No
29/11/2017	Bertino Laurent (**)	NERSC (Norway)	Technical - Argo buoy 6902671 there is a wrong salinity profile on 5th Oct	1 day to give feedback, 3 days to fix it.
09/11/2017	Ledenev Vyacheslav	STOCK COMPANY RESEARCH AND PROJECT DEVELOPMENT INSTITUTE OF MERCHANT MARINE «SOYUZHMORENIIPROEKT» (Russia)	Technical – “I wanted to get information about the water level in St. Petersburg and Kronstadt from your service and compare with this data with data from other sources.”	1 day
08/11/2017	Cristian Muñoz Mas	SOCIB (Spain)	Technical – instructions for exporting contents in different support format	1 day

30/10/2017	Roy Anthony	CEA (France) Commissariat à l'énergie atomique et aux énergies alternatives	Technical –assessment of tidal energy in different places around the world – request for details about some tidal currents in IBI region	1 day preliminary feedback, 1 week full details with the support of Puertos del Estado and EuroGOOS Tide Gauges TT Chair
23/10/2017	Jianting Du	Wind Energy Department, Technical University of Denmark	Technical – details on the depth of recordings	1 day
18/10/2017	Andre Cattrijsse	VLIZ (Belgium)	Technical – current data in the Dover Strait	1 day
18/10/2017	Jun She	DMI (Denmark)	Technical – support to download wave data	1 day
18/10/2017	Mathieu Ouellet	DFO Canada	Technical - an update of metadata for some Canadian platforms	1 day
18/10/2017	Isabel Lopes	Universidade Nova de Lisboa - Faculdade de Ciências Sociais e Humanas	Technical – need for some metadata	1 day
18/10/2017	Sjur Ringheim	IMR (Norway)	Technical – wrong metadata assignments	1 day
17/10/2017	Marcin Wichoroswki	IOPAN (Poland)	Technical – Sopot data not flowing	1 day for feedback, 1 week to fix the bug in collaboration with SMHI
11/10/2017	Villu Kikas	TUT – Tallin University of Technology Department of Marine Systems	Technical – missing of coordinates data for one FB data	1 day for feedback, (coordinates were made available as soon as he – the provider – updated the dataset)
05/10/2017	LEVIER Bruno	MERCATOR OCEAN	Technical – problem with the HFR data field value	1 day feedback, 1 week to harmonised the field values in all the HFR datasets.
03/10/2017	Holger Daedelow	Deutsches Zentrum für Luft- und Raumfahrt (DLR)	Technical support to optimise the customised ftp service for delivering (from Physics to DRL) selected platforms data	First interaction in October, then several other interactions in November and December to set the service up. More interaction is needed.
26/09/2017	'Snaith, Helen M	BODC - UK	Technical – PAP1 station was not visible on the portal	2 days
26/09/2017	Daedelow, Holger	DRL Deutsches Zentrum für Luft- und Raumfahrt – Germany	Technical – support to harvest wave and wind data	2 days
21/08/2017	Francisco Sousa Diaz	VLIZ - Belgium	Technical – the ERDDAP server was spamming the central portal	1 day
15/08/2017	Mathieu Ouellet	DFO - Canada	Technical – incomplete metadata for Canadian ARGOS	1 day

10/08/2017	Julien Mader	AZTI - Spain	Technical – one HFR system (Germany) was not delivering data	1 day – thanks HZG support: they changed some parameters and EMODnet Physics had to update the harvesting/connection service
19/06/2017	M. Ouellet	DFO MPO GC (Canada)	Metadata – correct some Canadian platforms metadata	1 day
14/06/2017	J. Mader	AZTI (Spain)	Technical – line duplication on the platform dashboard page	1 day
09/06/2017	A. Koroglu	IHE Delft Institute for Water Education (NL)	Technical – problem with authentication	1 day (in cooperation with CMEMS)
02/06/2017	M. Ouellet	DFO MPO GC (Canada)	Technical – platform 27730 is an ice-tethered profiler. To develop a specific platform page	1 day to get primary feedback. 1 week to create the specific template (*)
31/05/2017	I. Taupier-Letage	Mediterranean Institute of Oceanography- MIO (France)	Metadata - GS-3EBE3 provider is MIO-HyMeX	1 day
25/05/2017	M. Ouellet	DFO MPO GC (Canada)	Metadata – correct some Canadian platforms metadata	1 day
25/05/2017	M. Ouellet	DFO MPO GC (Canada)	Help-desk – request for help on some new portal features	1 day
11/05/2017	M. Ouellet	DFO MPO GC (Canada)	Metadata – to replace Integrated Science Data Management - ISDM with Fisheries and Oceans Canada- DFO	1 day

Table 6. User Feedback

(*) <http://www.emodnet-physics.eu/Map/platinfo/piroosctdplot.aspx?platformid=27730&60days=false>

(**)from the request (id. 20170031): "Hello, The web interface and visualisation of Argo data is great"

In collaboration with TRUST-IT, we are collecting feedback from selected known users, the first is already available on the Central portal: http://www.emodnet.eu/mediterranean_wind_wave_model_0

8 Meetings held/attended since last report

Date	Location	Title	Internal/External + Short Description
27-31/03/2017	Kuala Lumpur (Malaysia)	IODE – XXIV	External - The 24th Session of the IOC Committee on International Oceanographic Data and Information Exchange was held between 28-31 March 2017, preceded by a one-day scientific workshop on 27 March 2017 (1)
10-13/04/2017	Limassol (Cyprus)	EMODnet Ingestion	External to EMODnet Physics/Internal to EMODnet - EMODnet Ingestion project progress meeting
19-20/04/2017	Milan (Italy)	EMODnet Physics KO	Internal - KO meeting with the core group (ETT, EuroGOOS, MARIS, IFREMER, BODC)
24/04/2017	Vienna (Austria)	Oral presentation of EMODnet Physics @ EGU 2017	External - European Geosciences Union - ESS11.1 - Informatics in Oceanography and Ocean Science (2)
3-4/5/2017	Bologna (Italy)	SeaDataCloud TTG	External - SeaDataCloud Technical Task Group.
9/5/2017	Milan (Italy)	EMODnet Physics – River TWG	Internal - River Technical working group
17/05/2017	Milan (Italy)	Oral presentation of the EMODnet Physics @ Microsoft Italian IoT Summit	External - Italian Microsoft partners' meeting to show best available IoT applications and services.
22/5/2017	Madrid (Spain)	EMODnet Physics – Tide Gauge TWG	Internal – Tide Gauge Technical working group
23/5/2017	Barcelona (Spain)	EMODnet Physics – Water noise TWG	Internal – Under Water Noise Technical working group
23/5/2017	Brussels (Belgium)	EMODnet lots – EASME – KO meeting	Internal – EMODnet phase 3 KO meeting
24/5/2017	Palma de Mallorca (Spain)	EMODnet Physics @ SOCIB	External – presentation of EMODnet Physics, presentation of SOCIB and discussion about possible synergies, links and collaborations.
14/6/2017	Brussels (Belgium)	AtlantOS international Data workshop	External - EMODnet Physics is one of the AtlantOS integrators and is powering the AtlantOS data portal
18/6/2017	call	International Animal Welfare Foundation	External - After presenting EMODnet Physics and IAWF goals, the discussion was focused on EMODnet Physics plans for the underwater noise data management and product developments. They do not host data but are very interested in following up the EMODnet Physics progress. Contacts and connection with the European UWN Technical working group was established.

13-15/6/2017	Bremerhaven (Germany)	SOOS DMSC	External - South Ocean Observing system – Data Management Steering Committee annual meeting
20/6/2017	Call	South Oceans Observing System	External - We discussed technical details on how EMODnet Physics could offer the engine for the SOOS portal.
21-29/6/2017	Paris (France)	29th Session of the IOC Assembly	External - EMODnet Physics was presented to a number of delegates, among them GOOS Africa, Morocco, Canada, US, India
21-22/6/2017	Aberdeen (UK)	MTS IEEE	External - Interoperability SOS - SWE
5-6/7/2017	Genoa (Italy)	EMODnet Technical Working Group	Internal - EMODnet Technical Working Group
29-30/8/2017	Web meeting	SOOS	External - Follow up on of the previous meeting and EMODnet Physics was identified to power the SOOS data portal. In turn, the SOOS community will provide the EMODnet Physics infrastructure with new data from south ocean areas
6-7/9/2017	Skiathos (Greece)	Underwater Acoustic Conference Europe 2017	External - Wide forum on underwater acoustics and noise. We had an oral presentation of EMODnet Physics.
5-7/9/2017	Singapore (Singapore)	GOOS Regional Alliance Forum VIII	External – EMODnet Physics and EMODnet were shown in many presentations.
13-15/9/2017	Rome (Italy)	EMODnet Steering Committee	Internal - EMODnet Steering Committee
18/9/2017	Toulouse (France)	EMODnet @ MERCATOR	External – meeting to discuss and follow up on MoU between EMODnet Physics and CMEMS
19-21/9/2017	Luneburg - Germany	Radio Oceanography Workshop (ROW 2017).	External - International workshop on radio technologies (e.g. HFR) to monitor ocean status.
22/9/2017	Luneburg - Germany	EuroGOOS HF Radar Task Team meeting	Internal – coordination meeting with the HF TT
25-28/9/2017	Brussels (Belgium)	Copernicus Marine Week	External - During the “In situ Infrastructure and CMEMS current state of the system” sprinter session the in situ data management, the key European and international infrastructures and programmes, the cooperation and collaboration between the INSTAC and EMODnet Physics and SeaDataNet were presented and discussed.
27/9/2017	Konstanz (Germany)	Bio-logging workshop	External - Integrating data collected by animals into the Ocean Observing System. The WS is aimed at discussing: Data sharing and standardisation of formats, Recent advances and new opportunities, Increasing synergy between biology and physical communities
2-5/10/2017	Bergen (Norway)	EuroGOOS conference	External - International conference on Operational Oceanography. EMODnet Physics had an oral presentation and synergies, links, interoperability etc. were widely cited and discussed during the conference.

9/10/2017	Genoa (Italy)	Tech meeting – Italian River Data	External - DHI Italy is providing many of the Italian Regional Environmental Agencies with services for river data management. The meeting was focused on defining how EMODnet Physics can make available more Italian River Data.
16-19/10/2017	Athens (Greece)	SeaDataCloud TTG+GA	External - SeaDataCloud Technical Task Group and annual General Assembly. Links and cooperation between SDC and EMODnet Physics were presented and discussed with partners.
25/10/2017	Sopot (Poland)	HELCOM State & Conservation meeting	External - We presented the EMODnet program with a focus on EMODnet Physics and Data Ingestion services and features that can support HELCOM activities.
25-26/10/2017	Capri (Italy)	RITMARE project final meeting	External - Final meeting of the Italian RITMARE project on observing systems. EMODnet Physics was invited to show the European framework and discuss data management and data access.
8-11/11/2017	Torrelodones (Spain)	TG NOISE	External - Meeting of the EU Technical Group on Underwater Noise (EU TG-NOISE).
11/11/2017	Madrid (Spain)	EuroGOOS Tide Gauge Task Team	Internal - The meeting was focused on discussing the integration and presentation of the sea level trends as computed by SONEL and the development of a Sea Level Anomalies product.
14-16/11/2017	Athens (Greece)	MONGOOS annual meeting	External - Annual meeting of the Mediterranean Operational Network for the Global Ocean Observing System (MONGOOS). We gave an update on activities and collaboration between EMODnet Physics and Data Ingestion.
15-17/11/2017	Antwerp (Belgium)	EMODnet Heckathon	External - EMODnet Physics took part in the event and supported the participating teams.
20-24/11/2017	Las Palmas (Spain)	AtlantOS General Assembly	External - Annual Meeting of the AtlantOS project. EMODnet Physics is one of the key data integrators within WP7 and is powering the AtlantOS data portal.
20/11/2017	London (UK)	NOOS annual meeting	External - Annual meeting of the North Sea and European North West Shelf EuroGOOS ROOS.
23/11/2017	Copenhagen (Denmark)	OSPAR data management	External - It was a technical meeting with ICES people to discuss more interoperability between EMODnet Physics and ICES data portal to make more OSPAR data accessible and visible into/by EMODnet Physics
5/12/2017	webcall	Listen to Deep Ocean & SoundOcean projects	External - Technical meeting to discuss how to connect LIDO platforms (and datasets) to EMODnet Physics and develop some sound-maps (based on SoundOcean project experience)
12/12/2017	Webcall (SOCIB)	Glider data interoperability	External/Internal - Technical meeting to discuss on how to connect more (international) Glider data to EMODnet Physics
20/12/2017	webcall	Deep Ocean Observing System – Data Management Working Group	External - EMODnet Physics was invited to present its experience in data management and discuss mutual synergies.
23-25/01/2018	Athens (Greece)	INSTAC Meeting	External - Links between INSTAC and EMODnet Physics discussed

23/01/2018	Porto (Portugal)	EUDAT Conference - SeaDataCloud Workshop	External – workshop on cloud-based data management. The roles and cooperation between EMODnet and SeaDataCloud were presented
29/01/2018	Brussels (Belgium)	Absolute Sea Level Trends	External - Technical meeting to discuss connection, links and interoperability with the SONEL product
30/01/2018	Brussels (Belgium)	EuroGOOS Tide Gauge TT	Internal - Technical meeting about Tide Gauge data management
31/01/2018	Oostende (Belgium)	IODE - ODIS meeting	External – The roles and cooperation between EMODnet and SeaDataCloud were presented
13/02/2018	Galway (Ireland)	EuroGOOS, EMODnet Physics and Data Ingestion Workshop	External - Workshop to discuss programs, projects, data management and connections between local providers and integrators to European ones.
14/02/2018	Brussels (Belgium)	Coordination meeting CMEMS – EMODnet	External - Coordination meeting CMEMS – EMODnet
14/03/2018	London (UK)	Oceanology International 2018	External - presentation on SeaDataNet - EMODnet for Ocean ICT programme
15/03/2018	London (UK)	Oceanology International 2018	External - Sensor Web Enablement (SWE) Workshop. Real-time data flow in the context of EMODnet Ingestion, Physics and SeaDataCloud
20-21/02/2018	Paris (France)	EMODnet Physics core team annual meeting	Internal - Annual meeting of the consortium core team
20/02/2018	Web seminar	GOOS seminar	External - The history and integration of animal-borne instruments into a sustained ocean observing system
05/03/2018	call	BIAS underwater noise data management heritage	External - Technical (web) meeting to discuss the results of the BIAS project on underwater noise data and products the possible role of EMODnet Physics in the data management
06-07/03/2018	WebEx	ODIS	External - Intersessional working group to develop Concept Paper for an Ocean Data and Information System (ODIS)
07/03/2018	call	SoundMaps	Internal - Technical (web) meeting on the soundmaps development methods
09/03/2018	call	Coordination for an EMODnet workshop in Italy	Internal - (web) meeting with Italian representatives from the EMODnet lots to set up an EMODnet (phase 3) Workshop in Italy
14/03/2018	London (UK)	OI, Oceanology International	External - Presentation on EMODnet in general and Physics in detail
15/03/2018	London (UK)	JERICONEXT WP5 meeting	External - European Coastal observatories data management
20-21/03/2018	Alcudia (Mallorca)	EMODnet Technical Working group	Internal - EMODnet Technical Working group

21-23/03/2018	Alcudia (Mallorca)	EMODnet Steering committee	Internal - EMODnet Steering committee
26-27/03/2018	Milan (Italy)	Glider Workshop organisation meeting	Internal/External – technical meeting to design the workshop and its sessions

Table 7. Meetings

- 1) http://www.iode.org/index.php?option=com_oe&task=viewEventAgenda&eventID=1879
- 2) <http://meetingorganizer.copernicus.org/EGU2017/orals/22856>

9 Outreach and communication activities

Date	Media	Short description and/or link to the activity
27-30/03/2017	2 Oral presentations on EMODnet in general, EMODnet Physics in particular @ IODE XXIV	The 24th Session of the IOC Committee on International Oceanographic Data and Information Exchange was held between 28-31 March 2017, preceded by a one-day scientific workshop on 27 March 2017. https://www.iode.org/index.php?option=com_oe&task=viewEventAgenda&eventID=1879
24/04/2017	EGU – European Geoscience Union Assembly 2017	The EGU General Assembly 2017 saw 4,849 oral, 11,312 posters, and 1,238 PICO presentations. At the conference, 14,496 scientists from 107 countries participated, EMODnet Physics was presented and discussed during the ESSI 1.1 session http://meetingorganizer.copernicus.org/EGU2017/session/22856 http://meetingorganizer.copernicus.org/EGU2017/EGU2017-7113.pdf
17/05/2017	Microsoft Italian IoT Summit	EMODnet Physics was awarded to be presented as one of the best available IoT applications and services for the Italian Microsoft partners' (annual) meeting.
14/06-15/06/2017	SOOS – southern ocean observing system annual assembly	The EMODnet Physics was presented during the SOOS Data Management Steering Committee (DMSC) and it was agreed that EMODnet Physics is going power the SOOS data portal. This will have a big impact on the SOOS community and extend the EMODnet Physics end users.
27/9/2017	Biologging workshop	Oral presentation Collaboration with MEOP, EMODnet Physics sea mammal data management, and strategy for integrating more animal-borne instruments data into Ocean Observing Systems were presented and discussed.
25-29/9/2017	Copernicus Marine Week	Poster presentation Furthermore, during the "In situ Infrastructure and CMEMS current state of the system" sprinter session the in situ data management, the key European and international infrastructures and programmes, the cooperation and collaboration between the INSTAC and EMODnet Physics and SeaDataNet were presented and discussed.
21/9/2017	RemTech Esonda Expo	Oral presentation EMODnet Physics and the plan and progress on the river data management were presented
21/9/2017	Radio Oceanography Workshop (ROW 2017).	Oral presentation Progress on HFR data management and EMODnet Physics HFR data products were presented and discussed
6/9/2017	UACE 2017 – Underwater Acoustic	Oral presentation EMODnet Physics and the plan on the underwater noise data management were presented

	Conference Europe	
5-7/9/2017	GOOS Regional Alliance Forum VIII	<p>Oral presentation</p> <p>EuroGOOS activities and EMODnet Physics were presented as an example of regional ocean observing systems.</p>
14/6/2017	AtlantOS international Data workshop	EMODnet Physics is one of the AtlantOS integrators and is powering the AtlantOS data portal
2-5/10/2017	EuroGOOS conference	<p>International conference on Operational Oceanography.</p> <p>http://eurogoos.imr.no/resources/EuroGOOS_Conference_2017_BoA.pdf</p>
16-19/10/2017	SeaDataCloud TTG+GA	<p>SeaDataCloud Technical Task Group and annual General Assembly. Links and cooperation between SDC and EMODnet Physics were presented and discussed with partners.</p> <p>https://www.seadatanet.org/Events/Plenary-meetings/SDC-1st-annual-meeting</p>
25/10/2017	HELCOM State & Conservation meeting	We presented the EMODnet program with a focus on EMODnet Physics and Data Ingestion services and features that can support HELCOM activities.
25-26/10/2017	RITMARE project final meeting	<p>The final meeting of the Italian RITMARE project on observing systems. EMODnet Physics was invited to show the European framework and discuss on data management and data access.</p>
8-11/11/2017	TG NOISE	Meeting of the EU Technical Group on Underwater Noise (EU TG-NOISE).
14-16/11/2017	MONGOOS annual meeting	The annual meeting of the Mediterranean Operational Network for the Global Ocean Observing System (MONGOOS). We gave an update on activities and collaboration between EMODnet Physics and Data Ingestion.
15-17/11/2017	EMODnet Heckathon	EMODnet Physics took part in the event and supported the participating teams.
20-24/11/2017	AtlantOS General Assembly	Annual Meeting of the AtlantOS project. EMODnet Physics is one of the key data integrators within WP7 and is powering the AtlantOS data portal.
20/11/2017	NOOS annual meeting	The annual meeting of the North Sea and European North West Shelf EuroGOOS ROOS.
23/11/2017	OSPAR data management	It was a technical meeting with ICES people to discuss more interoperability between EMODnet Physics and ICES data portal to make more OSPAR data accessible and visible into/by EMODnet Physics
20/12/2017	Deep Ocean Observing System – Data Management Working Group	EMODnet Physics was invited to present its experience on data management and discuss mutual synergies.
13/02/2018	EuroGOOS, EMODnet Physics and Data Ingestion Workshop	Workshop to discuss programs, projects, data management and connections between local providers and integrators to European ones
20/02/2018	The history and integration of animal-borne instruments into a sustained ocean observing system	http://www.goosoocean.org/index.php?option=com_content&view=article&id=60&Itemid=169

14-15/03/2018	Oceanology International 2018	http://www.oceanologyinternational.com/en/Sessions/52333/Widening-Access-to-Ocean-Data
23/01/2018	Il Secolo XIX (newspaper)	Interview/article about EMODnet programme and EMODnet Physics https://twitter.com/ettspa/status/955727436007858176

Table 8. Outreach

10 Updates on Progress Indicators

Indicator 1 - Volume of data made available through the portal

@31/03/2018	Temperature	Salinity	Currents	Light Attenuation	Sea Level	Atmospheric	Waves	Wind	Bio-Chemical	River	Underwater noise	Total
Number of platforms providing operational data for latest 60days	7524	5451	1770	40	634	1387	1395	437	379	112	1	19130
Number of platforms providing operational data	21304	10470	3949	55	792	5996	1687	766	686	196	1	45902
Number of platforms providing historical data	21106	11043	2066	50	510	5818	1452	864	775	143	0	43827
Number of platforms providing validated historical data (CDI)	454	72	3	42	425	51	326	190	40	388	0	1991

 Table 9. Volume of data⁵

ARGO	CTDs	Drifting B	FB	gliders	sea mammals	mini logger	mooring	radar	river station	tide gauge
9294	322344	11134	260	192	1773	173	2513	144	472	1888

Table 10. Available platforms (@16/04/2018)

⁵ <http://www.emodnet-physics.eu/Map/service/sections/Section16.aspx>

Indicator 2 - Organisations supplying each type of data broken down into country and organisation type (e.g. government, industry, science)

EMODnet Physics is receiving, integrating and presenting data and products from many providers in Europe and outside Europe. In Europe, NRT data flow is based on formal data sharing agreements and e.g. all the EuroGOOS and ROOSs members are delivering data to EMODnet Physics. Some data and products are directly connected to Physics (e.g. HFR data, rivers data, underwater noise, etc.) some are made available via common integrating infrastructures (e.g. CMEMS INSTAC and SDN). For details on providers, see EMODnetPhysics_Interim_Annex1.xls⁶

Indicator 3 - Organisations that have been approached to supply data with no result

Organisation	description	Reason
Univerisità Partenope	HF Radar in the Gulf of Naples	The antenna is going to be relocated. Data collected are under validation.
Consorzio LaMMA	HF Radar – Tuscany	Antenna is installed in an Italian Coastguard facility and data is partially confidential and data access is only permitted to feed local MFC model and not for redistribution
IZOR	Coastal buoy – Split	The platform was deployed with national funds without a clear strategy on data distribution. The request is stuck in the administrative department of the institute
INGV	OS IS – la Spezia Gulf	Problems with the internal data dissemination policy
Nord Stream	Nord Stream’s environmental monitoring programme investigates how the pipelines affect 16 factors such as water and air quality, birds, fish and fisheries, seabed flora, and cultural heritage, with approximately 1,000 locations along the entire route being checked regularly.	New organisation and problems to find anyone responsible for the database
Middle East Technical University, Erdemli, Turkey	Fixed buoys	Data linked to military activities

⁶ <http://www.emodnet-physics.eu/Map/Service/Indicators/Section1.aspx>

Turkish State Meteorological Service	Tide gauges, wave buoys in Turkish waters, both Mediterranean and the Black Sea	Data linked to military activities
CEFAS Wavenet	Cefas' strategic wave monitoring network for the United Kingdom	Due to many contributors/data providers, many have their own data policies and it is difficult to share data. It has been discussed to gather the partners to discuss the issue
Cyprus	Tide gauges and ocean buoy	Internal organisation issues
Liquid Robotics	Wave gliders	Contacted but no reply. Also contacted individual institutes but lack of replies

Table 11. Organisation contacted to supply data with no results

Indicator 4 - Volume of each type of data and of each data product downloaded from the portal

Parameters/Themes	Downloadable Volume	Number of manual downloads	Number of Web Service request	Number of WMS request	Number of WFS request	Number of Map visualisations
Water temperature	346535	22280	543087	26	18	4679
Water salinity	269124	6839	207310	13	6	480
Currents	3952	3714	145675	13	6	1870
Optical Properties	132	574	1684	0	0	156
Sea Level	2619	16819	127783	2	2	3189
Atmospheric	7669	13043	325757	26	18	1623
Water conductivity/ BioGeoChemical	190942	8652	145284	12	2	1157
Waves	1268	19838	257707	18	18	21882
Winds	1464	11205	222636	19	10	2227
River	949	573	87120	1	0	319
Underwater noise	1	30	10084	0	0	104

Table 12. Volume of downloaded data and products (29/3/2017 – 31/3/2018)

It should be noted that a manual download or a web service request can include several parameters, and the number of WMS and WFS considering only the requests to the parameter layer⁷ and do not include the new GeoServer WMS and WFS layers.

Platform name	Provider	downloads	WS requests	CDI requests	total
Offshore location - Line Santander Site MG1		4	14965	0	14969
Offshore location - Line Santander Site MG2		4	14944	0	14948
USNDBC_mlww3		0	11788	0	11788
Melilla-coast-buoy	PdE - Puertos del Estado - Spain	28	10189	0	10217
61499	SOCIB - Balearic Islands Coastal Observing and Forecasting System	37	10166	0	10203
13130	PdE - Puertos del Estado - Spain	41	10151	0	10192
13131	PdE - Puertos del Estado - Spain	27	10164	0	10191
Barcelona-coast-buoy	PdE - Puertos del Estado - Spain	40	10130	0	10170
Algeciras-coast-buoy	PdE - Puertos del Estado - Spain	31	10139	0	10170
Bilbao-coast-buoy	PdE - Puertos del Estado - Spain	38	10131	0	10169

Table 13. Top ten most downloaded platform

Platform name	Provider	downloads	WS requests	CDI requests	total
62103	Met Office- United Kingdom	323	2690	0	3013
62170	Met Office- United Kingdom	99	1576	0	1675
62304	Met Office- United Kingdom	89	90	0	179
ElbeWR	BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany	87	5	0	92
LTKielWR	BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany	86	5	0	91
Westhinder	MDK - Maritieme Dienstverlening en Kust - Belgium	83	103	0	186

⁷ As described at <http://www.emodnet-physics.eu/Map/Service/GeoServerDefaultWMS.aspx> and <http://www.emodnet-physics.eu/Map/Service/GeoServerDefaultWFS.aspx>

HelgolandTG	WSOT - Waterways and Shipping Office Toenning - Germany	80	6	0	86
Helgoland	BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany	79	6	0	85
Brouwershavensegat	RWS - Rijkswaterstaat Waterdienst - Netherlands	78	78	0	156
HelgolandWR	BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany	76	6	0	82

Table 14. Top ten manual download

Platform name	Provider	downloads	WS requests	CDI requests	total
Europlatform	RWS - Rijkswaterstaat Waterdienst - Netherlands	75	48	14	137
ADCP_10		0	6809	11	6820
HuvudskarOst	SMHI - Swedish Meteorological and Hydrological Institute - Sweden	67	21	9	97
Knollsgrund	SMHI - Swedish Meteorological and Hydrological Institute - Sweden	57	77	9	143
FinngrundetWR	SMHI - Swedish Meteorological and Hydrological Institute - Sweden	51	70	9	130
HuvudskarOstWR	SMHI - Swedish Meteorological and Hydrological Institute - Sweden	51	5	9	65
K13a2	RWS - Rijkswaterstaat Waterdienst - Netherlands	67	11	8	86
SchiermonnikoogWaddenTG	RWS - Rijkswaterstaat Waterdienst - Netherlands	53	5	8	66
MalinHead	MI - Marine Institute - Ireland	25	5	8	38
NewlynTG	Met Office- United Kingdom	23	8616	8	8647

Table 15. Top ten CDI datasets requests

Indicator 5 - Organisations that have downloaded each data type

EMODnet Physics is tracking the IP address⁸ where the request comes from. Internal requests (ETT IPs) and known internet page-indexing/sniffing robots (e.g. Google) are filtered out. If data is requesting authentication (e.g. monthly files), EMODnet forwards the request to the CAS service and if the acknowledgement is positive the user can download data. If it is not the user is requested to fill in the registration form to receive a login and password. In November 2017, the system was updated and a web form asks for some user details (see also Indicator 7). Since this new feature was published, 241 users updated their profile and it is now possible to have a better idea of the organisations using the portal⁹.

Institute	Institute Type	Area of Interest	Country
École Nationale Supérieure des Sciences de la Mer et de l'Aménagement du Littoral (ENSSMAL Ex ISMAL)	Academia/Research	Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting	Algeria
université des Sciences et de la Technologie HOUARI BOUMEDIENE	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Algeria
USTHB	Academia/Research	Marine and Coastal	Algeria
IMOS	Academia/Research	Marine and Coastal	Australia
Sheffield	Academia/Research	Marine Resource	Belgium
ocean university of China	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	China
Technical University of Denmark	Academia/Research	Climate, Seasonal and Weather Forecasting	Denmark
TTU Department of Marine Systems	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Estonia
TUT MSI	Academia/Research	Marine and Coastal	Estonia
BRGM	Academia/Research	Marine and Coastal	France
Caen University	Academia/Research	Marine and Coastal	France
CEA Tech	Academia/Research	Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting	France
ENSAM	Academia/Research	Climate, Seasonal and Weather Forecasting	France
Ifremer	Academia/Research	Marine and Coastal	France

⁸ To resolve the IP vs the country, EMODnet Physics is using the GEOLite2DB from MixMind⁸ (free version) – last DB update synch 30/10/2017

⁹ Note that people from the same organization are giving different definition of the organization (e.g. AZTI)

IUEM	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	France
LEGOS	Academia/Research	Climate, Seasonal and Weather Forecasting	France
Lycée Clémenceau	Academia/Research	Climate, Seasonal and Weather Forecasting	France
M2C	Academia/Research	Marine and Coastal	France
University of Caen	Academia/Research	Marine and Coastal; Marine Resource	France
UPMC	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	France
Alfred Wegener Institute	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Germany
DLR	Academia/Research	Marine and Coastal	Germany
ENT	Academia/Research	Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting	Germany
GEOMAR Helmholtz Centre for Ocean Research Kiel	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Germany
Helmholtz-Zentrum Geesthacht	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Germany
hochschule Bremen	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Germany
HZG	Academia/Research	Marine and Coastal	Germany
IOW	Academia/Research	Marine and Coastal	Germany
aegean	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Greece
Democritus University of Thrace	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Greece
HCMR	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Greece
National Technical University of Athens	Academia/Research	Marine and Coastal	Greece
University of Piraeus	Academia/Research	Marine and Coastal; Marine Resource	Greece
uoa	Academia/Research	Marine and Coastal	Greece
Manipal Institute of Technology	Academia/Research	Climate, Seasonal and Weather Forecasting	India
Sharif University of Technology	Academia/Research	Marine and Coastal	Iran, Islamic Republic of
MI	Academia/Research	NULL	Ireland
GEBCO	Academia/Research	Marine and Coastal	Ireland

CMCC	Academia/Research	Marine and Coastal; Marine Resource	Italy
CNR-ISMAR	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Italy
ENEA	Academia/Research	Marine and Coastal	Italy
ISMAR-CNR	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Italy
Istituto Nazionale di Geofisica e Vulcanologia	Academia/Research	Marine and Coastal	Italy
IUAU	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Italy
OGS	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Italy
Politecnico di Torino	Academia/Research	Marine and Coastal	Italy
Tor Vergata	Academia/Research	Marine and Coastal	Italy
Università degli Studi di Padova	Academia/Research	Marine and Coastal	Italy
university	Academia/Research	Marine and Coastal	Italy
University of Bari	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Italy
university of Bologna	Academia/Research	Marine and Coastal	Italy
University of Ferrara	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Italy
UNIVERSITY OF IUAU	Academia/Research	Marine and Coastal	Italy
University of Salento	Academia/Research	Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting	Italy
University of Trento	Academia/Research	Marine and Coastal	Italy
enim	Academia/Research	Marine and Coastal; Marine Resource	Morocco
Deltares	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Netherlands
TU Delft	Academia/Research	Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting	Netherlands
IOPAs	Academia/Research	NULL	Poland
IDL/FCUL	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Portugal
Instituto Dom Luiz	Academia/Research	Climate, Seasonal and Weather Forecasting	Portugal

IST	Academia/Research	Marine Resource; Climate, Seasonal and Weather Forecasting	Portugal
MARETEC	Academia/Research	NULL	Portugal
Universidade de Évora	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Portugal
University of Lisbon	Academia/Research	Marine and Coastal	Portugal
University of Minho	Academia/Research	Marine and Coastal	Portugal
University of Minho	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Portugal
Russian State Hydro-meteorological university	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Russia
RIHMI-WDC	Academia/Research	Marine and Coastal; Marine Resource	Russian Federation
SOI	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Russian Federation
IzVRS	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Slovenia
NIB	Academia/Research	NULL	Slovenia
UL FGG	Academia/Research	Marine and Coastal	Slovenia
University of Ljubljana	Academia/Research	Marine and Coastal	Slovenia
University of Ljubljana	Academia/Research	Marine and Coastal	Slovenia
University of Ljubljana	Academia/Research	Marine and Coastal	Slovenia
AZTI	Academia/Research	Marine and Coastal	Spain
CSIC	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Spain
UC	Academia/Research	Climate, Seasonal and Weather Forecasting	Spain
University of Ferrara	Academia/Research	Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting	Spain
UPC	Academia/Research	Marine and Coastal	Spain
Swedish University of Agricultural Sciences	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Sweden
Cardiff University	Academia/Research	Marine and Coastal	United Kingdom
NOC	Academia/Research	Climate, Seasonal and Weather Forecasting	United Kingdom
Plymouth University	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	United Kingdom
Swansea University	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	United Kingdom
Ulster University	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	United Kingdom

University of Plymouth, UK	Academia/Research	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	United Kingdom
University of Portsmouth	Academia/Research	Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting	United Kingdom
University of Southampton	Academia/Research	Marine and Coastal; Climate, Seasonal and Weather Forecasting	United Kingdom
Wageningen Universiteit	Academia/Research	Marine and Coastal	United Kingdom
Stanford University	Academia/Research	Marine and Coastal	United States
University of Alaska Fairbanks	Academia/Research	Marine and Coastal	United States
BigDataIngestion	Business and private Company	Marine and Coastal	Afghanistan
South African Defence Force	Business and private Company	Marine and Coastal; Maritime Safety	Atlantic Area
IIIIIIIIII	Business and private Company	Marine and Coastal	Austria
123	Business and private Company	Marine Resource	Azerbaijan
COWI AS	Business and private Company	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Bahrain
IMDC nv	Business and private Company	Marine and Coastal	Belgium
ASL Environmental Sciences	Business and private Company	Marine and Coastal	Canada
COWI A/S	Business and private Company	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Denmark
Meritaito	Business and private Company	Marine and Coastal	Finland
ACRI-IN	Business and private Company	Marine and Coastal	France
ACTIMAR	Business and private Company	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	France
MeteoGroup	Business and private Company	Marine and Coastal	France
open ocean	Business and private Company	Climate, Seasonal and Weather Forecasting	France
SAIPEM	Business and private Company	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	France
Allianz Esa EuroShip GmbH	Business and private Company	Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting	Germany
Planetek Hellas	Business and private Company	Marine and Coastal; Maritime Safety; Marine Resource; Climate,	Greece

		Seasonal and Weather Forecasting	
OpenHydro	Business and private Company	Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting	Ireland
Parameter Space	Business and private Company	Marine and Coastal; Marine Resource	Ireland
ETT	Business and private Company	Marine and Coastal; Maritime Safety; Marine Resource	Italy
Aktis Hydraulics	Business and private Company	Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting	Netherlands
KCI	Business and private Company	Marine and Coastal	Netherlands
Shell	Business and private Company	Marine and Coastal	Netherlands
MSW	Business and private Company	Marine and Coastal	Portugal
STOCK COMPANY RESEARCH AND PROJECT DEVELOPMENT INSTITUTE OF MERCHANT MARINE «SOYUZHMORENIIPROEKT»	Business and private Company	Marine and Coastal	Russia
iberdrola	Business and private Company	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Spain
CA Metocean	Business and private Company	Marine and Coastal; Climate, Seasonal and Weather Forecasting	United Kingdom
DNVGL	Business and private Company	Marine and Coastal; Climate, Seasonal and Weather Forecasting	United Kingdom
HR Wallingford	Business and private Company	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	United Kingdom
Sunderland Marine	Business and private Company	Marine and Coastal; Climate, Seasonal and Weather Forecasting	United Kingdom
Vattenfall Wind Power Ltd	Business and private Company	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	United Kingdom
RPS Group	Business and private Company	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	United States
Shell	Business and private Company	Marine and Coastal; Climate, Seasonal and Weather Forecasting	United States
EMODnet Secretariat	Government/Public Administration	Marine and Coastal	Belgium

Hydrographic Institute	Government/Public Administration	Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting	Belgium
SOCIB	Government/Public Administration	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Belgium
DMI	Government/Public Administration	Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting	Denmark
Metsähallitus	Government/Public Administration	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Finland
CNRS	Government/Public Administration	Marine and Coastal	France
IFREMER	Government/Public Administration	Climate, Seasonal and Weather Forecasting	France
Shom	Government/Public Administration	Marine and Coastal; Climate, Seasonal and Weather Forecasting	France
BSH	Government/Public Administration	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Germany
Leibniz-Institute for Baltic Sea Research	Government/Public Administration	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Germany
CNR-ISMAR	Government/Public Administration	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Italy
ISMAR	Government/Public Administration	Marine and Coastal	Italy
ISPRA	Government/Public Administration	Marine and Coastal	Italy
Joint Research Centre	Government/Public Administration	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Italy
LEGMC	Government/Public Administration	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Latvia
Instituto Hidrográfico	Government/Public Administration	Marine and Coastal; Maritime Safety	Portugal
IHM	Government/Public Administration	Marine and Coastal	Spain
PLOCAN	Government/Public Administration	Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting	Spain
Puertos del Estado	Government/Public Administration	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Spain
Swedish Armed Forces METOC Centre	Government/Public Administration	Climate, Seasonal and Weather Forecasting	Sweden

DLR	Government/Public Administration	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Switzerland
Met Office	Government/Public Administration	Climate, Seasonal and Weather Forecasting	United Kingdom
RIHMI-WDC	Government/Public Administration	Climate, Seasonal and Weather Forecasting	United Kingdom
MO	Not for profit	Marine Resource	France
Polytech	Not for profit	Marine and Coastal; Marine Resource	France
Sea-Mer Asso	Not for profit	Marine Resource	France
EuroGOOS	Not for profit	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Germany
Helmholtz-Zentrum Geesthacht	Not for profit	Marine and Coastal	Germany
Deltares	Not for profit	Marine and Coastal	Netherlands
AZTI	Not for profit	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Spain
av	Other	Marine and Coastal; Climate, Seasonal and Weather Forecasting	France
lycée alain	Other	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	France
MERCATOR OCEAN	Other	Marine and Coastal	France
Leibniz institute for baltic sea research	Other	Marine and Coastal	Germany
öaldshföoreh	Other	Marine and Coastal	Germany
University	Other	Climate, Seasonal and Weather Forecasting	Germany
ERM	Other	Climate, Seasonal and Weather Forecasting	Italy
MetService	Other	Marine and Coastal	New Zealand
R2	Other	Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting	Russia
Azti	Other	Marine and Coastal; Climate, Seasonal and Weather Forecasting	Spain
no	Other	Climate, Seasonal and Weather Forecasting	Spain

Table 16. Registered users organisations

EMODnet Physics registered, 43,104 manual data download requests (27,089 near real time, 16,015 reprocessed), more than 750,000 web services transactions, 941 CDI datasets requests.

Country	#dataset requests
Germany	221,234
Belgium	190,909
United States	133,115
Morocco	105,859
France	78,493
Italy	20,457
Portugal	18,636
Netherlands	5,916
Greece	4,275
United Kingdom	4,185
Denmark	3,462

Table 17. Top 11 countries which downloaded datasets (both manual and web service requests)

Indicator 6 - User statistics to determine the main pages utilised and identify user navigation routes

EMODnet Physics Map page is the most visited page and it registered more than 30,000 views. The landing portal pages more than 19,000 views (home page more than 11,000). Products (trends and maps) more than 4,000 views. Services and in particular web services are intensively used (more than 500,000 accesses)

Indicator 6.1 reports on the access and use of EMODnet Physics dynamic map, products, and services.

Map page and products	MAP	AVGS	WIND	DASHB	PR.RD	PR.AR/PR	PR.DB	PR.FB	PR.GL	PR.MM	PR.ARCTIC	PR.ANTARCTIC	PSMSL	TOTAL
views	30,917	727	819	670	730	141	131	127	99	231	136	107	107	34,942

Table 18. Indicator 6.1.1

Services	WMS	WFS	SOS	Web Services	TOTAL
accesses	1,393	676	197	752,372	754,638

Table 19. Indicator 6.1.2

Indicator 6.2 provides users statistics about navigation on the landing portal (and its pages)

Landing pages	Home	About	Associate Partners	Background	Catalogue	Cookie.	Documentation	Help-Desk	How to.	Login	Meeting.	Near R.	News	QA/ QC.	Terms.	Users.	Videos.
views	11621	264	442	205	801	609	452	118	648	1533	39	416	516	363	605	394	254

Table 20. Indicator 6.2

Indicator 7 - List of what the downloaded data has been used for

Since November 2017, EMODnet Physics is collecting some details about users that are downloading data (for which an authentication is required). The user is requested to fill in (once only) a web form (Figure 1). Although this information is collected for a minor group of the EMODnet Physics users, it gives an idea of the main uses and application areas for which in situ data are requested.

Organisation type	% users	# users	Main use cases and application areas ¹⁰	
Academia/Research	61%	148	Marine and Coastal	134
			Climate, Seasonal and Weather Forecasting	55
			Marine Resource	37
			Maritime Safety	23
Business and private Company	16%	39	Marine and Coastal	37
			Climate, Seasonal and Weather Forecasting	21
			Marine Resource	13
			Maritime Safety	10
Government/Public Administration	11%	26	Marine and Coastal	20
			Climate, Seasonal and Weather Forecasting	20
			Maritime Safety	5
			Marine Resource	5
Not for profit	3%	8	Marine and Coastal	7
			Marine Resource	5
			Maritime Safety	2
			Climate, Seasonal and Weather Forecasting	2
Other	8%	20	Marine and Coastal	15
			Climate, Seasonal and Weather Forecasting	11
			Marine Resource	7
			Maritime Safety	5
Users that updated their profile		241		

Table 21. Users main use cases and application areas

¹⁰ The user was able to provide multiple choice

Country	% users
United Kingdom	30,3%
Italy	12,9%
France	10,8%
Germany	10,0%
Spain	5,0%
Portugal	4,2%
Greece	3,3%
Netherlands	2,9%
United States	2,1%
Belgium	2,1%
Denmark	1,7%
Algeria	1,7%
Slovenia	1,7%
Ireland	1,2%
Russia	1,2%
Finland	1,2%
Estonia	0,8%
Sweden	0,8%
India	0,8%
Switzerland	0,4%
China	0,4%
Azerbaijan	0,4%
Canada	0,4%
Andorra	0,4%
Morocco	0,4%
Bahrain	0,4%
Afghanistan	0,4%
Iran, Islamic Republic of	0,4%
New Zealand	0,4%
Austria	0,4%
Latvia	0,4%
Russian Federation	0,4%

Table 22. Users' Nationality

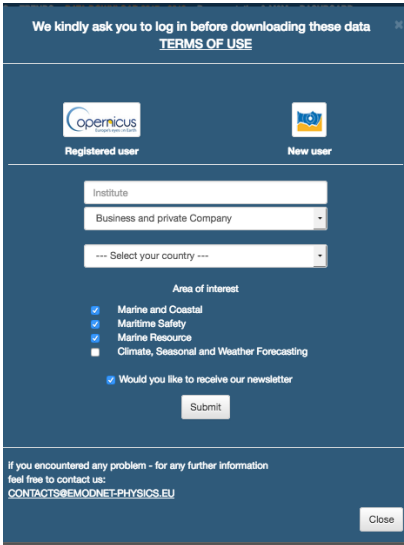


Figure 1. Webform

Indicator 8 - List of web-services made available and organisations connected through these

Service	Description	Examples
PermaURL	All platforms	http://www.emodnet-physics.eu/map/platinfo/piradar.aspx?platformid=10273 http://www.emodnet-physics.eu/map/platinfo/pidashboard.aspx?platformid=10273 Service description @ http://www.emodnet-physics.eu/map/spi.aspx
API REST/SOAP	Latest 60 days of data	www.emodnet-physics.eu/map/Service/WSEmodnet2.aspx www.emodnet-physics.eu/map/service/WSEmodnet2.asmx
OGS WMS, WFS, WCS	Postgresql + Geoserver	geoserver.emodnet-physics.eu/geoserver/web examples and service description @ www.emodnet-physics.eu/map/service/GeoServerDefaultWMS www.emodnet-physics.eu/map/service/GeoServerDefaultWFS
THREDDS (OpenDAP, WMS, WCS)	Latest 60 days + HFR data + Ice	thredds.emodnet-physics.eu/thredds/catalog.html
ERDDAP	Latest 60 days	erddap.emodnet-physics.eu
Widgets	All plots	www.emodnet-physics.eu/Map/Charts/PlotDataTimeSeries.aspx?paramcode=TEMP&platid=8427&timerange=7

Table 23. list of web services and interoperability services

List of known organisations (constantly/continuously) connected to those services:

- AZTI, they are integrating the EMODnet Physics widget into their regional portal
- SOOS, South Oceans Observing System, EMODnet Physics is powering the SOOS data portal
- DRL, German Space Agency, we were asked to set up a data delivery flow for a selection of platform measuring wave data to be assimilated in their models.
- EMSA, they are using EMODnet Physics M2M services to collect data into their internal information system
- METOFFICE UK, they assimilate HFR radar data (currents) into their models – NWS area.

11 Recommendations for follow-up actions by the EU

Please, give a list of recommendations and suggestions for the EU to consider and take action. [Max 1 page]

The EMODnet Physics contract has a two-year duration and it has been communicated by the EU that an extension of another two years without a full tender procedure is possible. However, details about the procedure and its timing are lacking while we are now halfway through the existing contract. For contingency and planning purposes, it is recommended that the EU provides information shortly about the intended procedure. Such a guarantee about continuation is of key importance in order to bind new data providers and not to lose the goodwill that has been built up over time within the Copernicus (CMEMS), EuroGOOS and SeaDataNet communities. Moreover, EMODnet Physics started reaching and serving a wider community of users (e.g. South Ocean Observing System) and has started working on the legacy of data management and dissemination for European projects on underwater noise and MSDF Indicator 11 (e.g. BIAS project). Delay will result in uncertainty and will considerably harm the position that EMODnet Physics has achieved in the last year.

EMODnet Physics is supporting activities on platform level (HFR, Ferrybox, mammals...) an activity that is partly linked to EuroGOOS Task Teams. EMODnet Physics identifies, together with platform operators tasks that have a big impact for a minor investment. As an example, data from marine mammals where a small investment brings ten years of archived mammal data from the North Sea to be included in EMODnet Physics.

Another example is supporting activities bringing together communities to discuss specific platform data issues. EMODnet Physics took the lead on these, supporting and organising specific workshops. These activities are critical to providing momentum among the platform operators. They bring together the communities to address and solve various data issues such as a recently EMODnet "Ireland" workshop, co-organised by EMODnet Physics and EMODnet Data Ingestion, addressing data providers from Ireland to Scotland, or the European glider meeting, hosted and organised by EMODnet Physics, addressing many glider data issues and suggesting ways to solve them. It should be noted that the above activities benefit directly CMEMS INSTAC and SDN by bringing new data and data originators into the current European data system and contribute to promoting EMODnet as the source for marine data.

It is recommended that EMODnet Physics continues and increases these activities, keeping the momentum and contributing to a better, data-coordinated European observation system. Participating data providers are given the opportunity to report on their observing capabilities and what data can be of interest for ingesting to EMODnet. Also, any possible issues in sharing data are discussed and solutions to solve them are proposed.

Activities are underway for formulating a feasible approach for the European Ocean Observing System (EOOS). Next to data collection, data management and ensuring that collected data sets become widely discoverable and accessible are key items for a successful implementation of EOOS. EMODnet Physics can play a major role in this process as it already brings together operational and delayed mode physical oceanographic data from many EOOS actors. Moreover, it is considered by Copernicus (CMEMS), EuroGOOS and SeaDataNet as a primary shop-window for making users aware of existing

data observation systems and providing access to the collected data. Therefore, it is recommended that the EU emphasises and underpins this role of EMODnet Physics and the wider EMODnet more explicitly in the EOOS formulation process towards EOOS stakeholders. Otherwise, there is a real risk that EOOS stakeholders will only focus on data collection, thereby taking harmonised data management and data provision for granted.

Interventions of EMODnet Physics at the TG-NOISE have contributed to the identification of a very specific and clear topic for the engagement of the Regional Sea Conventions. Making available more operational data (in terms of parameters and format that are close to MSFD I.11 requirements), offer a single European entry point to impulsive noise registries (MSFD I.11.1) and work on (regional) sound maps are three key identified activities for Physics to take care of and follow up.

It is recommended that the EU gives support and continuity to the EMODnet Physics project to set up a pan European harmonised data management infrastructure for serving RSCs.

River runoffs exert a strong influence in their neighbouring coastal area in several ways, modifying the water stratification, introducing significant fluctuations in circulation patterns and modulating the impact of upwelling events. In the current context of a global decline of the hydrometric networks, the uncertainties include the river runoff reaching the coast and most of the water properties such as temperature, salinity, etc. For this reason, river climatologies are generally imposed in the land boundaries of coastal or regional ocean models, ignoring river variability in flow and other associated properties. Anyhow, the main weakness of river climatologies is their incapacity to include the inter-annual variability compared to watershed model applications that are in agreement with the main river flow trends. On the other hand, watershed models tend to overestimate river flows, especially during dry seasons. EMODnet Physics has started integrating and making available near real-time river runoff and in situ river run-off trends (monthly and annual means). MFC community is welcoming this new data to improve the MFCs thermohaline circulation in coastal areas by a better understanding of land-marine boundary conditions, with special regard to the salinity fields. It is recommended to the EU to keep supporting this activity and, with the renewal for two contractual years, to ask EMODnet Physics to extend the coverage to minor rivers: generating climatological flows for small or poorly monitored rivers can also be regarded as a challenge.

12 Annex: Other documentation attached

List in Annex if you wish to provide any additional information.

List of identified publications citing EMODnet Physics

Year	Type	EMODnet Authors	Authors	Title	Publication	other info
2013	Conference	No	Sissy Iona, Stavroula Balopoulou, Pelopidas Karagevrekis, Angelo Lykiardopoulos	The HNODC Data & Information Management Services: Description & Recent Upgrades	Bollettino di Geofisica teorica ed applicata, Vol. 54 Supplement, 2013	IMDIS 2013, International Conference on Marine Data and Information Systems, 23-25 September 2013 - Lucca (Italy)
2013	Conference	No	Wilhelm Petersen	FerryBox Systems: State-of-the-art and Incorporation in European Observation Networks	Book of Abstract: The Future of Operational Oceanography 2013	
2013	Conference	Yes	A. Novellino, G. Manzella, D. Schaap, P. Goringe, L. Rickards, S. Pouliquen	EMODNet Physical Parameters	Bollettino di Geofisica teorica ed applicata, Vol. 54 Supplement, 2013	IMDIS 2013, International Conference on Marine Data and Information Systems, 23-25 September 2013 - Lucca (Italy)
2013	Conference	Yes	Dahlin, Hans; Gies, Tobias; Giordano, Marco; Goringe, Patrick; Manzella, Giuseppe; Maudire, Gilbert; Novellino, Antonio; Pagnani, Maureen; Petersson, Sian; Pouliquen, Sylvie; Rickards, Lesley; Schaap, Dick; Tjisse, Peter; van der Horste, Serge	European Marine Observation and Data Network (EMODnet)-physical parameters: A support to marine science and operational oceanography	EGU General Assembly 2013, held 7-12 April, 2013 in Vienna, Austria, id. EGU2013-3126	EGU 2013
2013	Conference	Yes	Patrick Goringe, Antonio Novellino, Giuseppe Manzella, Dick Schaap, Lesly Richards, Sylvie Pouliquen	EMODNet – Physical Parameters	Book of Abstract: The Future of Operational Oceanography 2013	IMDIS 2013, International Conference on Marine Data and Information Systems, 23-25 September 2013 - Lucca (Italy)

2013	Report	Yes	Ribotti, Alberto and Ciuffardi, Tiziana and Pes, Aandrea and Manzella, Giuseppe M.R. and Sparnocchia, Stefania	Rapporto tecnico-scientifico sullo stato dell'arte dei sistemi oceanografici operativi in Mare Mediterraneo e nei mari italiani con particolare riguardo ai sistemi osservativi	RITMARE project Report, 2013	
2014	Conference	No	W.R. Turrell, B. Berx, A. Gallego, S. Hughes, R. O'Hara-Murray, J. Sanchez, B. Pereira, A. Alonso-Martirena	HF Radar Supporting Blue Growth in NW Europe: The Brahan Project	HF Radar Supporting Blue Growth in NW Europe: The Brahan Project, Lisbon, 28-30 October 2014	
2014	Conference	Yes	Novellino, Antonio; Gorringe, Patrick; Schaap, Dick; Pouliquen, Sylvie; Rickards, Lesley; Manzella, Giuseppe	Knowledgebase for growth and innovation in ocean economy: assembly and dissemination of marine data for seabed mapping - European Marine Observation Data Network - EMODnet Physics	EGU General Assembly 2014, held 27 April - 2 May 2014 in Vienna, Austria, id.5765	EGU 2014
2014	Conference	Yes	Patrick Gorringe	Introducing the EuroGOOS HFR Task Team and EMODnet	European HFR meeting Monday 27th October 2014, Lisbon	EuroGOOS meeting
2015	Conference	Yes	Antonio Novellino; Paolo D'Angelo; Giacomo Benedetti; Giuseppe Manzella; Patrick Gorringe; Dick Schaap; Sylvie Pouliquen; Lesley Rickards	European marine observation data network — EMODnet physics	IEEE Conference Publications, 2015	OCEANS 2015 - Genoa
2015	Conference	Yes	Manzella, Giuseppe M. R .; Novellino, Antonio; D'Angelo, Paolo; Gorringe, Patrick; Schaap, Dick; Pouliquen, Sylvie; Loubrieu, Thomas; Rickards, Lesley	European Marine Observation Data Network - EMODnet Physics	EGU General Assembly 2015, held 12-17 April 2015 in Vienna, Austria. id.8417	EGU 2015
2015	Conference	Yes	Mader, Julien; Novellino, Antonio; Gorringe, Patrick; Griffa, Annalisa; Schulz-Stellenfleth, Johannes; Montero, Pedro; Montovani, Carlo; Ayensa, Garbi; Vila, Begoña; Rubio, Anna; Sagarmínaga, Yolanda	European coordination for coastal HF radar data in EMODnet Physics	EGU General Assembly 2015, held 12-17 April, 2015 in Vienna, Austria. id.14714	EGU 2015
2015	Journal	No	A Aparicio-González, J L López-Jurado, R Balbín, J C Alonso, B Amengual, J Jansá, M C García, F Moyá, R Santiago, M Serra, M Vargas-Yáñez	IBAMAR DATABASE: FOUR DECADES OF SAMPLING ON THE WESTERN MEDITERRANEAN SEA	Data Science Journal, Volume 13, 27 January 2015	

2015	Journal	No	U Gräwe, M Naumann, V Mohrholz, H. Burchard	Anatomising one of the largest saltwater inflows into the Baltic Sea in December 2014	Journal Geophysical Research, Volume 120, Issue 11 November 2015 Pages 7676–7697	
2016	Conference	No	Stefania Sparnocchia, Michela Martinelli, Srdjan Dobricic, Rajesh Nair, Alessandro Crise, Patrick Farcy, Glenn Nolan, Joaquin Tintorè	An interlinked coastal observatory network for Europe	Journal of Operational Oceanography. Volume 9, 2016 - Issue sup1: Operational Oceanography, Innovative Technologies and Applications. Pages s193-s201	Third Meeting of the Italian National Group for Operational Oceanography
2016	Conference	No	Bahamon, N., Ahumada-Sempool, M.A., Bernardello, R., Aguzzi, J., Gordo, A., Carreras, G., Velasquez, Z., Cruzado, A.	SEVEN YEARS OF MARINE ENVIRONMENTAL CHANGES MONITORING AT COASTAL OOCs STATIONS (CATALAN SEA, NW MEDITERRANEAN)	instrumentation viewPoint - 19 - MARTECH 16	MARTECH 2016
2016	Conference	No	A. Oliveira, J. Rogeiro, J.L. Gomes, P. Pinto, A. B. Fortunato, P. Freire, R. T., Costa, L. Sá, R. Pablo, A. Mendes	Plataforma integrada WebSIG para apoio à gestão da emergência em eventos de inundação em estuários	4as Jornadas de Engenharia Hidrográfica, Lisboa, 21 a 23 de junho de 2016	
2016	Conference	Yes	Novellino, Antonio; Benedetti, Giacomo; D'Angelo, Paolo; Goringe, Patrick; Thjisse, Peter; Schaap, Dick; Pouliquen, Sylvie; Manzella, Giuseppe	EMODnet Physics: One-stop Portal to access Multiplatform Observing Systems	EGU General Assembly 2016, held 17-22 April, 2016 in Vienna Austria, p.3831	EGU 2016
2016	Conference	Yes	S. Goggi, G. Pardelli, R. Bartolini, F. Frontini, M. Monachini, G. Manzella, M. De Mattei and F. Bustaffa:	A semantic engine for grey literature retrieval in the oceanography domain.	Ed. D. Farace and J. Frantzen, 104 – 111, 2016;	Seventeenth International Conference on Grey Literature - A New Wave of Textual and Non-Textual Grey Literature. December 1st - 2nd 2015 at the Royal Netherlands Academy of Arts and Sciences in Amsterdam.
2016	Journal	No	Gisbert Breitbach, Hajo Krasemann, Daniel Behr, Steffen Beringer, Uwe Lange, Nhan Vo, and Friedhelm Schroeder	Accessing diverse data comprehensively – CODM, the COSYNA data portal	Ocean Sci., 12, 909–923, 2016	
2016	Journal	No	Manuel Ruiz-Villarreal, Luz M. García-García, Marcos Cobas, Patricio A. Díaz, Beatriz Reguera	Modelling the hydrodynamic conditions associated with <i>Dinophysis</i>	Harmful Algae, Volume 53, March 2016, Pages 40–52	

				blooms in Galicia (NW Spain)		
2016	Journal	Yes	Jan-Bart Calewaert, Phil Weaver, Vikki Gunn, Patrick Gorringer, Antonio Novellino	The European Marine Data and Observation Network (EMODnet): Your Gateway to European Marine and Coastal Data	Ocean Engineering & Oceanography, Vol. 6, pp 31-46, 2016	
2016	Newsletter	Yes	S. POULIQUEN, T. CARVAL, D GUILLOTIN , C. COATANOAN, T. LOUBRIEU, C. GUYOT, K. BALEM, T. SZEKELY, J. GOURRION, A. GROUAZEL, K. VON SCHUCKMANN, H. WEDHE, L.S. RINGHEIM, T. HAMMARKLINT, A. HARTMAN, K. SOETJE, T. GIES, S. JANDT, L. MULLER, M. DE ALFONSO, F. MANZANO MUÑOZ, L. PERIVOLIOTIS, D. KASSIS, A. CHALKIOPOULOS, V. MARINOVA, P. JACCARD, A. LEDANG, K. SORENSEN, G. NOTARSTEFANO, J. TINTORE , S. KAITALA, P. ROIHA, L. A. LEDANG, K. SORENSEN, G. NOTARSTEFANO, J. TINTORE , S. KAITALA, P. ROIHA, L. RICKARDS, G. MANZELLA, F. RESEGHETTI	MAIN ACHIEVEMENTS FOR MYOCEAN IN SITU THEMATIC ASSEMBLY CENTER	MERCATOR OCEAN JOURNAL 54, 2016	
2016	Report	No	Carval Thierry, Chalkiopoulos Antonis, Perivoliotis Leonidas, De Alfonso Alonso-Muñoyerro Marta, Manzano Munoz Fernando, Jandt Simon, Ringheim Lid Sjur, Hammarklint Thomas, Marinova Veselka	System Requirements Document	CMEMS-INS-SRD	
2016	Report	Yes	Ifremer	Catalogue of data and platforms at Network GDAC level, including the example of Copernicus In Situ TAC	IFREMER IMN/IDM/ISI/TC/16-031, 30th May 2016	
2016	Report	Yes	V. Harscoat, S. Pouliquen	Data Management Handbook	AtlantOS – 633211, D7.4, 2016	EU Atlantos project
2016	Report	Yes	Pepijn de Vries, Jacqueline Tamis, Martine van den Heuvel-	Collecting literature for identifying data sets and data sources	IMARES Report C072/16	IMARES Wageningen UR, Den Helder, 14 July 2016

			Greve, Peter Thijsse & Belinda Kater			
2017	Book chapter	Yes	G. Manzella, R. Bartolini, F. Bustaffa, P. D'Angelo, M. De Mattei, F. Frontini, M. Maltese, D. Medone, M. Monachini, A. Novellino and A. Spada:	Semantic Search Engine for Data Management and Sustainable Development: Marine Planning Service Platform.	Oceanographic and Marine Cross-Domain Data Management for Sustainable edited by P. Diviacco, A. Leadbetter, H. Glaves, IGI Global,	
2017	Journal	No	Christina Kalogeri, George Galanis, Christos Spyrou, Dimitris Diamantis, Foteini Baladima, Marika Koukoula, George Kallos	Assessing the European offshore wind and wave energy resource for combined exploitation	Renewable Energy, Volume 101, February 2017, Pages 244–264	
2017	Journal	Yes	Anna Rubio, Julien Mader, Lorenzo Corgnati, Carlo Mantovani, Annalisa Griffa, Antonio Novellino, Céline Quentin, Lucy Wyatt, Johannes Schulz-Stellenfleth, Jochen Horstmann, Pablo Lorente, Enrico Zambianchi, Michael Hartnett, Carlos Fernandes, Vassilis Zervakis, Patrick Gorringer, Angélique Melet and Ingrid Puillat	HF Radar Activity in European Coastal Seas: Next Steps toward a Pan-European HF Radar Network	Marine Science, 20 January 2017	
2017	Conference	Yes	Novellino, Antonio; Gorringer, Patrick; Schaap, Dick; Pouliquen, Sylvie; Rickards, Lesley; Thijsse, Peter; Manzella, Giuseppe	EMODnet Physics in the EMODnet program phase 3	EGU General Assembly 2017, held 23-28 April 2017 in Vienna, Austria. id.7113	
2017	Book chapter	No	Keiran Westley	Chapter 6: The Northwest Shelf.	Submerged Landscapes of the European Continental Shelf. Edited by Nicholas C. Flemming, Jan Harff, Delminda Moura, Anthony Burgess, Geoffrey N. Bailey	
2017	Conference	Yes	Schaap, Dick M. A.; Schmitt, Thierry	EMODnet High-Resolution Seabed Mapping - further developing a high-resolution digital bathymetry for European Seas	EGU General Assembly 2017, held 23-28 April 2017 in Vienna, Austria. id.194371S	

2017	Journal	no	Kumar et al	Ocean wave height prediction using an ensemble of Extreme Learning Machine	neurocomputing	http://dx.doi.org/10.1016/j.neucom.2017.03.092
2017	Report	Yes	Novellino, A., Fernandez, V. and Buch, E. and WP9 partners	Web-based monitoring tool of the Atlantic Ocean observing system (Europe).	AtlantOS Deliverable, D9.2 . AtlantOS, 73 pp.	DOI 10.3289/AtlantOS_D9.2.
2017	Report	No	Carval Thierry, Chalkiopoulos Antonis, Perivoliotis Leonidas, De Alfonso Alonso-Muñoyerro Marta, Manzano Munoz Fernando, Jandt Simon, Ringheim Lid Sjur, Hammarklint Thomas, Marinova Veselka	System Requirements Document (updated version of the 2016 report)	CMEMS-INS-SRD	DOI:10.13155/40846
2017	Report	Yes	Harscoat Valerie, Pouliquen Sylvie	Data flow and Data Integration - WP7	AtlantOs meeting report 2017	DOI: 10.13155/51745
2017	Report	Yes	G Manzella, A Griffa, LP de la Villéon	Report on data management best practice and Generic Data and Metadata models. V. 2.1 [Deliverable 5.9]	JERICO NEXT D5.9	https://www.oceanbestpractices.net/handle/11329/354
2017	Journal	Yes	A. Novellino, P. D'Angelo	European Marine Observations and Data Network EMODnet Physics	GEOMEDIA - Open Journal System, V. 21, N. 5	http://mediageo.it/ojs/index.php/GEOMedia/article/view/889
2017	Workshop	Yes	A. Novellino	HELCOM Working Group on the State of the Environment and Nature Conservation (STATE & CONSERVATION 7-2017)	HELCOM report - - Sopot, Poland, 23-27 October 2017	https://portal.helcom.fi/meetings/STATE%2020-%2520CONSERVATION%25207-2017-470/Documents/Presentation%252018%2520EMODNet%2520Physics.pdf
2017	Conference	No	R. Bardaji, J. Piera, R. Bartolomé, J. Dañobeitia, O. Garcia	Oceanobs a python package to analyse data from marine observatories	OCEANS – Anchorage, 2017	http://ieeexplore.ieee.org/document/8232303/
2017	Book chapter	No	K Westley	Ch. 6 The North Western Shelf	Submerged Landscapes of the European Continental Shelf - John Wiley & Sons, 26 April 2017 - 552 pages	
2018	Workshop	Yes	A. Leadbetter, P. Gorringe, A. Novellino	EuroGOOS and EMODNet Physics Data Workshop	EUROGOOS Meeting Feb 2018	http://eurogoos.eu/events/4595/

2018	Journal	No	N. Krishna Kumar, R.Savitha, Abdullah Al Mamun	Ocean wave height prediction using an ensemble of Extreme Learning Machine	Neurocomputing Volume 277, 14 February 2018, Pages 12-20	https://doi.org/10.1016/j.neucom.2017.03.092
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Table 24. Identified publications

Processing levels

Oceanographic data and data product production workflow comprise different processing steps ranging from the acquisition of unprocessed data at full resolution from the platform plug, up to integrated products as processed by models with qualified assimilated data.

The following table seeks to represent generic processing levels, applicable to most of the platforms and data sources. The table follows the same conceptual scheme as applied to remote sensing processing levels (see Wikipedia "Remote Sensing").

Processing Level	Description	Processing sub-Level	Definition
Level 0	raw data: Unprocessed instrument/payload data at full resolution including synchronisation methods (e.g. elimination of CTD up-down duplicates) and excluding communication artefacts	LEVEL 0	Reconstructed, unprocessed instrument/payload data at full resolution; any and all communications artefacts, e.g. synchronisation frames, communications headers, duplicate data removed.
Level 1	Full resolution data reconstructed with calibration coefficients, geo and time referenced	LEVEL 1A	Reconstructed, unprocessed instrument data at full resolution, time-referenced and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing.
		LEVEL 1B	Level 1A data that have been processed to sensor units for next processing steps. Not all instruments will have data equivalent to Level 1B.
Level 2	Derived geophysical data processed with a minimum QC (e.g. gross range test)	LEVEL 2A	Derived geophysical variables at the same resolution and locations as the Level 1 source data.
		LEVEL 2B	Level 2A data that have been processed with a minimum set of QC.
Level 3	Data resampled regularly and with delayed mode QC applied (including climatology comparison).	LEVEL 3A	Variables mapped on uniform space-time grid scales, usually with some completeness and consistency
		LEVEL 3B	Level 3A data that have been processed with a minimum set of QC.
Level 4	Data quality assured from multiple campaign, measurements or model outputs.	LEVEL 4	The model output or results from analyses of lower level data, e.g. variables derived from multiple measurements

Table 25. Processing levels

13 List of abbreviations and acronyms

Acronym	Description
ARGO	a global array of free-drifting profiling floats
AZTI	Centro tecnológico experto en innovación marina y alimentaria
BIAS	Baltic Sea Information on the Acoustic Soundscape
BODC	British Oceanographic Data Centre
BSH	Bundesamt für Seeschifffahrt und Hydrographie – Germany
CDI	Common Data Index
CF	Climate and Forecast vocabulary convention
Chl	Chlorophyll
CIS	Common Implementation Strategy
CMEMS	Copernicus Marine Environment Monitoring Service
CNR-ISMAR	National Research Council - Istituto di Scienze Marine (Institute of Marine Sciences) - Italy
CSV	Comma Separated Value
CTD	Conductivity Temperature Depth probe
DMSC	Data Management Steering Committee of SOOS
DB	Drifting Buoy
DFO	Fisheries and Oceans Canada
DMI	Danmarks Meteorologiske Institut, Danish Meteorological Institute - Denmark
DOOS	Deep Ocean Observing Strategy
DOX	Dissolved Oxygen
EASME	Executive Agency for SMEs - European Commission
ECV	Essential Climate Variables
EGU	European Geosciences Union
EMODnet	European Marine Observation and Data Network
ERDAP	Environmental Research Division's Data Access Program
ETT	Digital and Creative Industry
EU	European Union
EUDAT	Research Data Services, Expertise & Technology Solutions
EuroGOOS	European component of the Global Ocean Observing System
EUSKOS	Basque Operational Oceanography System Basque Operational Oceanography System
FB	Ferrybox
GeoServer	Open-source server written in Java that allows users to share, process and edit geospatial data
GISC	Global Information System Centres
GLOSS	Global sea-level stations
GOOS	Global Ocean Observing System
GOSHIP	Global Ocean Ship-based Hydrographic Investigation Program
HCMR	Hellenic Centre for Marine Research - Greece
HELCOM	Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area

HF	HF radar
HFR	High-Frequency Radar
IAPB	International Arctic Buoy Programme
ICES	International Council for the Exploration of the Sea
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer - France
IMOS	Integrated Marine Observing System
IMR	Institute of Marine Research in Norway - Norway
INCREASE	Innovation and networking for the integration of coastal radars into European marine services
INSITU TAC	CMEMS In situ thematic assembly centre
INSPIRE	Infrastructure for Spatial Information in Europe
INSTAC	CMEMS In Situ Thematic Assembly Centre
IOC	Intergovernmental Oceanographic Commission of UNESCO
IODE	International Oceanographic Data and Information Exchange
IOPAN	Institute of Oceanology, Polish Academy of Sciences - Poland
ISPRA	Istituto Superiore per la Protezione e la Ricerca Ambientale - Italy
JERICO NEXT	Joint European Research Infrastructure for Coastal Observatories
L2W	L2W Coastcolour product provides information about water properties such as inherent optical properties, concentrations and other variables.
M2M	Machine-to-machine
MARIS	Marine Information Service
MEOP	Marine Mammals Exploring the Oceans Pole to Pole
Mercator Ocean	Mercator Océan - France
MESA	Multirole Electronically Scanned Array radar
MI	Marine Institute - Ireland
MIO	Mediterranean Institute of Oceanography - France
MONGOOS	Mediterranean Operational Network for the Global Ocean Observing System
MoU	Memorandum of Understanding
MSFD	Marine Strategy Framework Directive
NERSC	Nansen Environmental and Remote Sensing Centre - Norway
NetCDF	network Common Data Form
NIB	National Institute of Biology Marine Biology Station - Slovenia
NERSC	Nansen International Environmental and Remote Sensing Centre - Norway
NOAA	National Oceanographic and Atmospheric Administration
NODC	National Oceanographic Data Centre
NOOS	North West Shelf Operational Oceanographic System
NRT	Near Real-time
ODIS	Ocean Data and Information System
ODV4	Ocean Data View version 4
OGC	Open Geospatial Consortium
ODIP	Ocean Data Interoperability Project
OGS	Istituto Nazionale di Oceanografia e di Geofisica Sperimentale - Italy

OpenDAP	Open-source Project for a Network Data Access Protocol
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
P09	MedAtlas Parameter Usage Vocabulary
PANGAEA	Data Publisher for Earth & Environmental Science
PdE	Puertos del Estado - Spain
PSMSL	Permanent Service on Mean Sea Level
QA	Quality Assurance
QC	Quality Control
QF	Quality Flag
RSC	Royal Society of Chemistry
RITMARE	Ricerca Italiana per il Mare
ROOS	Regional organisation of EuroGOOS
TSM	Total Suspended Matter
SCRIPPS	Scripps Institution of Oceanography
SDN	SeaDataNet
SE	Service Evolution
sensorML	Sensor Model Language
SHOM	Service Hydrographique et Oceanographique de la Marine – France
SMHI	Swedish Meteorological and Hydrological Institute
SOCIB	Balearic Islands Coastal Observing and Forecasting System - Spain
SONEL	Système d’Observation du Niveau des Eaux Littorales
SOOS	South Ocean Observing System
SOS	Sensor Observation Service
SWE	Sensor Web Enablement
TG	Technical Group
THREDDS	Thematic Real-time Environmental Distributed
TT	Task Team
UK	United Kingdom
UPC	Universitat Politècnica de Catalunya.
ur-EMODnet	EMODnet prototype
US	United States
vADE	Advanced Radar System by SMHI
VLIZ	Vlaams Instituut voor de Zee
WCS	Web Coverage Service
WFS	Web Feature Service
WIS	WMO Information system
WISC	Expert Team on WIS GISCs and DCPCs (ET-WISC)
WMO	World Meteorological Organisation
WMS	Web Map Service
WP	Work Package

Table 26. Acronym table