EMODnet

European Marine Observation and Data Network

# EMODnet Thematic Lot n° 3 – Physics

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## EMODnet Phase III – Final Report

**Reporting Period: 29/03/2017 – 28/03/2019**

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# Disclaimer

# Executive summary

The European Marine Observation and Data Network (EMODnet) is a long-term, marine-data initiative funded by the European Maritime and Fisheries Fund which, together with the Copernicus space programme and the Data Collection Framework for fisheries, implements the EU's Marine Knowledge 2020 strategy.

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 map portal (www.emodnet-physics.eu/map) provides a single point of access to validated in situ datasets, products and their physical parameter metadata of European Seas and global oceans. More specifically, time series and datasets are made available, as recorded by fixed platforms (moorings, tide gauges, HF radars, etc.), moving platforms (ARGO, Lagrangian buoys, ferryboxes, etc.) and repeated observations (CTDs, etc.). The available themes are:

- the temperature of the water column
- the salinity of the water column
- horizontal velocity of the water column
- sea level and sea level trends
- wave height and period
- wind and atmospheric pressure
- optical properties (e.g. light attenuation, back scattering, turbidity, etc.)
- underwater sound pressure level (acoustic pollution)
- river runoff
- other biogeochemical data (e.g. chlorophyll, dissolved oxygen, etc.)
- sea-ice coverage

Acquisition of these physical parameters is largely an automated process based on a "federated" network infrastructure linking data providers and other marine data aggregating infrastructure. In particular, EMODnet Physics is strongly federated with two other European data aggregating infrastructures. One is the Copernicus Marine Environment Monitoring Service - In Situ Thematic Assembly Centre for operational data flow, while historical validated datasets are organised in collaboration with SeaDataNet and its network of National Oceanographic Data Centres. CMEMS-INSTAC and SDN-NODC subsets are integrated with other available sources to make the most comprehensive physical parameter data catalogues available. Thanks to international 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), EMODnet Physics catalogues are going beyond European borders to offer an even more exhaustive entry point to global-ocean physical observations.

EMODnet Physics is also co-coordinating the European effort for the design and development of new data flows. Progress in the management of sea surface currents, as recorded by HF radars, is

exemplary: initiated and supported by EMODnet Physics, the EuroGOOS HFR Task Team was able to attract and connect providers and projects. This effort enabled the design and set up of the European node for global HFR data management and exchange, making the International HFR data (GOOS-ObservingElementSpecification-HFRadar.pdf) catalogue available. The same coordination and networking approach has started being applied to other data flows (operational river runoff, underwater sound pressure levels), and platform networks (gliders, tagged sea mammals) with results beginning to be evident.

This led for the EMODnet Physics portal to incorporate data from supplementary physical monitoring systems, such as Argo (all Argo data are available), gliders and emerging measurement systems. Access is provided to more than 160,000 platforms and all available data and metadata have the same standards and formats (e.g. NetCDF, csv).

For each connected dataset/platform, a dedicated platform page is available. These pages provide the user with metadata, plots, download features, platform products – e.g. monthly averages or wind plots – 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.

Apart from these data, EMODnet Physics is developing interoperability services to facilitate machine-to-machine interaction and to provide further systems and services with European seas and ocean physical data and metadata. These features range from widgets to WxS OCG compliant services.

EMODnet Physics is offering more than 800.000 datasets and, in the past 2 years, it registered more than 140.000 manual data download requests, and more than 1.300.000 web services transactions.

# 1 Introduction

The Green Paper 'Marine Knowledge 2020: from seabed mapping to ocean forecasting' [COM(2012) 437 Final] has provided 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 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 in determining how well the data meets the needs of users from industry, public authorities and scientific fields.

It was 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.

Much effort was made in ur-EMODnet Physics to build consensus and support for the DGMARE initiative. From the beginning, EMODnet physics has created collaborative relationships, providing data access to – and preview for – coastal data in both European seas and non-European areas (e.g. linking international initiatives and marine-data programmes in US, Australian, Arctic and Antarctic Oceans etc.).

At the end of phase 2, in 2016, the portal was extended to the global Ocean and is now providing access to more than 13,000 platforms that give 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, 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 data users how it was gathered, how it was checked, processed, what algorithms were used, what errors found, and how the errors were corrected or flagged. Without them, data from different sources cannot be combined or re-used to obtain 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. While doing this, EMODnet Physics was supporting actions on the adoption of common Quality Assessment - Quality Control protocols, by participating in 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[1], MARIS[2], IFREMER[3]) 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.

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[1] **EuroGOOS (http://www.eurogoos.org)** is an association of agencies to further the goals of GOOS, and in particular the development of Operational Oceanography in the European Sea areas and adjacent oceans. EuroGOOS now has 42 members in 18 European countries. Among its priorities are the improvement of the observing system for operational oceanography in Europe, its contribution to global systems and the further development of GOOS, in particular by taking the lead in advancing Coastal GOOS. Activities of EuroGOOS associates and Regional Members are organised at regional level. The EuroGOOS **Regional Ocean Observing Systems** (ROOSs) are the core of the EuroGOOS association and acts as the operational arm of EuroGOOS and of initiatives such as CMEMS. The ROOSs are responsible for the collection of in situ data to fulfil the aims of the regional service needs. During the past couple of years, EuroGOOS has set up a number of Task Teams. EuroGOOS Task Teams are operational networks of observing platforms. They promote scientific synergy and technological collaboration among European observing infrastructures. Task Team members exchange open source tools, collaborate in areas of common interest, and jointly make European data available to the EuroGOOS ROOS regional data portals, which in turn are feeding data to EMODnet and Copernicus Marine Service, CMEMS.

[2] MARIS is representing the **SeaDataNet network of NODCs. SeaDataNet (http://www.seadatanet.org)** and is a Pan-European network of professional data centres providing on-line integrated databases of standardised quality. It is developing and operating an infrastructure for managing, indexing and providing access to ocean and marine environmental data sets and data products (e.g. physical, chemical, geological, and biological properties) and for safeguarding the long term archival and stewardship of these data sets. Data are derived from many different sensors installed on research vessels, satellites and in situ platforms that are part of various ocean and marine observing systems and research programs. Data resources are quality controlled and managed at distributed data centres that are interconnected by the SeaDataNet infrastructure and accessible for users through an integrated portal. The data centres are mostly National Oceanographic Data Centres (NODCs) which are part of major marine research institutes that are developing and operating national marine data networks, and international organizations such as IOC/IODE and ICES. The data sets managed come from various sources and time periods. This imposes strong requirements towards ensuring quality, elimination of duplicate data and overall coherence of the integrated data set. This is achieved in SeaDataNet by establishing and maintaining accurate metadata directories and data access services, as well as common standards for vocabularies, metadata formats, data formats, quality control methods and quality flags

[3] IFREMER is representing **CORIOLIS – the European Global Data Assembly Center** and the **Copernicus Marine Environment Monitoring System** In Situ Thematic Assembly Center **(CMEMS INSTAC).**

CMEMS (http://marine.copernicus.eu) is the operational marine application component of the COPERNICUS programme. The aim of CMEMS is to deliver generic and systematic reference information on the physical state and dynamics of the ocean and marine ecosystems. These products are generated by integrating/assimilating remote sensing data and model data. It comprises three main service layers: the central information system (i.e. the catalogue and the help desk), the dissemination unit (i.e. the cloud infrastructure that receives and disseminates CMEMS products) and the production layers (comprising several production units managing the production of observation and forecast products). One of the production unit is the INS TAC – in situ thematic assembly center – that is in charge of the collection and harmonisation of near real-time data. This data is used to feed models or to calibrate/validate the outcome of models of other production units. For this reason, INS TAC is specifically designed (product naming, data formats, data flagging, …) to serve the other CMEMS production units. The in-situ TAC integrates and controls quality, in a homogeneous manner, in situ data from outside CMEMS data providers to fit the needs of internal and external users. The INS TAC was developed on top of the EuroGOOS – ROOSs concept and infrastructure, according to which the regional assemblies agreed to share data from the same regional area (Baltic, Med, North Sea …) for common operational benefit. This infrastructure was taken from – and further developed and fine tuned by – MyOcean projects and made ready to be the CMEMS INSTAC PU.

CORIOLIS (http://www.coriolis.eu.org/About-Coriolis) is a component of the French and European operational ocenography and hosts the European Global Assembly Data Center for various networks (e.g. ARGO, drifting buoys etc).

More specifically, this project develops and maintains:

- a common method of access to data held in repositories and integrators, in coherence with efforts by 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 and visualise data and metadata, with a smooth downloading process;
- interoperability with data distributed by non-EU organisations;
- a process to monitor performance and deal with user feedback;
- a help-desk offering support to users.

As well as 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 must make available data and products for two new parameters: data from rivers and underwater sound.

During this phase, EMODnet Physics assembly was able to make available more than 160.000 platforms and more than 800.000 datasets, while re-organising and renewing the portal and its features, and giving support to users who made more than 140.000 manual data download requests, and more than 1.300.000 web services transactions.

# 2 Highlights in this reporting period

1. EMODnet Physics data policy is open and free and the user can discover, plot and download in situ marine data from European Coastal and National programmes together with data collected by international programmes (e.g. ARGO). To facilitate the user experience, service responsiveness and performances, the EMODnet Physics portal and back-office infrastructure undertook many major developments and updates. The EMODnet Physics landing and data portal was restyled and now offer customised pages and services for each type of recording platform. GeoNetwork, THREDDS, ERDDAP catalogues were added/updated, new and additional layers were added to GeoServer interface, and new widgets and APIs were developed. New physical parameter data-flows were designed and developed to make available data such as river runoff, underwater continuous and impulsive noise, suspended matter, etc.

2. EMODnet Physics is collaborating with a number of international initiatives and groups (CMEMS, SeaDataNet, JCOMMOPS, EuroGOOS Task Teams, SONEL, PSMSL, SOOS, DOOS, etc.) to promote European standards and facilitate data, products and best practice exchange, enabling it to increase access to data. EMODnet Physics is actively contributing to joint WMO/IOC working teams ET-WISC, Task Team on Data Centres and IPET-MOIS, Inter-Programme Expert Team on Integrated Marine Meteorological and Oceanographic Services within WMO and IOC Information Systems. EMODnet Physics is participating and contributing to TG NOISE. EMODnet Physics is contributing to the IOC Ocean Data and Information System, ODIS, https://odis.org. EMODnet Physics is also participating and contributing to TG NOISE. Participation in these activities promotes European standards and facilitates data, products, best practice exchange and by this increasing the access to data and promoting available services in Physics.

3. During the period, EMODnet Physics registered 143.470 manual data download requests (20.853 reprocessed datasets) and more than 1.300.000 web services transactions. EMODnet Physics products (gridded maps, layers, etc.) are available without authentication and they registered a positive trend in views. The product pages registered more than 5.000 views and GeoServer services registered more than 900.000 transactions.

4. EMODnet Physics participated in several TG NOISE meetings, and had specific meetings with HELCOM, OSPAR and ACCOBAMS (QUITEMED project) to deal with underwater noise, and interact with and engage with Sea Regional Conventions. Making available more operational data (in terms of parameters and format that are close to MSFD I.11 requirements), offer a single homogeneous European entry point to impulsive noise registries (MSFD I.11.1) and work on (regional) sound maps are the three key identified activities for Physics. These can be the basic layers to be used in combination with habitat layers and thresholds to go towards the MSFD indicators.

5. In collaboration with EMODnet Data Ingestion, a number of events were organised to promote the EMODnet aims and involve new communities and providers in the EMODnet data provision framework. Dedicated events were organised in Ireland, Poland, Italy, Spain, Germany, Portugal, etc. This action went together with proactive dissemination during the main marine related conferences and congresses (e.g. European Geoscience Union annual conferences, International Conference on Marine Data and Information Systems, European Marine Days, OceanBusiness, SeaFuture, Marine Technology workshop, etc.). In total, the EMODnet Physics team took an active part in more than 140 events.

6. 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, EMODnet Physics is hosting the map viewer for the Southern Ocean Observing System, SOOS, http://www.soos.aq/data/soosmap, a collaboration that has greatly increased access to data from the area, thus contributing to increased cooperation among data providers in the region. Similar activity has recently been initiated in the Red Sea and negotiations are ongoing with the Arctic community to provide a similar approach.

7. EMODnet Physics is playing a strategic role with platform network operators and besides offering the umbrella to facilitate the data format, standards, methodology, etc. harmonization, it is also facilitating the networking and co-operation between European teams and international teams. These kind of actions find their best show off during ad hoc organized international technical and scientific events. One example is the co- organized International Glider Workshop - "Connecting Glider Data Flows In Europe and beyond" (Genova 18-20 September 2018). The meeting that recorded 70 attendees from Europe, Australia, Brazil, Canada, United States and from both public (research institute, international organizations, etc.) and private (company) sector. The proactive discussion on data flow and data format harmonisation became the basis for developing an international standard (OceanGlider format) that will facilitate data discoverability, access and interoperability. A long term sustained collaboration between EMODnet Physics and JCOMMOPS is important to facilitate and speed up the process and provide the European Glider TT with the framework to develop and achieve planned actions. A second example is the EMODnet session at the 8th MARTECH. Besides a general introduction to the EMODnet programme, the Data Ingestion facility, EMODnet Physics and its latest results on underwater noise data-flow and river data flow where presented. The event contributed to the unlocking of new underwater data. A further example is the 8$^{th}$ International FerryBox Workshop that is going to take place in Genova, 24-26 April 2019 and has already registered more than 60 attendees from all over the world.

8. EMODnet Physics has initiated a collaboration with Van Oord. They are a Dutch company with 150 years of experience as an international marine contractor with main activities within dredging, offshore wind and offshore oil and gas. Van Oord collects data from locations all over the world but in particular in the North Sea. It's mainly ADCP data but also wave buoys

and tide gauges. EMODnet Physics has been granted access to their archived data and negotiations are ongoing to also access the near real time data with the main purpose to improve the operational models in the areas of interest (North Sea) for Van Oord. This collaboration may act as an example for other companies to release their data.

# 3 Summary of the work done

EMODnet Physics went through many developments and updates. An incomplete list of progress includes: 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.). There has also been the development of new products (e.g. total suspended matter) and the inclusion of third party products (e.g. SDN climatology, impulsive noise registries). This is generating good dynamic of the portal features, facilitating links with other thematic lots and the ingestion facility as well as connections with non-EU parties.

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

The acquisition of physical parameters is largely an automated process that integrates operational data source and key marine data integrators e.g. the Copernicus Marine Environment Monitoring Service In Situ Thematic Assembly Centre and/or Global Data Assembly Centres. EMODnet Physics is operationally processing this data flow to generate map layers and extract in situ (monthly) trends, averages, peak values of the physical 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 the in situ historical data collections broker between users and the NODCs. This "federative" approach facilitates interaction with other established databases for data preservation at both European (e.g. Global Runoff Data Centre, ICES databases, etc.) and international (e.g. GOOS, SOOS, NOAA, IMOS, etc.) levels.

EMODnet Physics is also leading the process of data flow chain design and the development of "younger" parameters/platforms/technologies such as river outflow, water noise, sea surface currents as recorded by HF radars, marine data from gliders, etc. The international relevance of these actions led to a stronger and highly proactive collaboration with JCOMMOPS and the GOOS project office (representing not only GOOS but also the JCOMM Observations Coordination Group (OCG)).

***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 are different for each provider. Interoperability is achieved, however, through 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 source invisible to the user, allowing data from various sources to be assembled without further processing (also see section 6). As well as these data, EMODnet Physics is providing 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 filter tools for data age, depth, geographical coverage, physical parameters, etc.

Data products for currents (radar), temperature (in situ NRT, in situ MEOP, gridded monthly men, climatologies), salinity (in situ NRT, in situ MEOP, gridded monthly men, climatologies), sea level (relative sea level trends from PSMSL, absolute sea level trends from SONEL), river input – total suspended matter, underwater noise, and sea ice are available for users.

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

EMODnet Physics GeoNetwork, THREDDS, ERDDAP catalogues were added/updated, with new and more layers being added to the GeoServer interface, and new widgets and APIs were developed. Whenever possible, SeaDataNet-controlled vocabulary (e.g. P02), to map the metadata, were used. The catalogues are making links to collections of similar datasets available (e.g. collection of sea mammal based profiles, collections of CTDs, etc.). In collaboration with EMODnet Data Ingestion, a real-time SOS SWE based data ingestion methodology was demonstrated (www.emodnet-physics.eu/RealTime).

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

EMODnet Physics portal is kept up-to-date. To facilitate the user experience, service responsiveness and performances, EMODnet Physics portal and back-office infrastructure went through many major developments and updates. The EMODnet Physics landing and data portal was restyled and they are now offering customised pages and services for each typology of recording platform. GeoNetwork, THREDDS, ERDDAP catalogues were added, new and more layers were added to GeoServer interface, new widgets and APIs were developed. New physical parameter data flows were designed and developed to make available data such as river runoff, underwater continuous and impulsive noise, suspended matter, etc.

***Task 5. Ensure the involvement of regional sea conventions***

The Underwater Noise theme was identified as the topic for engagement by the Regional Sea Conventions. EMODnet Physics participated in TG NOISE (and it is now an official permanent invited member on the board), and had specific meetings with HELCOM (Baltic area) and OSPAR (North West Shelf area). For the Mediterranean area, EMODnet Physics is interacting with the QuiteMed[4] project (EMODnet Physics coordinator joined the project advisory board). The outcome from these interactions defined the key activities to be implemented under EMODnet Physics: to make more operational data available (in terms of parameters and format that are close to MSFD I.11 requirements), to offer a single harmonised European entry point to impulsive noise registries (MSFD I.11.1) and to work on (regional) sound maps. A number of operational underwater noise data (i.e. Sound Pressure Level – SPL), sound maps, and the impulsive noise events registry are available in the portal, proofing the methodological approach to be further developed in collaboration with key partners (e.g. ICES, QuiteOcean, University Politecnica of Catalunia).

***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 the South Ocean Observing System (EMODnet Physics is also hosting the SOOSmap data portal). EMODnet Physics is contributing to joint WMO/IOC working teams ET-WISC, Task Team on Data Centres and IPET-MOIS, Inter-Programme Expert Team on Integrated Marine Meteorological

[4] www.quietmed-project.eu. Co-funded under the DG ENV/MSFD Second Cycle/2016 programme, the QuiteMed project objective is to enhance cooperation among Member States (MS) in the Mediterranean Sea to implement the Second Cycle of the Marine Directive and in particular to assist them in the preparation of their MSFD I.11 reports.

and Oceanographic Services within WMO and IOC Information Systems. EMODnet Physics is contributing to the IOC Ocean Data and Information System, ODIS (https://odis.iode.org/search). Further, EMODnet Physics is collaborating with JCOMMOPS in enabling the flow of new platforms, e.g. Glider and HFR, metadata and data and to promote European standards among the global platform communities. In collaboration with EMODnet Data Ingestion, EMODnet Physics made a connection with Russian National Oceanographic Data Centre, and in collaboration with the ODYSSEA project, it is going to make links with North African countries. Interactions for data sharing were started with South Eastern Mediterranean countries (Egypt, Israel) and the Red Sea, leading to fruitful discussions on Red Sea – Mediterranean interactions and future collaboration opportunities.

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

Progress indicators and a monitoring service 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 (reserved for subscribers) with stats on the use of platforms and downloads. The report reaches the providers by email and gives information about the use (number of hits, most viewed datasets etc.) of their platforms/datasets via EMODnet Physics. This developed tool is one of the most appreciated and since it was published, EMODnet Physics is recording an increasing number of interested users. It is serving most European data providers linked to EMODnet Physics (e.g. AZTI, SOCIB, IFREMER, etc.) as well as European supported marine research projects (e.g. AtlantOS, JERICO-NEXT, SeaDataCloud).

***Task 8. Operate a help desk offering support to users***

As planned, the services were developed and EMODnet Physics is operating a help-desk to deal with user feedback and their support needs. The help-desk is based on an automatic e-mail/ticketing system working 24/7. Help-desk operators are informed about new 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 97 requests for help (Table 6). The requests were mainly asking for correction of metadata and helping to find and download specific datasets.

For efficient project management we added a project management task, organised in four Work Packages (WP):

| WP # | WP Title | Corresponding Tasks |
|---|---|---|
| WP 1 | Project management | Task 9. Project management<br>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<br>Task 2. Construct products from one or more data sources that provide users with information about the distribution of parameters in time and space<br>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<br>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<br>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 | During the first year, the development of the ERDDAP layer, as well as the EMODnet Physics data, took longer 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 net cdf files. EMODnet Physics is now equipped with a service layer that re-organises the variables and re-writes data so that they are available on the EMODnet Physics ERDDAP server. The implementation of this new catalogue was a key project milestone. The ERDDAP catalogue implementation continued for the whole contract duration and now EMODnet Physics is able to link and ingest many more data sources (see next points). |
| Interoperate with the OAI-PMH that is a widely used standard by both European entities (e.g. PANGAEA) and non-EU organisations | An 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.<br>The PANGAEA information system operates 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.<br>Thanks to the new EMODnet Physics back-office infrastructure, it is now possible to link and ingest some of the datasets. The activity can be developed further in the coming years. |
| Extend the capacity of EMODnet Physics to integrate historical data hosted in unstructured databases (e.g. GOSHIP). | The reorganisation of the data flow behind the EMODnet Physics data portal and the implementation of the latest version of the ERDDAP catalogue now offers the possibility of including and linking this kind of unstructured databases.<br>Moreover, many GOSHIP data are already integrated either in CMEMS INSTAC products or in the SDN that are already available in the EMODnet Physics portal. |
| 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. Nowadays, this viewing tool is using the EMODnet Physics widgets showing the synergies and cooperation. |
| Complexity in the management of the noise sound maps | The noise sound maps are based on AIS data. While waiting for the Human Activity AIS product and a study on how and if it is possible to generate noise sound maps, EMODnet Physics is |

| | |
|---|---|
| | using an open and free source of AIS data. This data is not freely accessible all over Europe, and so it is possible to work in some areas only (http://www.aishub.net/coverage).<br>Computing the monthly noise (@63Hz, 125Hz, 2KHz at 3 depth levels) for a small box (2DEG * 2DEG) takes from 2 to 3 weeks (by using the selected method that was developed by Quiet-Oceans).<br>Once the map is generated, it has to be calibrated/validated versus in situ operational SPLs data. EMODnet Physics was able to link SPLs data from 5 sites (some are only temporary data). Given the limitation of operational data together with the high-computation-needs, EMODnet Physics focused on proofing the method to make calibrated sound maps in a target area (Barcelona) where we have access to both AIS data and SPLs. |
| Download of all available dataset for a given parameter – subsetting feature | Re-organisation of the whole EMODnet Physics data management and data infrastructure. The system is now mainly based on an ERDDAP server and datasets collected from the federated infrastructures (CMEMS, IOOS, IMOS …) are processed to generate and fill the EMODnet Physics DB. Datasets are now available in different transport format. The user is provided with the links to the original data source. |
| MEOP2018 contained errors in the metadata. | The product was temporarily unavailable and then rolled back to the previous version. Now the system is linking/including MEOP2018 (April 2018). |
| Implementing the new indicators and interacting with TRUST-IT to gather quarterly stats | Some indicators (5.2.2, 6.3, 6.4, 6.5, 7.1, 7.2.2, 10.2) are based on tools and methods hosted by Trust-IT. The agreement was that TRUST-IT was providing these quarterly stats in time to let the lots deliver quarterly reports. This interaction did not always work properly and EMODnet Physics often did not receive (in time) some of the data to be reported.<br>Tracking tools and indicators are quite important in the monitoring of progress and impact, and the lots must be able to access this information at any time, without any mediating entity. |

Table 1. Challenges

# 5 Allocation of project resources

The total budget of EMODnet Physics is 1.400.000€, divided as follows:

| Task description | Total | Resource usage (%) |
|---|---|---|
| Task 1: Develop a common method of access to data held in repositories | 110,000.00 € | 100% |
| 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 € | 100% |
| Task 3: Develop procedures for machine-to-machine connections to data and data products | 270,000.00 € | 100% |
| Task 4: Develop a web portal allowing users to find, visualise and download data | 280,000.00 € | 100% |
| Task 5: Ensure the involvement of regional sea conventions | 70,000.00 € | 100% |
| Task 6: Facilitate interoperability with data distributed by non-EU organisations | 140,000.00 € | 100% |
| Task 7: Install a process to monitor performance and deal with user feedback | 80,000.00 € | 100% |
| Task 8: Operate a help-desk offering support to users | 135,000.00 € | 100% |
| OTHER GENERAL COSTS - project Management | 140,000.00 € | 100% |
| **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) | 15% |
| Preparing data products (Task 2) | 15% |
| Preparing web-pages, viewing or search facilities (Task 4 and Task 6) | 25% |
| Managing user feedback (Task 7 and Task 8) | 10% |
| Project management (Task 9) | 25% |
| Outreach and communication activities (Task 9 and Task 5) | 10% |
| Others | - |

Table 3. Categories and resources split

# 6 Work package updates

## 6.1 WP1 – Project Management

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

- **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, Seabed Habitats and Human Activities.

- **Physics and Biology** – Physics is collecting and making oceanographic data available, as collected by tagged sea animals. Together with the physical parameters (typically temperature and salinity of the water column), EMODnet Physics also receives animal tracking as well as information on the animal (species), which is made available to Biology as map/geoserver layers.
- **Physics and Chemistry** – thanks to its architecture and infrastructure, Physics is receiving some operational parameters (e.g. Chl, DOX, etc.) that are in the Chemistry domain. These parameters are offered by means of machine-to-machine interfaces. A further topic of collaboration is river data management, and Physics and Chemistry designed a common strategy to deal both with this and with data providers. While Chemistry focuses on nutrients, Physics works on river flow (both near real-time data and historical data) and on the development of a total suspended matter product.
- **Physics and Seabed Habitats** - physics datasets have been used by Seabed Habitats to develop/validate products (e.g. the Kinetic Energy on the Seabed and Light Availability on the Seabed). The two projects recently started interacting, in order to use and improve underwater noise and total suspended matter products.
- **Physics and Human Activities** – the two initiatives are working on the possibility to use Human Activity ship density maps as a layer for generating sound maps. The potential impact of the outcome (water noise is a source parameter for the MSFD Descriptor 11 and theme of interest for both Regional Sea Conventions and TG NOISE) makes this topic and the collaboration very important for activities in coming years.
- **Physics and Data Ingestion** – this is a very important and fruitful collaboration. Besides cooperating on the ingestion and long term safekeeping of the datasets towards NODCs, they are working together to establish permanent connections (data flow) with new operational oceanography data providers. In particular, Physics and Data Ingestion developed a pilot for real-time data exchange using Sensor Web Enablement (SWE) aiming at giving direct standardised access to selected data types from selected monitoring instruments. A dedicated viewer shows this RT data exchange (www.emodnet-physics.eu/realtime).

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

This joint action greatly contributed towards filling gaps and making data available in areas that were not yet covered by EMODnet Physics (e.g. Croatia, Iceland, Ireland, some Italian areas, Russia, etc.), as well as making more platform network data available (e.g. HF radar and ocean gliders).

- **Engagement of the Regional Sea Conventions**

In 2014, TGNOISE started working on guidance on enabling monitoring[5] on pressure indicators (only), in 2016 it started working on impact indicators related to an assessment that should be done at (sub) regional level. For both impulsive and continuous noise, the key issue is to identify (a set of) thresholds indicating when noise is affecting/impacting habitats. Although it is possible to define thresholds for impulsive noise (e.g. % yearly reduction of population/mortality, % of population/habitat exposed above disturbance level), for continuous noise, there are knowledge gaps on the direct effects on the population. The TGNOISE approach is to keep developing maps that include temporal information. The maps can be produced @ 63Hz, 125Hz and 2KHz and can be used to calculate statistical properties in specific areas as well as a time function. Monthly and annual soundscape maps can be drawn. Relevant statistical measures are n:th exceedance levels (n = 5, 10, 25, 50, 75, 90, and 95%). These model outputs should be integrated with monitoring data where sensors should be deployed at two types of location, near shipping lanes where individual signatures from ships are obtained and in locations where noise from distant shipping dominates. Furthermore, it is highly desirable to perform measurements at two depths above and below the thermo- and/or haloclines or by modelling, taking the complex acoustic environment into account. In this framework, the indicator can be based on the correlation between the statistical measure of the exceedance levels and % of the population. In this framework, EMODnet Physics is integrating and federating impulsive noise event registries by using a harmonised statistical grid (10' latitude and 20' longitude) for the whole of Europe, providing users with a common layer to be used in combination with the habitat layer to work on thresholds. Concerning continuous noise, the EMODnet Physics approach is following TGNOISE recommendations and is working on making in situ operational SPL data available, to be used to calibrate/correct the sound maps.

- **Cooperation and coordination with MERCATOR - CMEMS**

Since August 2016, EMODnet Physics and MERCATOR OCEAN (i.e. trusted entity to develop the Copernicus Marine programme) signed a Memorandum of Understanding on in situ data management and presentation. Continuous interaction is improving the quality of the offered service, as it facilitates the unlocking of new and increased data that contribute to the improvement of the quality of in situ products, thereby reducing data duplication, cleaning metadata, facilitating access and use of data and products. Besides cooperating to link new platforms and add more and better data to both EMODnet Physics and CMEMS, EMODnet Physics has developed a user-friendly interface to view those data for its own users, developing updated widgets that have been used by CMEMS In Situ TAC to improve the viewing service developed for outreach and promotion activities[6].

[5] Impulsive Noise Registries are developed on data from 2015

[6] http://www.emodnet.eu/emodnet-physics-enhances-services-cmems-situ-thematic-assembly-centre

- **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 exchange of best practices. EMODnet Physics officers are members of the core teams and, as such, they are involved in various projects and programmes (e.g. AtlantOS, JericoNEXT, SeaDataCloud, CMEMS INSTAC, CMEMS DU, etc.) creating links between the projects and EMODnet; with a particular focus on data flow management infrastructure and standards. The team is also serving on many Data Management boards (e.g. EuroGOOS DATAMEQ[7], SOOS DMCG[8], TT WISC[9], OceanGlider DMT[10], etc.). This is facilitating and increasing the cooperation among different communities across Europe and between Europe and non-European Countries, as well as increasing the amount of available data in EMODnet Physics and key European marine data infrastructures.

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

The objectives of WP2 are the identification of specific additional data sources that contribute to the EMODnet physical parameters portfolio (Argo, profiling floats, gliders, radar, CTD from ships, river outflow, water noise, etc.), and the reduction of spatial and temporal gaps in cooperation and collaboration with the underlying EuroGOOS ROOSs, CMEMS INS TAC, and SeaDataNet NODCs infrastructures, as well as EMODnet Data Ingestion. Part of this activity is the development of EMODnet Physics services with user-friendly interfaces for data and metadata uploading, data tracking and providing guidance and documents on preferred data, common data and metadata models. This WP includes Task 1. (Develop a common method of access to data held in repositories), Task 2. (Construct products from one or more data sources that provide users with information about the distribution of parameters in time and space), and Task 6. (Facilitate interoperability with data distributed by non-EU organisations).

EMODnet Physics is developing an **operational service where real-time, 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 the user can download in situ data without authentication in case of operational data for the past 60 days, operational data from platforms participating in international programmes (e.g. ARGO) and data from providers that specifically requested it. Users are asked to authenticate requests for some data older than 60 days and reprocessed/delay mode in situ data, and for dataset aggregations hosted by National Oceanographic Data Centres.

[7] http://eurogoos.eu/data-management-exchange-quality-working-group-data-meq/

[8] Annual Report SOOS

[9] https://wiswiki.wmo.int/tiki-index.php?page=ET-WISC-2019

[10] https://www.ego-network.org/dokuwiki/doku.php?id=public:data

Real-time data acquisition and dissemination is based on the latest implementation of the Sensor Web Enablement (SWE) and Sensor Observation Service (SOS) standards. These interoperable interfaces permit the insertion and retrieval of georeferenced observation data in a standardised format. This new data stream management is done jointly, in collaboration with EMODnet Data Ingestion, and besides developing and deploying the SOS, the two projects are working and contributing on a set of standards to implement ISO/OGC O&M features and SensorML for the Marine domain[11].

The acquisition of near real-time physical parameters is largely an automated process: EMODnet Physics collects data from its federated structure of providers and makes it available in the EMODnet Physics catalogue (ERDDAP)[12] and hence in the map viewer[13].
Typically, the transport format is NetCDF (CF Convention), as defined by the EuroGOOS DATAMEQ working group and the SeaDataNet technical working team, and includes metadata and data quality flags. Data quality is flagged according to an automatic – unsupervised procedure at the data source. EMODnet Physics is operationally processing this data flow to generate map layers and extract in situ (monthly) trends, averages and peak values of the parameters.
Historical validated datasets are 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 users and the NODCs. For the historical validated datasets (fixed stations – mooring, tide gauge) the metadata format is the CDIs (common data index) and the transport formats are ODV4 and NetCDF (CF convention). For the parameters (and platforms) that are not managed by its pillars (e.g. river outflow, water noise, sea surface currents as recorded by HF radars, etc.), EMODnet Physics is developing and supplying the full data management, hosting and dissemination chain.

- **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 Systems (GLOSS) core network, and more than 1,300 Permanent Services 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[14] collection, EMODnet Physics is already making available a relative sea level trend product and a sea level anomalies product. Based on the SONEL[15] product, EMODnet Physics is making an absolute sea level trend product available.

[11] 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.

[12] erddap.emodnet-physics.eu

[13] www.emodnet-physics.eu/map

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

[15] SONEL aims at providing high-quality continuous measurements of sea- and land levels at the coast from tide gauges (relative sea levels) and from modern geodetic techniques (vertical land motion and absolute sea levels) for studies on long-term sea level trends, but also the calibration of satellite altimeters, for instance. Use yearrange filter in the viewparams parameter of the GetMap/GetFeature request. The value of the yearrange filter is the concatenation of the start and end year which values range are from 1900 to 2015. The minimum

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

Temperature, in the water column, is a vital component of the climate system and its variability. Salinity observations contribute to monitoring the global water cycle, ocean density and mass, etc. These in situ data are an important input for many ocean phenomena models, to validate and calibrate remote sensing observations and to understand the ocean's role in the global climate system. In situ observation available in EMODnet Physics are taken from a variety of catalogues (e.g. CMEMS INSTAC, SDN, IOOS, AIMOS, etc.) linking platforms with a large range of spatial and temporal scales. EMODnet Physics data collection includes: ~2.000 moorings offering very high temporal resolution at specific locations, but with spatial resolution limited by density of the array; ~200 gliders and ~2.000 tagged animals that achieve much higher spatial resolution depending on endurance and other instrument characteristics; ~9.000 profiling floats (ARGO) delivering temperature profiles (nominally 0-2.000 m); ~130.000 spots along the tracks of research voyages of ship-based Conductivity-Temperature-Depth (CTD) observations providing full depth temperature observations; ~11.500 surface loads and ~270 ferrybox repeated transects providing high-resolution sea surface temperature datasets. Based on the CORA (Coriolis Ocean Dataset for Reanalysis), EMODnet Physics is making available a gridded (0,5 degree * 0,5 degree) monthly variation of the temperature, from early 1900 to 2016. Based on the SeaDataNet regional products (based on the SeaDataNet aggregated dataset - DIVA software v4.6.10 - mask: relative error threshold 0.5) it is making available regional temperature Climatology (1900-2013).

Thanks to the new data management infrastructure, EMODnet Physics is now able to ingest and connect more data sources and it is ready to provide a larger collection of temperature and salinity datasets, overcoming some of the current collection limitations (see next figure)

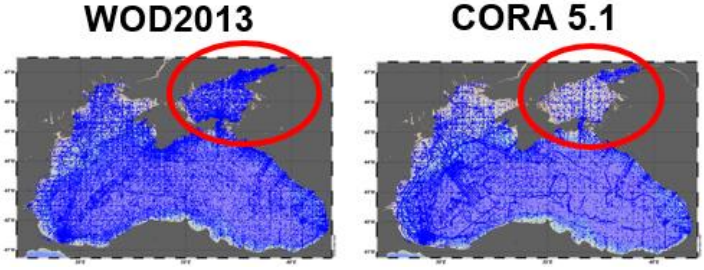


Figure 1. From SeaDataCloud WP11 report (S. Simoncelli) @ General Assembly (Barcelona, Nov. 2018). Thanks to the joint SeaDataCloud and EMODnet Physics gaps analysis effort, these bottle data from WOD are also going to be integrated (April 2019) into the CMEMS INSTAC products for serving the CMEMS community.

- **Sea Surface Currents**

Ocean surface general circulation is responsible for significant surface transport of heat, salt, passive tracers and ocean pollutants. The existing surface current observing systems (moorings, Lagrangian drifters) capture much of this range. EMODnet Physics is combining these observations together with land-based HF radars observation that offer a high-resolution tool (with limited spatial coverage) for improved understanding of surface currents, eddies and air-sea fluxes, and exchange

distance from start and end year is 30 years. For more info: https://github.com/EMODnet/EMODnet-Physics-Documentation/blob/master/WFS.md#layers-for-sea-level-products-data-from-psmsl-and-sonel

between coastal waters and the open ocean. The EMODnet Physics HFR catalogue (150 antennas) groups the European observation capacity (40 antennas) with other global sources to provide the user with one of the most exhaustive sources of HF Radar observations (see also GOOS-ObservingElementSpecification-HFRadar.pdf). Based on this catalogue, EMODnet Physics is also delivering an operational product of surface currents direction and intensity.

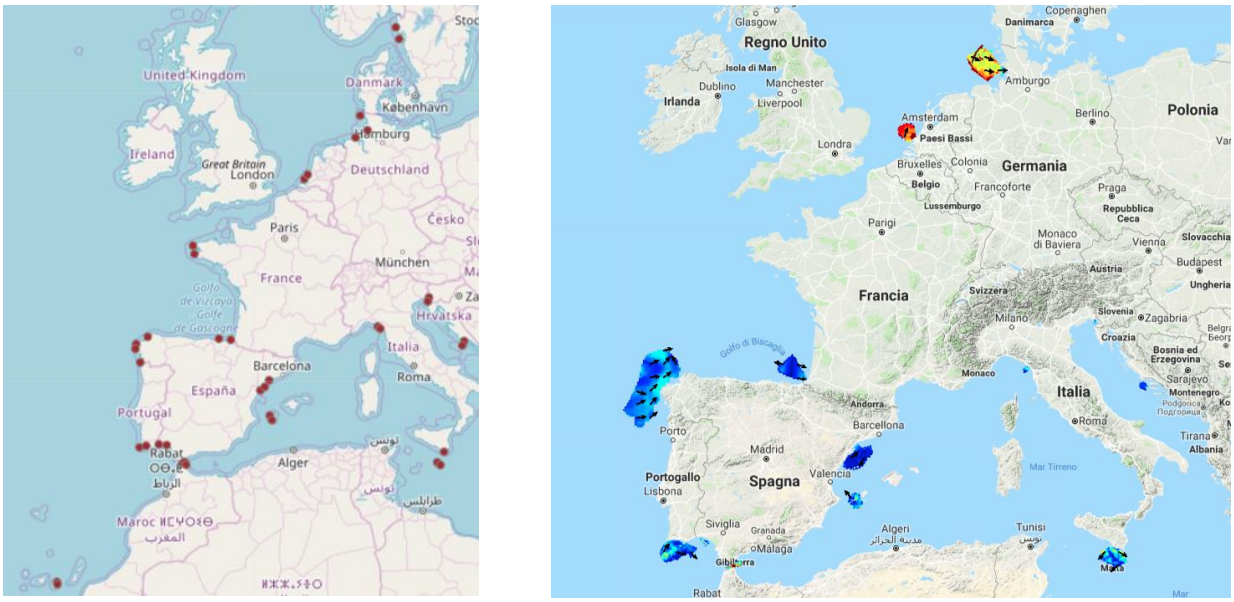

Figure 2. EMODnet Physics HFR catalogue (left) and the product (right)

- **River Runoff Data**

River runoffs exert a strong influence in their neighbouring coastal area in several ways, modifying water stratification, introducing significant fluctuations in circulation patterns and modulating the impact of upwelling events. In the current context of a global decline of hydrometric networks, uncertainties include the river runoff reaching the coast and most of the water properties as temperature, salinity, etc. 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. In any case, 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. To tackle this user-need, EMODnet Physics developed a dedicated data infrastructure[16] to manage and give access to in situ river runoff operational data (~170 stations) and historical trends (~550 stations - the EMODnet Physics is based on the Global Runoff Data Base collection).

[16] Transport file is netcdf v3.6 (and v.4.0), data is be stored in a data server according data age. CF convention/SeaDataNet P09 are used for parameters

- **Total Suspended Matter**

Total Suspended Matter (unit: % of suspended particles, not dissolved) is a gridded product based on the CoastColour L2W Concentrations Data, obtained from the OC4 algorithm for clear and moderate turbid waters, and from the CoastColour v1 neural network. The L2W product is then remapped on a regular grid, maintaining 300m full resolution, in order to obtain products over the European sea basins and monthly averaged. The product covers the period 2012 – 2013.

- **Impulsive Noise Event Registry**

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

- **Sound Maps**

TG NOISE has made progress on this concept and it has lately started discussing how to implement the MSFD indicator. It is also likely to combine and correlate sound/noise maps vs biodiversity maps. The main source of continuous noise is human activity, and in particular shipping, and according to the MSFD the Sound Pressure Level (@ 1uPa) should be extracted for the two-third octave band (cantered @ 63Hz and 125Hz – lately was also added 2KHz). The noise map can be based on ship density maps combined to a model of noise propagation at sea. This product should be calibrated (or the map uncertainty should be assessed) by in situ data. EMODnet Physics is implementing such an approach by running the pilot for the areas in which in situ data is available, and it is developing a common method to manage and federate the in situ operational SPL data.

- **Ice Extent and Ice-type**

This product covers both the Arctic and Antarctic Oceans. It is based on the SEAICE_GLO_SEAICE_L4_NRT_OBSERVATIONS_011_001 that is developed by SIW-METNO-OSLO-NO for CMEMS. EMODnet Physics is integrating that product together with in situ observations and, only for the Arctic, the Seasonal Ice Extent (million square kms) as computed by the Arctic Regional Ocean Observing System. The product provides, in operational mode: sea ice concentration, sea ice edge, sea ice type (OSI-401 OSI-402 and OSI-403). These products have daily data starting from 2005 at 10km resolution.

- **Wave and winds – Sea State**

Sea State is the characterisation of wave and swell, typically in terms of height, wavelength, period, and directional wave energy flux. Although it is well known that sea state strongly impacts on marine safety, marine transport and damage to structures, the availability of in situ wave and wind observations is still very limited. These data are accessible in EMODnet Physics, integrating several

data sources (Data Buoy Cooperation Panel, OceanSITES, regional observations in Europe – CMEMS INSTAC, US - IOOS, Australia – IMOS, etc.) into one single catalogue. Operational data are aggregated into a synoptic dynamic view.

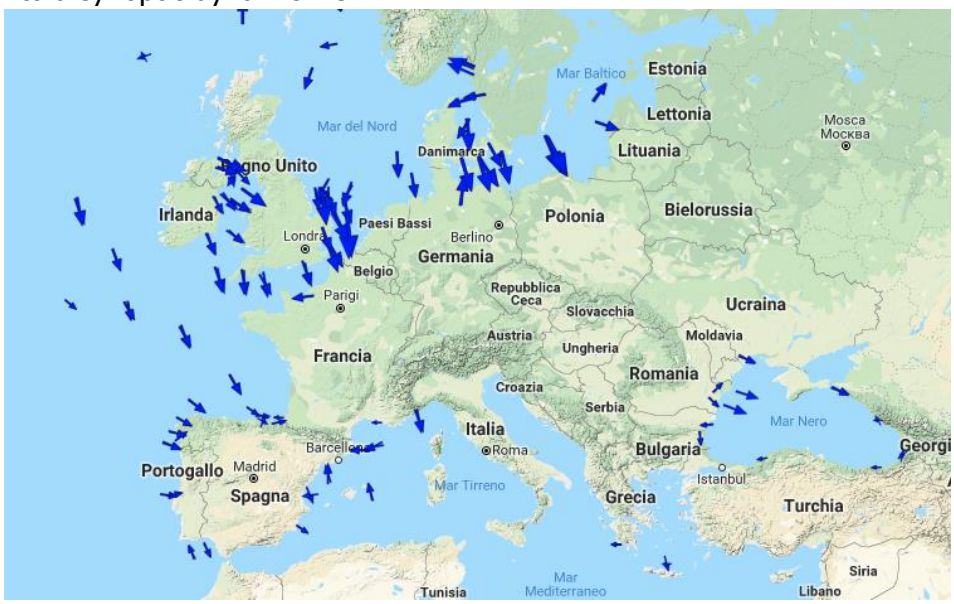


Figure 3. EMODnet Physics Wind synoptic viewer

## 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 has also to develop monitoring tools of 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).

During the contract, the portal pages were renewed for content and layout (taking specifications from the EMODnet Steering Committee into account). The landing page (www.emodnet-physics.eu) is offering direct links to main services and (M2M) interfaces. The map page (www.emodnet-physics.eu/map) lets the user discover and access data per theme, platform, recording age, depth, provider, area. For each recording system, a "platform page" presents the metadata (data owner, provider, typology of platform etc.), data plots, quick download features and trends/averages for the given parameter. Plots for trends/averages are available: the time-series (one point per month) and annual time-series (each line is one year of recordings). Temperature, salinity, currents, sea level trends, ice coverage, river and water noise products are also available and discoverable in the web portal. Links to source products are indicated (and selectable) as well as the QF. A section on "Documentation and M2M" extends the metadata set and describes available machine-to-machine services (e.g. examples of how to call back the plot widgets, how to use ERDDAP catalogue, link to the THREDDS catalogue, etc.). All M2M and web interfaces are linked and the user can easily pass

from one catalogue/service to another, selecting and using the one that fits his needs better. The GitHub page: https://github.com/EMODnet-Physics/EMODnet-Physics-Documentation describes technical documentation and examples on how to use available machine-to-machine interfaces.

| Service | Description | Examples |
|---|---|---|
| permaURL | All platforms | http://www.emodnet-physics.eu/map/platinfo/piradar.aspx?platformid=10273<br>http://www.emodnet-physics.eu/map/platinfo/pidashboard.aspx?platformid=10273<br>Service description @<br>http://www.emodnet-physics.eu/map/spi.aspx |
| API REST/SOAP | Latest 60 days of data | www.emodnet-physics.eu/map/Service/WSEmodnet2.aspx<br>www.emodnet-physics.eu/map/service/WSEmodnet2.asmx |
| OGC WMS, WFS, | Postgresql + Geoserver | geoserver.emodnet-physics.eu/geoserver/web<br>examples and service description @<br>www.emodnet-physics.eu/map/service/GeoServerDefaultWMS<br>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

## 6.4 WP4 – Analysis Evaluation and Feedback

The aim of WP4 is to report system effectiveness in meeting the needs of users and other EMODnet portals, assess the robustness of the developed information system and operate the help-desk in order to deal with user feedback and support needs. 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).

As planned, the services were developed and EMODnet Physics is operating a help-desk to deal with user feedback and support needs. Since the help-desk entered in service, EMODnet Physics collected 97 requests (Table 6). The requests were mainly asking for correction of metadata and helping to find and download specific datasets. EMODnet Physics is collecting (number of hits, amount and type of data used, etc.) and reporting:

- monthly page views;
- most popular page in the past month and past year;
- number of data and data products downloaded;
- types of user downloading data (where known);

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

Statistics are web available on the EMODnet Physics dashboard: http://www.emodnet-physics.eu/map/service/Dashboard/default.aspx.

Based on this tracking tool, EMODnet Physics is now offering a monthly report (reserved for subscribers) with stats on the use of platforms and downloads. The report reaches the providers by email and gives information about the use (number of hits, most viewed datasets etc.) of their platforms/datasets via EMODnet Physics. This developed tool is one of the most appreciated and since it was published, EMODnet Physics is recording an increasing number of interested users all over Europe.

Before downloading datasets that require authentication, a web form collects more information about the users, their organisation and how there are going to use data.

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

| Organisation type | % of users | Main use cases and application areas |
|---|---|---|
| Academia/Research | 63.20% | Marine and Coastal |
| Business and private Company | 16% | Marine and Coastal |
| Government/Public Administration | 11% | Marine and Coastal - Climate, Seasonal and Weather Forecasting |
| Non-profit | 3% | Marine and Coastal |
| Other | 14.50% | Climate, Seasonal and Weather Forecasting |

Table 5. Data for 505 users (who updated their profile)

# 7 User Feedback

In general, users are happy with the EMODnet Physics interface (e.g. request (id. 20170031): "Hello, the web interface and visualisation of Argo data is great") and service (also see use cases). Interaction with the portal users showed increasing interest and the need for subsetting features in which the user would like to select, for example, a parameter and a time range and collect the selection at once. The portal is partially answering to this need: the user can select the parameter, the time range (and the boxing area) and proceed with the download. The result is a package with several files containing the selected parameter back to back to all the other parameters that are collected by the platform. ERDDAP catalogue is already fixing this need and it would be good to have this feature in the map portal too. Direct interaction during events (e.g. SEAFUTURE) permitted collection of some new user needs. There is a need for more wind data at sea level, and to create a dedicated product. The following table lists the interactions that were collected by the help-desk service.

| Date | Organisation | Type of user feedback (e.g. technical, case study etc.) | Response time |
|---|---|---|---|
| 18/03/2019 | Mercator Ocean | Tech – HFR data missing | 1 day |
| 27/2/2019 | Fisheries and Oceans Canada, Government of Canada | Tech – wrong metadata | 1 day |
| 19/2/2019 | EMSA - Portugal | Tech – support to link the EMODnet Physics WMS | 1 day |
| 14/2/2019 | University of Plymouth - UK | Tech – support to download a specific dataset | 1 day |
| 13/2/2019 | Jacobs - Coastal Engineer Buildings Infrastructure and Advanced Facilities | Tech - support to use some datasets (parameters) | 1 day |
| 5/2/2019 | AquaBioTech Group | Tech – support to find and download datasets | 1 day |
| 4/2/2019 | Mercator Ocean – Toulouse - FR | Tech – MATROOS HFR data files empty | 1 day |
| 30/1/2019 | EMODnet Secretariat | Tech – WMS server down | Some hours |
| 23/1/2019 | Mercator Ocean – Toulouse - FR | Tech – Ligurian HFR data grid error (September data) | 1 day to answer – CNR that is in charge of the HFR in Liguria is going to republish the full-time series in April 2019 |
| 21/1/2019 | Technical University of Denmark – Copenhagen | Tech – support to understand file naming | 1 day |
| 18/1/2019 | RIVM (Dutch National Institute for Public Health and the Environment) - Netherland | Tech – support to download sea-basin layer | 1 day |
| 17/1/2019 | Laboratoire EPHE Biogeographie et Ecologie des Vertebres Campus CNRS - Montpellier | Tech – support to download a salinity data collection | 1 day |
| 4/1/2019 | UNIversity of Lisboa - Portugal | Tech – empty files when downloaded river data | 1 day |
| 6/12/2018 | OGS - Italy | Tech - SeaDataCloud Annual Metrics Analysis – OGS is using a custom made service to | 1 day |

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| | | extract stats and report on the SDN related dataset in Physics. The service was not reachable | |
| 29/11/2018 | Swiss Antarctic Circumpolar Expedition | Assessment of the feasibility to provide SACE M2M and hosting interfaces. We proposed the same model as developed for SOOS. We are waiting for their feedback | 1 day |
| 29/11/2019 | ICloud | Tech – details on the wind direction binning methods in Black Sea stations. | Primary feedback in 1 day. We are waiting for the second level of details from the provider. |
| 28/11/2018 | Aarhus Universitet | Tech – support to download a data aggregation subset | 1 day |
| 19/11/2018 | EMODnet Secretariat | Tech – sea water velocity service down | A few hours |
| 19/11/2018 | CMCC | Feasibility to develop/ customise some services to facilitate data assimilation procedure | The service was discussed, designed, tested and made available in 3 weeks. |
| 16/11/2018 | University of Turku | Tech – support to download a salinity layer to study changes of species´ habitats at Finnish coast under the effect of climate change and salinity decrease | 1 day |
| 13/11/2018 | CNR | Permission to use a snapshot from the Physics (map) portal for a scientific publication | 1 day |
| 7/11/2018 | Berring Data Collective | Tech – support to download some network operators metadata | 1 day |
| 24/10/2018 | EuroGOOS | Tech – support to create and download a list of platforms (for gap analysis) | 1 day |
| 25/10/2018 | STRATH | Tech – support to download wind and wave parameters | 1 day. The user was also interested in wave energy products (not available yet, not in the current project scope) |
| 23/10/2018 | Deepocean | Tech – details on the Tide Gauge timing (UTC) | 1 day |
| 16/10/2018 | Fertoing | Tech – details on chart datum is used in observed sea level data | 1 day |
| 16/10/2018 | EuroGOOS –AltantOS project | Tech – optimisation/evolution of some monitoring features developed by EMODnet Physics for the AtlantOS WP9 | 2 weeks to design, develop, deploy the new service. |
| 10/10/2018 | IFREMER | Tech – bug in one map portal filter | 1 day |
| 4/10/2018 | New University of Lisbon | Tech – support to download metadata from the portal | 1 day |
| 06/07/2018 | EMODnet Secretariat | Support to use the portal | 1 day |

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| 19/07/2018 | geo.aegean.gr | Tech – details on differences between monthly data and reprocessed data | 1 day |
| 27/07/2018 | Sea-Mer Asso | Tech – wind rose plots have an angular offset | 1 day |
| 31/07/2018 | IFREMER | Tech – support to download data subsets | 1 day, first follow up, 1 week to fix it |
| 01/08/2018 | seo-dwarf project | Tech - Support to download chlorophyll-a near the surface for the years of 2017 and 2018 (in Baltic) | 1 day |
| 13/08/2018 | Lawrence Berkeley National Laboratory | Tech – support to find own data | 1 day |
| 22/08/2018 | GeoMETOC Support Center | Tech – two stations were erroneously joined together | 1 day |
| 23/08/2018 | EMODnet Secretariat | Tech – an issue on the map viewer | 1 day |
| 28/08/2018 | Los Alamos National Laboratory | Support to download data from the EMODnet/SOOS child portal | 1 day |
| 10/09/2018 | National Technical University of Athens | Support for understanding the names and conventions | 1 day |
| 20/09/2018 | IFREMER | Tech – support to use APIs | 1 day |
| 26/09/2018 | MERCATOR OCEAN | Tech – error in HFR data dissemination | 1 day |
| 26/09/2018 | IHE Delft | Tech – support to download data subsets | 1 day, first follow up, 1 week to fix it |
| 03/04/2018 | Nacionalni inštitut za biologijo | Technical – HFR data flow – update of Slovenian links | 1-day feedback – waiting for them to link their new service |
| 04/04/2018 | Marine and Freshwater Research Institute | Technical – support to find and download CDIs from EMODnet Physics portal | 1 day |
| 09/04/2018 | University - not specified | Technical – support to download temperature and salinity | 1 day |
| 18/04/2018 | Istituto Hidrografico | Technical – request to correct some HFR metadata | 1 day |
| 24/04/2018 | IFREMER - EuroARGO | Technical - request to change some EuroARGO metadata | 1 day the first feedback, 1 week to fix it |
| 26/04/2018 | HZG | Technical – request for extending the HZG datasets in Physics | 1 day the first feedback, working on the new fetching services |
| 03/05/2018 | EMODnet secretariat | Technical – the link to user guide was not working | 2 days |
| 03/05/2018 | COWI A/S | Technical – support to find and download metocean (wave, wind) data | 1 day |
| 14/05/2018 | PLASMAR project | Technical – support to download Mediterranean T and S data | 1 day |
| 07/05/2018 | AZTI | Technical – missing data in Donostia Buoy | 1 day to give preliminary feedback, 1 month to fix the data flow |

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| 14/06/2018 | ACTIMAR | Technical – Support to data from Foxtrott Lightship (WMO #62170) * | 1 day |
| 25/06/2018 | INTECMAR | Technical – to correct Xunta Galicia HFR metadata | 1 day |
| 11/01/2018 | 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. |
| 15/01/2018 | University of Gothenburg | Support to download specific datasets | Within the day of the request |
| 16/01/2018 | Royal Belgian Institute of Natural Sciences | Wrong metadata in some Belgian stations | 1 day and corrections in 2 days |
| 16/01/2018 | IUEM | Support to understand differences in some datasets and file naming convention | Within the day of the request |
| 01/02/2018 | LNEC | 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 in the platform page) |
| 12/02/2018 | ENIM | Support to download HFR data | 1 week to identify and fix the bug. |
| 20/02/2018 | COWI | Support to download a specific dataset in CSV format | Within the day of request. |
| 20/02/2018 | COWI - international consulting group | Support to download a specific dataset in CSV format | Within the day of request. |
| 12/02/2018 | ENIM - Ecole Nationale d'Ingénieurs de Metz | Support to download HFR data | 1 week to identify and fix the bug. |
| 01/02/2018 | 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 in the platform page) |
| 16/01/2018 | Royal Belgian Institute of Natural Sciences | Wrong metadata in some Belgian stations | 1 day and corrections in 2 days |
| 16/01/2018 | 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 | University of Gothenburg | Support to download specific datasets | Within the day of the request |
| 11/01/2018 | 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 | University Cardiff (UK) | Looking for tidal stream information around the Isle of Wight | 1 day (no further feedback from the user) |
| 15/12/2017 | 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 |

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| 29/11/2017 | 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 | STOCK COMPANY RESEARCH AND PROJECT DEVELOPMENT INSTITUTE OF MERCHANT MARINE «SOYUZMORNIIPROEKT» (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 | SOCIB (Spain) | Technical – instructions for exporting contents in different support format | 1 day |
| 30/10/2017 | 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 | Wind Energy Department, Technical University of Denmark | Technical – details on the depth of recordings | 1 day |
| 18/10/2017 | VLIZ (Belgium) | Technical – current data in the Dover Strait | 1 day |
| 18/10/2017 | DMI (Denmark) | Technical – support to download wave data | 1 day |
| 18/10/2017 | DFO Canada | Technical - an update of metadata for some Canadian platforms | 1 day |
| 18/10/2017 | Universidade Nova de Lisboa - Faculdade de Ciências Sociais e Humanas | Technical – need for some metadata | 1 day |
| 18/10/2017 | IMR (Norway) | Technical – wrong metadata assignments | 1 day |
| 17/10/2017 | IOPAN (Poland) | Technical – Sopot data not flowing | 1 day for feedback, 1 week to fix the bug in collaboration with SMHI |
| 11/10/2017 | TUT – Tallinn 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 | 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 | 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 | BODC - UK | Technical – PAP1 station was not visible on the portal | 2 days |
| 26/09/2017 | DRL Deutsches Zentrum für Luft- und Raumfahrt – Germany | Technical – support to harvest wave and wind data | 2 days |

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| 21/08/2017 | VLIZ - Belgium | Technical – the ERDDAP server was spamming the central portal | 1 day |
| 15/08/2017 | DFO - Canada | Technical – incomplete metadata for Canadian ARGOs | 1 day |
| 10/08/2017 | 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 | DFO MPO GC (Canada) | Metadata – correct some Canadian platforms metadata | 1 day |
| 14/06/2017 | AZTI (Spain) | Technical – line duplication on the platform dashboard page | 1 day |
| 09/06/2017 | IHE Delft Institute for Water Education (NL) | Technical – problem with authentication | 1 day (in cooperation with CMEMS) |
| 02/06/2017 | 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 | Mediterranean Institute of Oceanography- MIO (France) | Metadata - GS-3EBE3 provider is MIO-HyMeX | 1 day |
| 25/05/2017 | DFO MPO GC (Canada) | Metadata – correct some Canadian platforms metadata | 1 day |
| 25/05/2017 | DFO MPO GC (Canada) | helpdesk – request for help on some new portal features | 1 day |
| 11/05/2017 | DFO MPO GC (Canada) | Metadata – to replace Integrated Science Data Management - ISDM with Fisheries and Oceans Canada-DFO | 1 day |

Table 6. User Feedback (@01/03/2019)

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

# 8 Meetings held

EMODnet Physics invested a lot on organising and attending meetings and other events. Table 7 and Table 8 provide details.

| Date | Location | Type | Attended (A) / Organised (O) | Short description and main results (# participants, agreements made, etc.) |
|---|---|---|---|---|
| SUM of O | | | 39 | (Total # of meetings organised) |
| Sum of A | | | 74 | (Total # of meetings attended) |

Table 7. Meetings

| Date | Location | Type | Attended (A) / Organised (O) | Short description and main results (# participants, agreements made, etc.) |
|---|---|---|---|---|
| 27-31/03/2017 | Kuala Lumpur (Malaysia) | workshop | A | 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) | meeting | A | EMODnet Ingestion - External to EMODnet Physics/Internal to EMODnet - EMODnet Ingestion project progress meeting |
| 19-20/04/2017 | Milan (Italy) | meeting | O | EMODnet Physics KO - Internal - KO meeting with the core group (ETT, EuroGOOS, MARIS, IFREMER, BODC) |
| 24/04/2017 | Vienna (Austria) | conference | O/A | Oral presentation of EMODnet Physics @ EGU 2017 - External - European Geosciences Union - ESSI1.1 - Informatics in Oceanography and Ocean Science (2) |
| 3-4/5/2017 | Bologna (Italy) | meeting | A | SeaDataCloud TTG - External - SeaDataCloud Technical Task Group. |
| 09/05/2017 | Milan (Italy) | meeting | O | EMODnet Physics – River TWG - Internal - River Technical working group |
| 17/05/2017 | Milan (Italy) | conference | A | Oral presentation of the EMODnet Physics @ Microsoft Italian IoT Summit - External - Italian Microsoft partners' meeting to show the best available IoT applications and services. |
| 22/05/2017 | Madrid (Spain) | meeting | A/O | EMODnet Physics – Tide Gauge TWG - Internal – Tide Gauge Technical working group |
| 23/05/2017 | Barcelona (Spain) | meeting | O | EMODnet Physics – Water noise TWG - Internal – Under Water Noise Technical working group |
| 23/05/2017 | Brussels (Belgium) | meeting | A | EMODnet lots – EASME – KO meeting - Internal – EMODnet phase 3 KO meeting |
| 24/05/2017 | Palma de Mallorca (Spain) | meeting | O | EMODnet Physics @ SOCIB - External – presentation of EMODnet Physics, presentation of SOCIB and discussion about possible synergies, links and collaborations. |
| 14/06/2017 | Brussels (Belgium) | workshop | A | AtlantOS international Data workshop - External - EMODnet Physics is one of the AtlantOS integrators and is powering the AtlantOS data portal |

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| 18/06/2017 | call | meeting | O | International Animal Welfare Foundation - External - After presenting EMODnet Physics and IAWF goals, the discussion 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 progresses. Contacts and connection with the European UWN Technical working group was established. |
| 13-15/6/2017 | Bremerhaven (Germany) | meeting | A | SOOS DMSC - External - South Ocean Observing system – Data Management Steering Committee annual meeting |
| 20/06/2017 | Call | meeting | A | 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) | workshop | A | 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) | conference | A | MTS IEEE - External - Interoperability SOS - SWE |
| 5-6/7/2017 | Genova (Italy) | meeting | A | EMODnet Technical Working Group - Internal - EMODnet Technical Working Group |
| 29-30/8/2017 | Web meeting | meeting | A | 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) | conference | A | 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) | conference | A | GOOS Regional Alliance Forum VIII - External – EMODnet Physics and EMODnet were presented in many presentations. |
| 13-15/9/2017 | Rome (Italy) | meeting | A | EMODnet Steering Committee - Internal - EMODnet Steering Committee |
| 18/09/2017 | Toulouse (France) | meeting | A | EMODnet @ MERCATOR - External – meeting to discuss and follow up on MoU between EMODnet Physics and CMEMS |
| 19-21/9/2017 | Luneburg - Germany | workshop | A | Radio Oceanography Workshop (ROW 2017). - External - International workshop on radio technologies (e.g. HFR) to monitor ocean status. |
| 22/09/2017 | Luneburg - Germany | meeting | O | EuroGOOS HF Radar Task Team meeting - Internal – coordination meeting with the HF TT |
| 25-28/9/2017 | Brussels (Belgium) | conference | A | 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. |
| 27/09/2017 | Konstanz (Germany) | workshop | A | 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 |

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| 2-5/10/2017 | Bergen (Norway) | conference | A | 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. |
| 09/10/2017 | Genoa (Italy) | meeting | O | 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) | meeting | A | SeaDataCloud TTG+GA - External - SeaDataCloud Technical Task Group and the annual General Assembly. Links and cooperation between SDC and EMODnet Physics were presented and discussed with partners. |
| 25/10/2017 | Sopot (Poland) | meeting | A | 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) | workshop | A | 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) | meeting | A | TG NOISE - External - Meeting of the EU Technical Group on Underwater Noise (EU TG-NOISE). |
| 11/11/2017 | Madrid (Spain) | meeting | A/O | 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) | meeting | A | 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) | workshop | A/O | EMODnet Heckathon - External - EMODnet Physics took part in the event and supported the participating teams. |
| 20-24/11/2017 | Las Palmas (Spain) | meeting | A | 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) | meeting | A | NOOS annual meeting - External - Annual meeting of the North Sea and European North West Shelf EuroGOOS ROOS. |
| 23/11/2017 | Copenhagen (Denmark) | meeting | A | 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 |
| 05/12/2017 | webcall | meeting | O | 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) | meeting | O/A | Glider data interoperability - External/Internal - Technical meeting to discuss on how to connect more (international) Glider data to EMODnet Physics |

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| 20/12/2017 | webcall | meeting | O | Deep Ocean Observing System – Data Management Working Group - External - EMODnet Physics was invited to present its experience on data management and discuss mutual synergies. |
| 23-25/01/2018 | Athens (Greece) | meeting | A | INSTAC Meeting - External - Links between INSTAC and EMODnet Physics discussed |
| 23/01/2018 | Porto (Portugal) | conference | A | EUDAT Conference - SeaDataCloud Workshop - External – workshop on cloud-based data management. The roles and cooperation between EMODent and SeaDataCloud were presented |
| 29/01/2018 | Brussels (Belgium) | meeting | O | Absolute Sea Level Trends - External - Technical meeting to discuss connection, links and interoperability with the SONEL product |
| 30/01/2018 | Brussels (Belgium) | meeting | A/O | EuroGOOS Tide Gauge TT - Internal - Technical meeting about Tide Gauge data management |
| 31/01/2018 | Oostende (Belgium) | meeting | A | IODE - ODIS meeting - External – The roles and cooperation between EMODent and SeaDataCloud were presented |
| 13/02/2018 | Galway (Ireland) | workshop | O | 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) | meeting | A | Coordination meeting CMEMS – EMODnet - External - Coordination meeting CMEMS – EMODnet |
| 14/03/2018 | London (UK) | conference | A | Oceanology International 2018 - External - presentation on SeaDataNet - EMODnet for Ocean ICT programme |
| 15/03/2018 | London (UK) | conference | A | 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) | meeting | O | EMODnet Physics core team annual meeting - Internal - Annual meeting of the consortium core team |
| 20/02/2018 | Web seminar | seminar | A | GOOS seminar - External - The history and integration of animal-borne instruments into a sustained ocean observing system |
| 05/03/2018 | call | meeting | O | 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 | meeting | A | ODIS - External - Intersessional working group to develop Concept Paper for an Ocean Data and Information System (ODIS) |
| 07/03/2018 | call | meeting | O | SoundMaps - Internal - Technical (web) meeting on the sound maps development methods |
| 09/03/2018 | call | meeting | O | 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 |
| 15/03/2018 | London (UK) | meeting | A | JERICONEXT WP5 meeting - External - European Coastal observatories data management |
| 20-21/03/2018 | Alcudia (Mallorca) | meeting | A | EMODnet Technical Working group - Internal - EMODnet Technical Working group |
| 21-23/03/2018 | Alcudia (Mallorca) | meeting | A | EMODnet Steering committee - Internal - EMODnet Steering committee |

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| 26-27/03/2018 | Milan (Italy) | meeting | O | Glider Workshop organisation meeting - Internal/External – technical meeting to design the workshop and its sessions |
| 03/04/2018 | web | Technical Meeting | O | EMODnet UWN - Internal – technical meeting to design the data flow for generating and making available sound maps in Physics |
| 05/04/2018 | web | Technical meeting | O | Technical meeting with PANGAEA - External – technical meeting for better integration and visibility of EMSO data in Physics (PANGAEA is one of the EMSO DBs) |
| 9-10/04/2018 | Vienna, Austria | Conference | A | EGU - External – European Geophysical Union Annual Assembly. |
| 9-10/04/2018 | Vienna, Austria | Conference | O | EGU - External – EGU ESSI 1.1 (*), the session hosted many presentations on how to implement data management and data flow to make data available on EMODnet Physics |
| 16-17/04/2018 | Barcelona, Spain | Meeting | A | EMODnet DIP - Internal – EMODnet Data Ingestion annual assembly. During the meeting, we presented the river, underwater noise and HFR data management as designed within EMODnet Physics and EMODnet Data Ingestion |
| 25-26/04/2018 | Sopot, Poland | meeting | A | SDC TWG - External – SeaDataCloud Technical Working Group. SDC and EMODnet Physics are collaborating on action to reduce the gap between the operational data streams and its long term stewardship. |
| 26/04/2018 | Sopot, Poland | workshop | O | EMODnet – SDN – SWE Workshop - External - Sensor Web Enablement - how to join European operational oceanography – the colloquium was intended to present data flow and data management of the major European infrastructures and facilitate the Polish institutes to join the network |
| 08/05/2018 | Web | Technical meeting | O | SOOS - External – technical meeting to develop further the collaboration and optimise the services from EMODnet Physics to SOOSmap |
| 9-10/5/2018 | La Spezia, Italy | workshop | A | CMRE WS big data - External – Marine Big Data Workshop. After introducing the EMODnet program and lots in general we presented a focus on EMODnet Human Activities and Physics |
| 12-14/05/2018 | La Valletta, Malta | meeting | O | European Research Vessel Operators - External – EMODnet Physics and its features were presented to ERVO group. During the meeting we also discussed synergies and ERVO were informed/invited to the planned EMODnet Physics workshop on Ferrybox |
| 22-25/05/2018 | Brussels, Belgium | Annual assembly | A | EuroGOOS GA - Internal/External – EuroGOOS Annual Assembly. State of art about EMODnet Physics and its interaction with the EuroGOOS partners were presented and discussed. |
| 28-31/05/2018 | Liège, Belgium | conference | A | 50th Liege Colloquium - External – EMODnet Physics was presented (poster) at the 50th Liege Colloquium. The event was focusing on long-term studies in oceanography and we presented how to find and use long term data in EMODnet Physics |
| 31/05/2018 | web | Technical meeting | O | Glider WS organisation - Internal – glider workshop organisation committee meeting |
| 5-7/06/2018 | Seville, Spain | Technical meeting | A | CMEMS DR - External – Copernicus Marine Environment Monitoring Service Design Review meeting. During the |

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| | | | | meeting, we also discussed the interaction between the new CMEMS DU and Physics. |
| 5-6/06/2018 | Bucharest, Romania | meeting | A | TG NOISE - External – TG NOISE meeting. |
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| 08/06/2018 | Trieste, Italy | workshop | O | EMODnet Day Italy - External – the workshop gave an overview of the state of art of EMODnet, its lots, the Ingestion facility and how some users are using the EMODnet data and services. |
| 08/06/2018 | Trieste, Italy | workshop | A | MEDCIS workshop - External – during the workshop, we discussed the EMODnet products and data vs data flow for MSFD |
| 19-22/06/2018 | La Spezia, Italy | exhibition | A | SEAFUTURE - External – exhibition for maritime and marine operators. The exhibition is mainly addressed to navy and sea security operators. It registered more than 2,000 visitors. ** |
| 22/06/2018 | La Spezia, Italy | workshop | A | Session on - Understanding our marine universe: economic, scientific implications - External – oral presentation of the EMODnet program, projects with examples on some portal features and some case histories. |
| 22/06/2018 | Vigo, Spain | conference | A | EOF - External - international symposium on physical oceanography |
| 20-22/06/2018 | Oostende, Belgium | training | A | SDC training - External – participation in the SeaDataCloud operator training session |
| 25-28/06/2018 | Oslo, Norway | Technical meeting | A | CMEMS TWG - External – Copernicus Marine Environmental Monitoring Service technical working group meeting. |
| 26-27/06/2018 | Rome, Italy | meeting | A | JericoNEXT SC - External – JericoNext Steering Committee. Synergies with EMODnet Physics were discussed |
| 23/06/2018 | Davos, Switzerland | conference | A | Polar 2018 - External – EMODnet Physics was proposed to be the INTAROS webmap engine. |
| 27/06/2018 | Davos, Switzerland | meeting | O | SOOS - External – technical meeting to discuss and plan EMODnet Physics developments for the SOOS community and SOOSmap |
| 10/07/2018 | Web-meeting | meeting | O | International Glider Workshop - Organising committee technical meeting - 15 attendees |
| 11-13/07/2018 | Malta | training | O | EMODnet training session during the JERICO-NEXT summer school - A dedicated session in the program linked to the COPERNICUS Marine Environment Monitoring Service (CMEMS) and EMODnet, and together with the JERICO-NEXT Virtual Access portals were used to showcase the relevance of data streams through dedicated hands-on practical sessions (*). About 30 students |
| 10-11/09/2018 | Helsinki | TT meeting | A | SeaDataCloud Technical WG - Period technical meeting. SeaDataNet is one of the EMODnet Physics pillars. During the meeting, we discussed joint activities and services to close the gap between NRT and validated data. About 40 attendees |
| 14/09/2018 | La Spezia | meeting | A | Ligurian Integrated monitoring Project (PIM) kick-off - Kick-off of a local project on the development of a Ligurian Integrated monitoring infrastructure. The benefit of synergies with EMODnet Physics and Ingestion were discussed. 25 attendees |

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| 18-20/09/2018 | Genova | workshop | O | International Glider Workshop - Goal of the workshop was to discuss the harmonisation of data formats and data flow to facilitate more operators to join an open data distribution and accessibility. |
| 26-27/09/2018 | Galway | meeting | A | JERICO-NEXT Annual Assembly - Interaction and synergies between JN and some of the EMODnet lots (Physics, Biology, and Ingestion) were discussed during the meeting. About 60 attendees |
| 01/10/2018 | Oostende | TWG | A | EMODnet TWG - EMODnet Technical Working Group meeting. |
| 22-24/10/2018 | Bilbao | workcamp | O | HFR - Technical workcamp for HFR operators. The event was planned to give the overview of HFR data flow and share common tools to apply the same QC/QF and be linked to EMODnet Physics (and other integrators) – 20 attendees |
| 4-6/11/2018 | Barcelona | Conference | A | IMDIS - International conference on Marine Data and Information Systems - 180 attenders |
| 7-8/11/2018 | Barcelona | meeting | A | SDC GA - SeaDataCloud General Assembly – SDC is one of the EMODnet Physics pillars and they are cooperating in closing the gap between NRT and validated dataset and making high-value products available (e.g. TEMP and PSAL climatologies) 80 attendees |
| 19-20/11/2018 | Brussels | Meeting | A | EMODnet SC - EMODnet Steering Committee - 25 attendees |
| 20-21/2018 | Brussels | Meeting | A | DATAMEQ - DATAMEQ is the EuroGOOS working Group dealing with data harmonisation, standards and interoperability - 15 attendees |
| 21-24/11/2018 | Brussels | Conference | A | EOOS - EOOS conference - 350 attenders |
| 4-5/12/2018 | Genova | workshop | O | MONGOOS WS - MONGOOS Workshop on downstream applications using EMODnet Physics (and others) data services - 35 attendees |
| 5-6/12/2018 | Genova | meeting | A | MONGOOS AA - Annual assembly of the Mediterranean Operational Network for the Global Ocean Observing System (MONGOOS), promoting partnerships and capacity building for GOOS in the Mediterranean Sea. MONGOOS is creating a continuous working framework with EuroGOOS and GOOS Africa - 30 attendees |
| 10-11/12/2018 | Porto | Conference | O | MARTECH - MARTECH workshop aims to bring together those working in MARine TECHnology for discussions and presentations of recent advances in the field and for cross-disciplinary knowledge exchange cutting across engineering and science - 40 attendees |
| 11/01/2019 | call | meeting | O | Swiss Arctic Polar Expedition - meeting to discuss the services EMODnet Physics can offer to the project - external 1to1 meeting |
| 23-25/01/2019 | Southampton | workshop | A | External - ESA, European Space Agency, Atlantic from Space Workshop, Southampton. - approximately 40 people |
| 11/02/2019 | Genova | meeting | O | ARPAL Genova - meeting to present the EMODnet Physics features and link new and more in situ Ligurian Data - external 10 people |
| 12-15/03/2019 | Bijing, China | meeting | A | Joint Meeting of the Expert Team on WIS Centres (ET WISC) and Task Team on Data Centres (TT DC) |

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| 20-22/03/2019 | Geneve, Switzerland | meeting | A | WMO, IPET-MOIS, Inter-Programme Expert Team on Integrated Marine Meteorological and Oceanographic Services within WMO and IOC Information Systems |

Table 8. 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

## 9.1 Outreach and communication activities

| Date | Communi-cation action/ma-terial | Short description (of the material, title, …) and/or link to the activity - Main results (# participants, # views, # press clippings, etc.) |
|---|---|---|
| 27-30/03/2017 | Oral presentation | 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 | oral and poster presentations | The EGU General Assembly 2017 saw 4,849 oral, 11,312 poster, 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 | Oral presentation | EMODnet Physics was awarded and presented as one of the best available IoT applications and services for the Italian Microsoft partners' (annual) meeting. - |
| 14/06-15/06/2017 | Oral presentation | The EMODnet Physics was presented during the SOOS Data Management Steering Committee (DMSC) and it was agreed that EMODnet Physics is going to power the SOOS data portal. This will have a big impact on the SOOS community and extend the EMODnet Physics end users. - |
| 27/09/2017 | Oral presentation | Collaboration with MEOP, EMODnet Physics sea mammal data management, strategy for integrating more animal-borne instruments data into Ocean Observing Systems were presented and discussed. - |
| 25-29/9/2017 | Poster presentation | Copernicus Marine Week - 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. - |
| 21/09/2017 | Oral presentation | RemTech Esonda Expo - EMODnet Physics and the plan and progress on the river data management were presented - |
| 21/09/2017 | Oral presentation | Progress on HFR data management and EMODnet Physics HFR data products were presented and discussed - |
| 06/09/2017 | Oral presentation | UACE 2017 – Underwater Acoustic Conference Europe - EMODnet Physics and the plan on the underwater noise data management were presented - |

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| 5-7/9/2017 | Oral presentation | Radio Oceanography Workshop (ROW 2017). EuroGOOS activities and EMODnet Physics were presented as an example of regional ocean observing systems. - |
| 14/06/2017 | Oral presentation | AtlantOS international Data workshop - EMODnet Physics is one of the AtlantOS integrators and is powering the AtlantOS data portal - |
| 2-5/10/2017 | Oral presentation | EuroGOOS conference - International conference on Operational Oceanography. http://eurogoos.imr.no/resources/EuroGOOS_Conference_2017_BoA.pdf - |
| 16-19/10/2017 | Oral presentation | SeaDataCloud Technical Task Group and the annual General Assembly. Links and cooperation between SDC and EMODnet Physics were presented and discussed with partners. - https://www.seadatanet.org/Events/Plenary-meetings/SDC-1st-annual-meeting - |
| 25/10/2017 | Oral presentation | HELCOM State & Conservation meeting - We presented the EMODnet programme with a focus on EMODnet Physics and Data Ingestion services and features that can support HELCOM activities. - |
| 25-26/10/2017 | Oral presentation | The 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 | Oral presentation | Meeting of the EU Technical Group on Underwater Noise (EU TG-NOISE). - |
| 14-16/11/2017 | Oral presentation | 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 | support | EMODnet Heckathon - EMODnet Physics took part in the event and supported the participating teams. - |
| 20-24/11/2017 | Oral presentation | 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 | Oral presentation | The annual meeting of the North Sea and European North West Shelf EuroGOOS ROOS. |
| 23/11/2017 | Oral presentation | OSPAR data management - This 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 | Oral presentation | 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 | Oral presentation | EuroGOOS, EMODnet Physics and Data Ingestion Workshop in Galway. Workshop to discuss programs, projects, data management and connections between local providers and integrators to European ones - |
| 20/02/2018 | Web seminar | The history and integration of animal-borne instruments into a sustained ocean observing system - http://www.goosocean.org/index.php?option=com_content&view=article&id=60&Itemid=169 - [1] |
| 14-15/03/2018 | Oral presentation | Oceanology International 2018 - http://www.oceanologyinternational.com/en/Sessions/52333/Widening-Access-to-Ocean-Data - [2] |

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| 23/01/2018 | Il Secolo XIX (newspaper) | Interview/article about EMODnet programme and EMODnet Physics - |
| 9-10/04/2018 | Oral presentation | EGU – ESSI 1.1 - EMODnet Physics: tackling new challenges. During the Q/A session EMODnet Physics was mentioned to be a very good example of a project that is asking data for re-distributing/re-sharing with added value services and products. - About 70 participants. |
| 16-17/04/2018 | Oral presentation | Data Ingestion annual – presentation of EMODnet Physics focussing on river, underwater noise data flow - About 70 participants |
| 26/04/2018 | Oral presentation | Sensor Web Enablement - how to join European operational oceanography - https://www.emodnet-ingestion.eu/internal_html/colloquium-eu-seadatacloud-sensor-web-enablement--how-to-join-european-operational-oceanography/41 - About 30 participants |
| 9-10/5/2018 | Oral presentation | Marine Big Data Workshop. After introducing the EMODnet program and lots in general, we gave a focus on EMODnet Human Activities and Physics - About 30 participants |
| 22-25/05/2018 | Oral presentation | EuroGOOS Annual Assembly. State of art about EMODnet Physics - About 40 participants |
| 28-31/05/2018 | Poster presentation | 50th Liege Colloquium - http://labos.ulg.ac.be/gher/wp-content/uploads/sites/36/2018/05/Program2018real.pdf - More than 100 participants |
| 08/06/2018 | Oral presentation | EMODnet Day Italy .- http://www.emodnet.eu/sites/emodnet.eu/files/public/News%20Items/emodnet%20programma_29maggio.pdf - About 60 participants |
| 22/06/2018 | Oral presentation | SEAFUTURE - Understanding our marine universe: economic, scientific implications - About 20 participants |
| 22/05/2018 | Oral presentation | Encuentro de la Oceanografía Física 2018. EMODnet Physics: the European Marine Observation and Data network for global oceanographic data aggregation - http://isms.gal/wp-content/uploads/2018/06/eof-orales.pdf - About 50 participants |
| 18/07/2018 | presentation | EMODnet training session during the JERICO-NEXT summer school - About 30 students |
| 18-19/09/2018 | presentations | General introduction to EMODnet, EMODnet Physics and EMODnet Ingestion, goals, infrastructures, the activity on data harmonisation and interoperability, the point of view as a glider data user - 70 attendees |
| 05/11/2018 | presentation | IMDIS – EMODnet Physics general presentation. - 180 attenders |
| 06/11/2018 | Methodology document | TG NOISE – EMODnet Physics progresses on underwater noise data management - 30 attendees |
| 16/11/2018 | presentation | Port Authority Regione Marche - EMODnet Physics and its services, benefit and opportunities. - 5 attendees |
| 20/11/2018 | presentation | DATAMEQ – updates on EMODnet Physics - 15 attendees |
| 21/11/2018 | Posters and poster pitches | EOOS – EMODnet Physics activities on underwater noise and river runoff - 350 attendees |
| 04/12/2018 | presentations | MONGOOS – EMODnet Physics activities on underwater noise and river runoff - 35 attendees |

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| 10/12/2018 | presentations | MARTECH - General introduction to EMODnet, EMODnet Ingestion, EMODnet Physics, goals, infrastructures, the activity on data harmonisation and interoperability with a special focus on underwater noise and river runoff data products. - 40 attendees |
| 23-25/01/2019 | Oral presentation | ESA Atlantic from Space Workshop, NOC Southampton, UK |
| 18-20/02/2019 | Oral and poster presentations | 5th Session of the IOC Committee on International Oceanographic Data and Information Exchange and Scientific Conference, Tokyo |
| 4-6/03/2019 | Oral presentation | WERA HFR Workshop, Hamburg, Germany. |

Table 9. Outreach activities

## 9.2 List of identified publication citing EMODnet Physics

| Date | type | Name of journal, conference, … | Publication title | Authors | Other info |
|---|---|---|---|---|---|
| **2017** | Book chapter | Oceanographic and Marine Cross-Domain Data Management for Sustainable edited by P. Diviacco, A. Leadbetter, H. Glaves, IGI Global, | Semantic Search Engine for Data Management and Sustainable Development: Marine Planning Service Platform. | G. Manzella, et al. | |
| **2017** | Journal | Renewable Energy, Volume 101, February 2017, Pages 244–264 | Assessing the European offshore wind and wave energy resource for combined exploitation | C Kalogeri, et al | |
| **2017** | Journal | Marine Sciemce, 20 January 2017 | HF Radar Activity in European Coastal Seas: Next Steps toward a Pan-European HF Radar Network | Anna Rubio, et al. | |
| **2017** | Conference | EGU General Assembly 2017, held 23-28 April, 2017 in Vienna, Austria. id.7113 | EMODnet Physics in the EMODnet program phase 3 | Novellino A. Et al | |
| **2017** | Book chapter | Submerged Landscapes of the European Continental Shelf. Edited by Nicholas C. Flemming,Jan Harff,Delminda Moura,Anthony Burgess,Geoffrey N. Bailey | Chapter 6: The Northwest Shelf. | Keiran Westley | |
| **2017** | Conference | EGU General Assembly 2017, held 23-28 April, 2017 in Vienna, Austria. id.194371S | EMODnet High Resolution Seabed Mapping - further developing a high resolution digital bathymetry for European seas | Schaap, Dick M. A.; Schmitt, Thierry | |

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| **2017** | Journal | neurocomputing | Ocean wave height prediction using ensemble of Extreme Learning Machine | Kumar et al | http://dx.doi.org/10.1016/j.neucom.2017.03.092 |
| **2017** | Report | AtlantOS Deliverable, D9.2 . AtlantOS, 73 pp. | Web-based monitoring tool of the Atlantic Ocean observing system (Europe). . | Novellino, A., et al | DOI 10.3289/AtlantOS_D9.2. |
| **2017** | Report | CMEMS-INS-SRD | System Requirements Document (updated version of the 2016 report) | Carval T eta l. | DOI:10.13155/40846 |
| **2017** | Report | AtlantOs meeting report 2017 | Data flow and Data Integration - WP7 | Harscoat Valerie, Pouliquen Sylvie | DOI: 10.13155/51745 |
| **2017** | Report | JERICO NEXT D5.9 | Report on data management best practice and Generic Data and Metadata models. V. 2.1 [Deliverable 5.9] | G Manzella, A Griffa, LP de la Villéon | https://www.oceanbestpractices.net/handle/11329/354 |
| **2017** | Journal | GEOMEDIA - Open Journal System, V. 21, N. 5 | European Marine Observations and Data Network EMODnet Physics | A. Novellino, P. D'Angelo | http://mediageo.it/ojs/index.php/GEOmedia/article/view/889 |
| **2017** | Workshop | HELCOM report -- Sopot, Poland, 23-27 October 2017 | HELCOM Working Group on the State of the Environment and Nature Conservation (STATE & CONSERVATION 7-2017) | A. Novellino | https://portal.helcom.fi/meetings/STATE%2520-%2520CONSERVATION%25207-2017-470/Documents/Presentation%252018%2520EMODNet%2520Physics.pdf |
| **2017** | Conference | OCEANS – Anchorage, 2017 | Oceanobs a python package to analyze data from marine observatories | R. Bardaji, et al | http://ieeexplore.ieee.org/document/8232303/ |
| **2017** | Book chapter | Submerged Landscapes of the European Continental Shelf - John Wiley & Sons, 26 apr 2017 - 552 pages | Ch. 6 The North Western Shelf | K Westley | |

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| **2018** | Workshop | EUROGOOS Meeting Feb 2018 | EuroGOOS and EMODNet Physics Data Workshop | A. Leadbetter, P. Gorringe, A. Novellino | http://eurogoos.eu/events/4595/ |
| **2018** | Journal | Neurocomputing Volume 277, 14 February 2018, Pages 12-20 | Ocean wave height prediction using ensemble of Extreme Learning Machine | N. KrishnaKumar, R.Savitha, AbdullahAl Mamun | https://doi.org/10.1016/j.neucom.2017.03.092 |
| **2018** | Newsletter | Challenger Society for Marine Science | Challenger Wave | | https://www.challenger-society.org.uk/files/pagefiles/Documents/C%20wave/CWave_201805.pdf |
| **2018** | Conference | EGU 2018 ESSI1.1 | EMODnet Physics: tackling new challenges | Patrick Gorringe and Antonio Novellino | https://meetingorganizer.copernicus.org/EGU2018/EGU2018-7770.pdf |
| **2018** | Conference | EGU 2018 ESSI1.1 | Best practices in QA/QC | Catia Chiappini and Giuseppe M.R. Manzella | EGU2018-6821 |
| **2018** | Conference | EGU 2018 ESSI1.1 | Effortless Integration of Underwater Noise Measurements into EMODnet data portal through SensorWeb Standards | E. Martinez et al. | EGU2018-13103 |
| **2018** | Conference | EGU 2018 ESSI1.1 | The European common data and metadata model for real-time High Frequency Radar surface current data | L. Corgnati et al. | EGU2018-13317 |
| **2018** | Conference | EGU 2018 ESSI1.1 | Animal-borne instruments in EuroGOOS – EMODnet Physics | L. Boehme et al. | EGU2018-14307 |
| **2018** | Conference | EGU 2018 ESSI1.1 | SOOSmap brings circumpolar Southern Ocean data to a computer near you | P. Bricher et al. | EGU2018-15262 |
| **2018** | Conference | EGU 2018 ESSI1.1 | Multi-Platform Data Distribution Challenges from | M.V. Charcos-Lloréns et al. | EGU2018-16380-1 |

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| | | | Observing Systems to Data Distribution | | |
| **2018** | Conference | EGU 2018 ESSI1.1 | An European initiative to provide operational river observations and forecasts | F. Campustano et al. | EGU2018-19688 |
| **2018** | Journal | Modern Approaches in Oceanography and Petrochemical Sciences. 1(5)-2018. MAOPS.MS.ID.000124. Lupine Publisher | Emodnet Physics: Benefits from Marine Data Sharing | G.M.R. Manzella, A. Novellino, P. D'Angelo | http://www.lupinepublishers.com/maops/pdf/MAOPS.MS.ID.000124.pdf |
| **2018** | Journal | Modern Approaches in Oceanography and Petrochemical Sciences. 1(5)-2018. MAOPS.MS.ID.000124. | Producing Contiguous Data in Marine Environment: A Gaussian-Montecarlo Methodology. | G. M. Manzella, M. Gambetta, A. Novellino | https://juniperpublishers.com/ofoaj/pdf/OFOAJ.MS.ID.555736.pdf |
| **2018** | Report | CMEMS-INS-SIVP | System Integration and Verification Plan | T. Carval, et al. | http://dx.doi.org/10.13155/51660 |
| **2018** | Report | AtlantOS – 633211 D.4.2 | South Atlantic tide gauge data management plan | E. Bradshaw, L. Rickards | http://oceanrep.geomar.de/43389/1/AtlantOS_deliverable_D4.2.pdf |
| **2018** | Journal | Journal of Coastal Research: Special Issue 85 - Proceedings of the 15th International Coastal Symposium: pp. 1256 – 1260. | Wave Climate Definition on Modeling Morphological Changes in Figueira da Foz Coastal System (W Portugal). | C Ferreira, et al. | |
| **2018** | Journal | Marine Policy, Volume 97, November 2018, Pages 130-138 | Data challenges and opportunities for environmental management of North Sea oil and gas decommissioning in an era of blue growth | F. Murray, et al. | https://doi.org/10.1016/j.marpol.2018.05.021 |

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| **2018** | Journal | Sensors 2018, 18, 2737. | Integration of Underwater Radioactivity and Acoustic Sensors into an Open Sea Near Real-Time Multi-Parametric Observation System. | S. Pensieri et al. | https://www.mdpi.com/1424-8220/18/8/2737 |
| **2018** | Journal | Bollettino di Geofisica Teorica ed Applicata Vol. 59 | EMODnet Physics: a horizontal platform serving blue growth | Novellino A. et al | https://imdis.seadatanet.org/content/download/121493/file/IMDIS2018_Proceedings.pdf |
| **2018** | Journal | Bollettino di Geofisica Teorica ed Applicata Vol. 59 | EMODnet Physics and River Runoff data management | Campuzano F. et al. | https://imdis.seadatanet.org/content/download/121493/file/IMDIS2018_Proceedings.pdf |
| **2018** | Journal | Bollettino di Geofisica Teorica ed Applicata Vol. 59 | EMODnet Central Portal data services | Oset P. et al. | https://imdis.seadatanet.org/content/download/121493/file/IMDIS2018_Proceedings.pdf |
| **2018** | Journal | Bollettino di Geofisica Teorica ed Applicata Vol. 59 | SOOSmap brings circumpolar Southern Ocean data to a computer near you | Bricher P. et al. | https://imdis.seadatanet.org/content/download/121493/file/IMDIS2018_Proceedings.pdf |
| **2018** | Journal | Bollettino di Geofisica Teorica ed Applicata Vol. 59 | EMODnet PP: Portugal presence | Almeida S. et al. | https://imdis.seadatanet.org/content/download/121493/file/IMDIS2018_Proceedings.pdf |
| **2018** | Journal | Bollettino di Geofisica Teorica ed Applicata Vol. 59 | Generating ocean climatologies from in situ observations | Barth A. et al. | https://imdis.seadatanet.org/content/download/121493/file/IMDIS2018_Proceedings.pdf |
| **2018** | Journal | Bollettino di Geofisica Teorica ed Applicata Vol. 59 | Integration of Underwater Noise Measurements into EMODnet Physics | Del Rio J et al. | https://imdis.seadatanet.org/content/download/121493/file/IMDIS2018_Proceedings.pdf |
| **2018** | Journal | Bollettino di Geofisica Teorica ed Applicata Vol. 59 | Building strong foundations towards the pan-European High Frequency Radar network | Corgnati L et al. | https://imdis.seadatanet.org/content/download/121493/file/IMDIS2018_Proceedings.pdf |

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| **2018** | Conference | The 4th Ocean Radar Conference for Asia-Pacific | Present and future of the European HF radar network: outcomes of the INCREASE project | Rubio A. et al | http://orca2018.official.jp/wp-content/uploads/2018/05/ExtendedAbstract_Session4.pdf |
| **2018** | Report | Project Atlantos H2020 D4.5 | Gap analysis of links between coastal and open ocean networks | Akpinar A, Charria G | https://www.atlantos-h2020.eu/download/deliverables/AtlantOS_D4.5.pdf |
| **2018** | Conference | An international conference on glider data management. Connecting glider data flows in Europe and beyond. 18-20 September 2018, Aquario du Genova, Italy | EMODNET: The gateway to marine data | Novellino A. et al | https://www.ego-network.org/dokuwiki/lib/exe/fetch.php?media=public:egodmmeeting:d1s1_06_20180912_emodnetphy_gliderws.pdf |
| **2018** | Workshop | MONGOOS: WORKSHOP ON OPERATIONAL OCEANOGRAPHY. DOWNSTREAM SERVICES | European Marine Observation and Data network and River Runoff data management | Novellino A. et al | |
| **2018** | Workshop | MONGOOS: WORKSHOP ON OPERATIONAL OCEANOGRAPHY. DOWNSTREAM SERVICES | EMODNET, Approaches for Integrating Underwater Noise, Measurements into ocean observation systems | Novellino A. et al | |
| **2018** | Conference | MARTEC - 8th INTERNATIONAL WORKSHOP ON MARINE TECHNOLOGY | EMODNET PHYSICS: TOWARDS AN EUROPEAN IMPULSIVE NOISE REGISTER | Novellino A. et al | https://sarti.webs.upc.edu/martech/usb_2018/paginas/Abstract_Magazine.pdf |
| **2018** | Conference | MARTEC - 8th INTERNATIONAL WORKSHOP ON MARINE TECHNOLOGY | DATAFLOW OF UNDERWATER NOISE MEASUREMENTS: FROM OBSEA TO EMODNET | Del Rio J et al. | https://sarti.webs.upc.edu/martech/usb_2018/paginas/Abstract_Magazine.pdf |
| **2018** | Conference | MARTEC - 8th INTERNATIONAL WORKSHOP ON | THE SOUND OF WAVES IN THE MUTRIKU WAVE ENERGY PLANT | Bald J et al. | https://upcommons.upc.edu/bitstream/handle/2117/126596/ID22.pdf |

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| | | MARINE TECHNOLOGY | | | |
| **2018** | Conference | MARTEC - 8th INTERNATIONAL WORKSHOP ON MARINE TECHNOLOGY | EMODNET INGESTION PORTAL – WAKE UP YOUR DATA! SET THEM FREE FOR BLUE SOCIETY | Schaap D. et al. | https://upcommons.upc.edu/bitstream/handle/2117/126801/ID4.pdf |
| **2018** | Report | FixO3 - Work Package 4Data Management and Harmonisation Deliverable 4.3 | Agreement to Establish FixO3 Data Dissemination to Marine Infrastructures | Snaith H. et al. | http://www.fixo3.eu/download/Deliverables/FixO3_D4.3_FINAL.pdf |
| **2018** | Report | AtlantOs D9.3 | Report on assessment of the performance of AtlantOS observing system | Ott M. et al. | http://oceanrep.geomar.de/44762/1/AtlantOS_D9_3.pdf |
| **2018** | Conference | OCEANS 2018 MTS/IEEE Charleston | Interoperable Ocean Observing using Archetypes: A use-case based evaluation | Stacey P. Berry D. | https://ieeexplore.ieee.org/abstract/document/8604834 |
| **2018** | Report | AtlantOS Deliverable, D3.20 | Drifter network improvement report | Poli P. et al. | http://oceanrep.geomar.de/44986/ |

Table 10. List of known publication using EMODnet data or products

# 10 Updates on Progress Indicators

## *Indicator 1 - Volume of data made available through the portal*

EMODnet-Physics map portal (www.emodnet-physics.eu/map) provides a single point of access to near real-time and historical data of physical parameters of European Seas and global oceans. More specifically, it gives access to time series and datasets as recorded by fixed platforms (moorings, tide gauges, HF radars, etc.), moving platforms (ARGO, Lagrangian buoys, ferrybox, etc.) and repeated observations (CTDs, etc.). The available themes are:

- the temperature of the water column
- the salinity of the water column
- horizontal velocity of the water column
- wave height and period
- wind and atmospheric pressure
- optical properties (e.g. light attenuation, back scattering, turbidity, etc.)
- the underwater sound pressure level
- river runoff
- other biogeochemical data (e.g. chlorophyll, dissolved oxygen, etc.)

Temperature, Salinity and some chemical properties (e.g. Chlorophyll) are the most available parameters. Underwater noise (in support to MSFD) is the least available one (data flow is very recent and still under consolidation). The following tables provide figures on the available data volume where the unit is the platform. (For sake of simplicity a CTD is considered a platform.)

| Parameters/Themes | Downloadable Volume[17] |
|---|---|
| Water Temperature | 340187 |
| Water salinity | 262176 |
| Currents | 5388 |
| Optical Properties | 96215 |
| Sea Level | 3760 |
| Atmospheric | 11256 |
| Water conductivity/ BioGeoChemical | 181789 |
| Waves | 1363 |
| Winds | 1622 |
| River | 636 |
| Underwater noise | 3 |

Table 11. Downloadable volumes. Unit = #platforms (@01/03/2019)

[17] Together with the deployment of the new backoffice infrastructure it was possible to clean some duplicates and add datasets to some themes (e.g. to optical properties).

Each platform can record a single parameter or a collection of parameters. The following table shows the volume in terms of platforms.

| ARGO | CTDs | Drifting B | FB | gliders | sea mammals | mini loggers | moorings | radar | river stations | tide gauges |
|---|---|---|---|---|---|---|---|---|---|---|
| 10479 | 313212 | 13206 | 406 | 212 | 2131 | 177 | 3406 | 152 | 635 | 3189 |

Table 12. Available platforms (@01/03/2019)

## *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, for example, all the EuroGOOS and ROOS 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_FinalReport.xls (Annex 1)[18]

Concerning the gridded or aggregated products, key providers are:

- Mercator Ocean/Copernicus Marine Environment Monitoring Service
- SeaDataCloud (the T&S climatology is a product developed during the project by the joint effort of several SDN partners)
- PSMSL, provided and maintained by NERC BODC (UK)
- SONEL, provided and maintained by the University of La Rochette (France)
- MEOP, provided and maintained by MEOP (the data management is coordinated by the University of St. Andrews – Scotland and the University of Stockholm)
- Global Runoff Data Center – hosted by the Federal Institute of Hydrology (BfG) Germany
- Impulsive Noise registry – hosted by ICES (Denmark) on behalf of OSPAR and HELCOM, and the ACCOBAMS web portal for the MED

[18] http://www.emodnet-physics.eu/Map/Service/Indicators/Section1.aspx

## *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 | The antenna is installed in an Italian Coastal Guard facility and data is partially confidential and data access is only permitted to feed local MFC model and not for redistribution |
| INGV | OS IS – la Spezia Gulf | Problems with the internal data dissemination policy |
| Middle East Technical University, Erdemli, Turkey | Fixed buoys | Data linked to military activities |
| Turkish State Meteorological Service | Tide gauges, wave buoys in Turkish waters, both Mediterranean and the Black Sea | Data linked to military activities |
| 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 |
| CEFAS Wavenet | Cefas' strategic wave monitoring network for the United Kingdom | Due to many contributor/data providers, many have their own data policies and it is difficult to share data. Ongoing discussions to get the partners to meet and 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 |
| Alfred Wegener Institute | Ship operational data - polar expeditions | Embargo for validation and publication purposes |
| Swedish Ministry of Defence. | BIAS project – Baltic underwater noise maps covering 2017 | Project results are on hold while waiting for the official validation and adoption of the developed methodology |
| Polish Institute of Ocenology | Tide gauges and ocean buoy | Internal organization issues |

Table 13. Approached entities with no results

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

During the period, EMODnet Physics registered hundreds of thousands of data download requests. The following tables present figures.

| Parameters/Themes | Downloadable Volume | Number of manual downloads requested | Number of Web Service requests | Number of WMS requests | Number of WFS requests |
|---|---|---|---|---|---|
| **Water temperature** | 340187 | 90949 | 1046392 | 191355 | 627 |
| **Water salinity** | 262176 | 34986 | 444349 | 11132 | 70 |
| **Currents** | 5388 | 30293 | 428531 | 105361 | 4848 |
| **Optical Properties** | 96215 | 3884 | 2493 | | |
| **Sea Level** | 3760 | 35889 | 212604 | 18545 | 274 |
| **Atmospheric** | 11256 | 46422 | 684903 | 2064 | 9 |
| **Water conductivity/ BioGeoChemical** | 181789 | 21356 | 303859 | 887 | 5 |
| **Waves** | 1363 | 33934 | 541762 | 9154 | 0 |
| **Winds** | 1622 | 21688 | 453982 | 63346 | 4 |
| **River** | 636 | 2784 | 3916 | 610 | 46 |
| **Underwater noise** | 3 | 149 | 45491 | 3824 | 39 |
| **TOTAL** | 904395 | 322334 | 4168282 | 406278 | 5922 |

Table 14. The volume of downloaded data and products (29/3/2017 – 01/3/2019). Downloadable Volume Unit = platforms. A platform may record more than one parameter. Any download/service request can include other parameters.

Comparing the data of the first year of the contract against the second one, there is a positive trend in the total downloadable volume (increased from 824655 to 904395), in the number of the requests (manual requests doubled) and in the use of the new WxS services.

| | 29/3/2017 - 31/3/2018 | 1/4/2018 - 1/3/2019 |
|---|---|---|
| Number of manual downloads | 103567 | 218767 |
| Number of Web Service request | 2074127 | 2094155 |
| Number of WMS request | 130 | 406148 |
| Number of WFS request | 80 | 5842 |

Table 15. Service Analysis

EMODnet Physics products (maps, layers, etc.) are available without authentication and they registered an increasing number of views/service requests.

| | requests on GEOSERVER | requests on THREDDS | requests on ERDDAP | Views on Product Pages |
|---|---|---|---|---|
| 2019-02 | 28021 | 20910 | 2 | 283 |
| 2019-01 | 15097 | 36166 | 0 | 386 |
| 2018-12 | 11585 | 38847 | 0 | 233 |
| 2018-11 | 10351 | 24602 | 1 | 371 |
| 2018-10 | 15041 | 15409 | 5 | 284 |
| 2018-09 | 102745 | 11932 | 1 | 169 |
| 2018-08 | 11942 | 6368 | 3 | 272 |
| 2018-07 | 19203 | 2683 | 1 | 375 |
| 2018-06 | 14450 | 2326 | 3 | 344 |
| 2018-05 | 14936 | 2973 | 2 | 228 |
| 2018-04 | 7846 | 2530 | 6 | 281 |
| 2018-03 | 68287 | 27352 | 16 | 199 |
| 2018-02 | 61222 | 48419 | 3 | 189 |
| 2018-01 | 40284 | 7476 | 0 | 127 |
| 2017-12 | 51666 | 4160 | NA | 165 |
| 2017-11 | 159014 | 21161 | NA | 155 |
| 2017-10 | 277297 | 10501 | NA | 160 |
| 2017-09 | 1356 | NA | NA | 64 |
| 2017-08 | NA | NA | NA | 167 |
| 2017-07 | NA | NA | NA | 115 |
| 2017-06 | NA | NA | NA | 199 |
| 2017-05 | NA | NA | NA | 258 |
| 2017-04 | NA | NA | NA | 358 |
| **Total** | **910343** | **283815** | **43** | **5382** |

Table 16. Products requests on service interfaces

The following tables show the most downloaded/requested platforms. Interestingly, users are manually downloading platforms in the North West Shelf and using machine-to-machine interfaces to access Mediterranean datasets. A request can be a single dataset (e.g. a file covering one month of recordings) or a full-time series. Supplementary information (full list) is reported in the EMODnetPhysics_FinalReport.xls (MostDownloaded.XXX sheets).

| Platform Code | Provider | Mar 2017 - Feb 2019 |
|---|---|---|
| 62103 | Met Office- United Kingdom | 463 |
| 62304 | Met Office- United Kingdom | 171 |
| 62170 | Met Office- United Kingdom | 169 |
| Europlatform | RWS - Rijkswaterstaat Waterdienst - Netherlands | 165 |
| 62305 | Met Office- United Kingdom | 153 |
| 62107 | Met Office- United Kingdom | 145 |
| 6903284 | HCMR - Hellenic Centre for Marine Research, Institute of Oceanography - Greece | 139 |
| Europlatform2 | RWS - Rijkswaterstaat Waterdienst - Netherlands | 138 |
| Arkona | BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany | 137 |
| Europlatform3 | RWS - Rijkswaterstaat Waterdienst - Netherlands | 134 |
| K13a2 | RWS - Rijkswaterstaat Waterdienst - Netherlands | 134 |
| LTKielWR | BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany | 132 |
| ArkonaWR | BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany | 128 |
| ElbeWR | BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany | 127 |
| LTKiel | BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany | 127 |
| NsbII | BSH - Bundesamt für Seeschifffahrt und Hydrographie - Germany | 127 |
| 62164 | Oil Platform - Private Industry | 125 |
| LichteilandGoeree2 | RWS - Rijkswaterstaat Waterdienst - Netherlands | 123 |
| 62059 | CEREMA - Centre Etudes et Expertise sur les Risques Environnement Mobilite et Amenagement - France | 123 |
| Brouwershavensegat | RWS - Rijkswaterstaat Waterdienst - Netherlands | 123 |

Table 17. top 20 most downloaded platforms (manual requests)

| Platform Code | Provider | Mar 2017 - Feb 2019 |
|---|---|---|
| Melilla-coast-buoy | PdE - Puertos del Estado - Spain | 22782 |
| 61499 | SOCIB - Balearic Islands Coastal Observing and Forecasting System | 22748 |
| OBSEA | UPC - Universitat Politecnica de Catalunya - Spain | 22747 |
| 68422 | HCMR - Hellenic Centre for Marine Research, Institute of Oceanography - Greece | 22712 |
| COLONIA-SANT-PERE | SOCIB - Balearic Islands Coastal Observing and Forecasting System | 22704 |
| PORTO-CRISTO | SOCIB - Balearic Islands Coastal Observing and Forecasting System | 22704 |
| SA-RAPITA | SOCIB - Balearic Islands Coastal Observing and Forecasting System | 22703 |
| POLLENSA | SOCIB - Balearic Islands Coastal Observing and Forecasting System | 22703 |
| ANDRATX | SOCIB - Balearic Islands Coastal Observing and Forecasting System | 22702 |
| CIUTADELLA | SOCIB - Balearic Islands Coastal Observing and Forecasting System | 22702 |
| LA-MOLA | SOCIB - Balearic Islands Coastal Observing and Forecasting System | 22701 |
| 6201062 | XG - Xunta Galicia - Spain | 22699 |
| 6201040 | XG - Xunta Galicia - Spain | 22698 |
| 6201039 | XG - Xunta Galicia - Spain | 22697 |
| 6201038 | XG - Xunta Galicia - Spain | 22696 |
| 6201031 | XG - Xunta Galicia - Spain | 22695 |
| Bilbao-station | Euskalmet- Basque Goverment - Spain | 22692 |
| Pasaia-station | Euskalmet- Basque Goverment - Spain | 22691 |
| Malaga-coast-buoy | PdE - Puertos del Estado - Spain | 22687 |
| LasPalmas-coast-buoy | PdE - Puertos del Estado - Spain | 22685 |

Table 18. top 20 most downloaded platforms (web services requests)

## *Indicator 5 - Organisations that have downloaded each data type*

EMODnet Physics is tracking the IP address[19] 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 is asking for some user details (see also Indicator 7). Since this new feature was published 505 users updated their profile and it is now possible to have a better idea of the organisations using the portal[20].

| 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 - USTHB | Academia/Research | Marine and Coastal | Algeria |
| Université des Sciences et de la Technologie HOUARI BOUMEDIENE - USTHB | Academia/Research | Marine and Coastal; Marine Resource | Algeria |
| Université des Sciences et de la Technologie HOUARI BOUMEDIENE - USTHB | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Algeria |
| Flinders University | Academia/Research | Marine and Coastal | Australia |
| IMOS | Academia/Research | Marine and Coastal | Australia |
| University of Tasmania | Academia/Research | Climate, Seasonal and Weather Forecasting | Australia |
| University of Tasmania | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Australia |
| Sheffield | Academia/Research | Marine Resource | Belgium |
| ULiège | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Belgium |
| University of Liège | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Belgium |

[19] To resolve the ip vs the country, EMODnet Physics is using the GEOLite2DB from MixMind[19] (free version) – last DB update synch 30/10/2017

[20] Noted that people from the same organisation are giving different definitions of the organisation (e.g. AZTI)

| | | | |
|---|---|---|---|
| University of Windsor | Academia/Research | Climate, Seasonal and Weather Forecasting | Canada |
| dlut | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | China |
| Nanjing University of Information Science and Technology | Academia/Research | Marine and Coastal | China |
| Ocean University of China | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | China |
| cyprus university of technology | Academia/Research | Marine and Coastal | Cyprus |
| EMU | Academia/Research | Climate, Seasonal and Weather Forecasting | Cyprus |
| Aalborg University | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Denmark |
| Aarhus University | Academia/Research | Marine and Coastal | Denmark |
| DHI | Academia/Research | Marine and Coastal | Denmark |
| DTU Wind Energy | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Denmark |
| Simac | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource | Denmark |
| Technical University of Denmark | Academia/Research | Climate, Seasonal and Weather Forecasting | Denmark |
| Technical University of Denmark | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Denmark |
| Alexandria university | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Egypt |
| Tallinn University of Technology | Academia/Research | Marine and Coastal | Estonia |
| Tallinn University of Technology | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Estonia |
| Tallinn University of Technology | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, | Estonia |

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|---|---|---|---|
| | | Seasonal and Weather Forecasting | |
| TUT MSI | Academia/Research | Marine and Coastal | Estonia |
| BRGM | Academia/Research | Marine and Coastal | France |
| Caen University | Academia/Research | Marine and Coastal | France |
| Centrale Nantes | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | France |
| ENSAM | Academia/Research | Climate, Seasonal and Weather Forecasting | France |
| Ifremer | Academia/Research | Marine and Coastal | France |
| IUEM | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | France |
| IUEM | Academia/Research | Marine Resource | France |
| LEGOS | Academia/Research | Climate, Seasonal and Weather Forecasting | France |
| LEGOS | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | France |
| Lycée Clémenceau | Academia/Research | Climate, Seasonal and Weather Forecasting | France |
| M2C | Academia/Research | Marine and Coastal | France |
| Principle Power | Academia/Research | Marine and Coastal | France |
| Université de Caen | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | 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 |
| Alfred Wegener Institute for Polar and Marine Research | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Germany |
| Alfred Wegener Institute, Helmholz Center for Polar and Marine Research | Academia/Research | Marine and Coastal | Germany |

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|---|---|---|---|
| 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; Marine Resource | Germany |
| Hochschule Bremen | Academia/Research | Marine and Coastal | Germany |
| Hochshule Bremen | Academia/Research | Marine and Coastal | Germany |
| HZG | Academia/Research | Marine and Coastal | Germany |
| IOW | Academia/Research | Marine and Coastal | Germany |
| Leibniy institute for baltic sea research | Academia/Research | Marine and Coastal | Germany |
| Leibniz Institute for Baltic Sea Research | Academia/Research | Climate, Seasonal and Weather Forecasting | Germany |
| Leibniz Institute for Baltic Sea Reserach | Academia/Research | Marine and Coastal | Germany |
| Leibniz-Institute of Baltic Sea Research | Academia/Research | Marine and Coastal | Germany |
| River and coastal engineering institut | Academia/Research | Marine and Coastal | Germany |
| TU Braunschweig | Academia/Research | Marine and Coastal | Germany |
| Universität Rostock | Academia/Research | Marine and Coastal | Germany |
| University of Ghana | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Ghana |
| aegean | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Greece |
| Agricultural University Athens | Academia/Research | Marine and Coastal; 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 |
| df | Academia/Research | Marine and Coastal | Greece |
| DUTh | Academia/Research | Marine and Coastal | Greece |
| HCMR | Academia/Research | Marine and Coastal | 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 |
| NKUA | Academia/Research | Marine and Coastal | Greece |
| University of Athens | Academia/Research | Climate, Seasonal and Weather Forecasting | Greece |
| UOA | Academia/Research | Climate, Seasonal and Weather Forecasting | Greece |
| uoa | Academia/Research | Marine and Coastal | Greece |
| CSIR-NIO,GOA | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | India |
| CSIR-NIO,GOA | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | India |
| Manipal Institute of Technology | Academia/Research | Climate, Seasonal and Weather Forecasting | India |
| National Centre for Polar and Ocean Research | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | India |
| Sharif University of Technology | Academia/Research | Marine and Coastal | Iran, the Islamic Republic of |
| GEBCO | Academia/Research | Marine and Coastal | Ireland |
| Institute of Technology Blanchardstown | Academia/Research | Climate, Seasonal and Weather Forecasting | Ireland |
| CMCC | Academia/Research | Marine and Coastal | Italy |
| CMCC | Academia/Research | Marine and Coastal; Marine Resource | Italy |
| CMCC | Academia/Research | Marine Resource; Climate, Seasonal and Weather Forecasting | Italy |
| CNR-ISMAR | Academia/Research | Marine and Coastal | 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, | Italy |

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|---|---|---|---|
| | | Seasonal and Weather Forecasting | |
| 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 |
| IUAV | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Italy |
| JRC Ispra | Academia/Research | Marine and Coastal | Italy |
| JRC Ispra | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Italy |
| National Research Council of Italy | Academia/Research | Climate, Seasonal and Weather Forecasting | Italy |
| Politecnico di Torino | Academia/Research | Marine and Coastal | Italy |
| Polito | 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 Cagliari | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Italy |
| UNIVERSITY OF IUAV | Academia/Research | Marine and Coastal | Italy |
| University of Salento | Academia/Research | Marine and Coastal | Italy |
| University of Salento | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | 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 |
| ALBA Balamand University | Academia/Research | Marine and Coastal; Marine Resource; | Lebanon |

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|---|---|---|---|
| | | Climate, Seasonal and Weather Forecasting | |
| UASLP | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Mexico |
| enim | Academia/Research | Marine and Coastal; Marine Resource | Morocco |
| Delft University of Technology | Academia/Research | Marine and Coastal | Netherlands |
| deltares | Academia/Research | Marine and Coastal | Netherlands |
| Deltares | Academia/Research | Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting | Netherlands |
| Deltares | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Netherlands |
| IHE Delft | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Netherlands |
| TU Delft | Academia/Research | Marine and Coastal | Netherlands |
| TU Delft | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Netherlands |
| Institute of Oceanography | Academia/Research | Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting | Poland |
| Uniwersytet Gdański | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Poland |
| centec | Academia/Research | Marine and Coastal | Portugal |
| CIIMAR | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Portugal |
| Facultade do Porto | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Portugal |
| FCUP | Academia/Research | Climate, Seasonal and Weather Forecasting | Portugal |

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|---|---|---|---|
| IDL/FCUL | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Portugal |
| Instituto Dom Luiz | Academia/Research | Climate, Seasonal and Weather Forecasting | Portugal |
| Instituto Superior Técnico | Academia/Research | Climate, Seasonal and Weather Forecasting | Portugal |
| IPMA | Academia/Research | Marine and Coastal; Marine Resource | Portugal |
| IST | Academia/Research | Marine and Coastal | Portugal |
| ist | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Portugal |
| IST | Academia/Research | Marine and Coastal; Marine Resource | Portugal |
| IST | Academia/Research | Marine Resource; Climate, Seasonal and Weather Forecasting | Portugal |
| MARETEC - Instituto Superior Técnico - Universidade de Lisboa | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Portugal |
| University of Beira Interior | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Portugal |
| University of Minho | Academia/Research | Marine and Coastal | Portugal |
| University of Minho | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Portugal |
| Constanta Maritime University | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Romania |
| DHM | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Romania |
| Faculty of Geography, University of Bucharest | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Romania |
| University of Bucharest | Academia/Research | Marine and Coastal | Romania |
| Russian State Hydrometeorological university | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Russia |

| | | | |
|---|---|---|---|
| Institute of Oceanology, Moscow | Academia/Research | Marine and Coastal | Russian Federation |
| IORAN | Academia/Research | Marine and Coastal | Russian Federation |
| RIHMI-WDC | Academia/Research | Marine and Coastal; Marine Resource | Russian Federation |
| RSHHU | Academia/Research | Climate, Seasonal and Weather Forecasting | Russian Federation |
| RSHHU | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Russian Federation |
| Russian State Hydrometeorological University | Academia/Research | Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting | Russian Federation |
| Shirshov Insitute of Oceanology | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Russian Federation |
| SOI | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Russian Federation |
| TMSI | Academia/Research | Marine and Coastal | Singapore |
| IzVRS | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Slovenia |
| National Institute of Biology | Academia/Research | Marine and Coastal | Slovenia |
| UL FGG | Academia/Research | Marine and Coastal | Slovenia |
| University of Ljubljana | Academia/Research | Marine and Coastal | Slovenia |
| Univerza v Ljubljani | Academia/Research | Marine and Coastal | Slovenia |
| csir | Academia/Research | Marine and Coastal | South Africa |
| University of Cape Town | Academia/Research | Climate, Seasonal and Weather Forecasting | South Africa |
| AZTI | Academia/Research | Marine and Coastal | Spain |
| EHU | Academia/Research | Marine and Coastal | Spain |
| EHU | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Spain |
| IEO | Academia/Research | Climate, Seasonal and Weather Forecasting | Spain |
| IEo | Academia/Research | Marine and Coastal | Spain |
| UC | Academia/Research | Climate, Seasonal and Weather Forecasting | Spain |
| UCA | Academia/Research | Marine and Coastal; Marine Resource | Spain |

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|---|---|---|---|
| Unifersity of Ferrara | Academia/Research | Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting | Spain |
| Universidad de Vig | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Spain |
| UNIVERSITAT POLITECNICA DE CATALUNYA | Academia/Research | Marine and Coastal | Spain |
| university of Cádiz | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Spain |
| University of the Basque Country | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Spain |
| University of Vigo | Academia/Research | Marine and Coastal | Spain |
| UPC | Academia/Research | Marine and Coastal | Spain |
| UPC | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Spain |
| UPC | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Spain |
| Stockholm University | Academia/Research | Marine and Coastal | Sweden |
| Swedish University of Agricultural Sciences | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Sweden |
| Graduate school of science engineering and technology | Academia/Research | Climate, Seasonal and Weather Forecasting | Turkey |
| Graduate School of Science Engineering and Technology | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Turkey |
| graduate school of scince engineering and technology | Academia/Research | Climate, Seasonal and Weather Forecasting | Turkey |
| ONU | Academia/Research | Marine and Coastal | Ukraine |
| Bangor University/ National Oceanography Centre | Academia/Research | Marine and Coastal | United Kingdom |
| Imperial College London | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |
| National Oceanography Centre | Academia/Research | Marine and Coastal | United Kingdom |
| NOC | Academia/Research | Marine and Coastal | United Kingdom |
| Plymouth | Academia/Research | Marine and Coastal | United Kingdom |
| plymouth | Academia/Research | Marine and Coastal | United Kingdom |

| | | | |
|---|---|---|---|
| Plymouth Marine Laboratory | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |
| Plymouth Marine Laboratory | Academia/Research | Marine and Coastal; Marine Resource | United Kingdom |
| plymouth university | Academia/Research | Marine and Coastal | United Kingdom |
| plymouth university | Academia/Research | Climate, Seasonal and Weather Forecasting | United Kingdom |
| Plymouth University | Academia/Research | Marine and Coastal | United Kingdom |
| Plymouth University | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |
| Plymouth University | Academia/Research | Marine and Coastal; Marine Resource | United Kingdom |
| Plymouth university | Academia/Research | Marine and Coastal; Marine Resource; 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 |
| Plymouth University | Academia/Research | Marine Resource | United Kingdom |
| plymouth university | Academia/Research | Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| The University of Plymouth | Academia/Research | Marine and Coastal | United Kingdom |
| UCL | Academia/Research | Marine and Coastal | United Kingdom |
| Ulster University | Academia/Research | Marine and Coastal | United Kingdom |
| Ulster University | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |
| ulster university | Academia/Research | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| Ulster University | Academia/Research | Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| University of Plymouth | Academia/Research | Marine and Coastal | United Kingdom |
| University of Plymouth | Academia/Research | Marine and Coastal | United Kingdom |
| University Of Plymouth | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |

| | | | |
|---|---|---|---|
| University of Plymouth | Academia/Research | Marine and Coastal; Marine Resource | United Kingdom |
| University of Plymouth | Academia/Research | Marine and Coastal; Maritime Safety; Marine Resource; 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 | United Kingdom |
| University of Southampton | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |
| University of Southampton | Academia/Research | Marine and Coastal; Marine Resource | United Kingdom |
| Wageningen Universiteit | Academia/Research | Marine and Coastal | United Kingdom |
| Stanford University | Academia/Research | Marine and Coastal | United States |
| UCLA | Academia/Research | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United States |
| BigDataIngestion | Business and private Company | Marine and Coastal | Afghanistan |
| tre | Business and private Company | Marine and Coastal | Afghanistan |
| sdfad | Business and private Company | Marine and Coastal; Maritime Safety | Atlantic Area |
| lllllllllll | 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 | Business and private Company | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Belgium |
| IMDC nv | Business and private Company | Marine and Coastal | Belgium |

| | | | |
|---|---|---|---|
| Climatempo | Business and private Company | Marine and Coastal | Brazil |
| ASL Environmental Sciences | Business and private Company | Marine and Coastal | Canada |
| Berring Data Collective | Business and private Company | Climate, Seasonal and Weather Forecasting | Denmark |
| COWI | Business and private Company | Marine and Coastal | Denmark |
| COWI A/S | Business and private Company | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Denmark |
| DHI | Business and private Company | Marine and Coastal | 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 | France |
| MERCATOR OCEAN | Business and private Company | Marine and Coastal | France |
| MeteoGroup | Business and private Company | Marine and Coastal | France |
| Noveltis | Business and private Company | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | France |
| SAIPEM | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | France |
| sinaps consult | Business and private Company | Marine and Coastal; 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 |
| OMIKRON SA | Business and private Company | Marine and Coastal | Greece |
| Planetek Hellas | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Greece |

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|---|---|---|---|
| OpenHydro | Business and private Company | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Ireland |
| Badinotti group spa | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Italy |
| DHI | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Italy |
| Eni | Business and private Company | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Italy |
| ETT | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource | Italy |
| Aktis Hydraulics | Business and private Company | Marine and Coastal | Netherlands |
| 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 |
| G | Business and private Company | Marine and Coastal | Portugal |
| STOCK COMPANY RESEARCH AND PROJECT DEVELOPMENT INSTITUTE OF MERCHANT MARINE «SOYUZMORNIIPROEKT» | Business and private Company | Marine and Coastal | Russia |
| Fertoing LLC | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Russian Federation |
| iberdrola | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Spain |

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|---|---|---|---|
| MyWave | Business and private Company | Climate, Seasonal and Weather Forecasting | Spain |
| Research and Development Concretes | Business and private Company | Marine and Coastal; Marine Resource | Spain |
| Zunibal | Business and private Company | Marine and Coastal | Spain |
| CA Metocean | Business and private Company | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |
| DNV GL | 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 |
| DNVGL | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| Fugro | Business and private Company | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |
| Fugro | Business and private Company | Marine and Coastal; Marine Resource | United Kingdom |
| Fugro | Business and private Company | Marine Resource | United Kingdom |
| Geo-4D | Business and private Company | Maritime Safety | United Kingdom |
| HR Wallingford | Business and private Company | Marine and Coastal | United Kingdom |
| HR Wallingford | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| Nexen | Business and private Company | Climate, Seasonal and Weather Forecasting | United Kingdom |
| Oceanalysis Ltd | Business and private Company | Marine and Coastal; Marine Resource | United Kingdom |
| Partrac | 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 |

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|---|---|---|---|
| Tritec Marine | Business and private Company | Marine and Coastal; Marine Resource | United Kingdom |
| Vattenfall Wind Power Ltd | Business and private Company | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| Vattenfall Wind Power Ltd | Business and private Company | Marine Resource | United Kingdom |
| WSP | Business and private Company | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |
| Jacobs Engineering Group | Business and private Company | Marine and Coastal | United States |
| RPS Group | Business and private Company | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United States |
| 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 |
| UOH | Government/Public Administration | Marine and Coastal | Anguilla |
| aKust | Government/Public Administration | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Belgium |
| EMODnet Secretariat | Government/Public Administration | Marine and Coastal | Belgium |
| Febima | Government/Public Administration | Maritime Safety | Belgium |
| Hydrographic Institute | Government/Public Administration | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Belgium |
| RBINS | Government/Public Administration | Marine and Coastal; Maritime Safety; Marine Resource | Belgium |
| socib | Government/Public Administration | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Belgium |

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|---|---|---|---|
| Nanjing University of Information Science and Technology | Government/Public Administration | Marine and Coastal | China |
| OUC | Government/Public Administration | Marine and Coastal | China |
| Institute of Oceanography and Fisheries | Government/Public Administration | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Croatia |
| DMI | Government/Public Administration | Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting | Denmark |
| Forsvarets Center for Operativ Oceanografi | Government/Public Administration | Marine and Coastal; Maritime Safety; Climate, Seasonal and Weather Forecasting | Denmark |
| Joint GeoMETOC Support Center | Government/Public Administration | Marine and Coastal | Denmark |
| Finnish environment institute | Government/Public Administration | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Finland |
| Finnish Meteorolocigal Institute | Government/Public Administration | Marine and Coastal | Finland |
| Metsähallitus | Government/Public Administration | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Finland |
| BRGM | Government/Public Administration | Marine and Coastal; Climate, Seasonal and Weather Forecasting | France |
| IFREMER | Government/Public Administration | Climate, Seasonal and Weather Forecasting | France |
| Ifremer | Government/Public Administration | Marine and Coastal; Climate, Seasonal and Weather Forecasting | France |
| ifremer | Government/Public Administration | Marine and Coastal; Maritime Safety; Marine Resource; 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 |

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|---|---|---|---|
| Helmholtz-Zentrums Geesthacht | Government/Public Administration | Marine and Coastal | Germany |
| Leibniz-Institute for Baltic Sea Research | Government/Public Administration | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Germany |
| leibniz-Institute for Baltic Sea Research Warnemuende | Government/Public Administration | Climate, Seasonal and Weather Forecasting | Germany |
| HCMR | Government/Public Administration | Marine and Coastal | Greece |
| NCAOR | Government/Public Administration | Climate, Seasonal and Weather Forecasting | India |
| 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 Center | 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 |
| Instituto Português do Mar e da Atmosfera | Government/Public Administration | Climate, Seasonal and Weather Forecasting | Portugal |
| Slovenian Environment Agency | Government/Public Administration | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Slovenia |
| IHM | Government/Public Administration | Marine and Coastal | Spain |
| MNCN | Government/Public Administration | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Spain |
| PLOCAN | Government/Public Administration | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Spain |
| Swedish Armed Forces METOC Centre | Government/Public Administration | Climate, Seasonal and Weather Forecasting | Sweden |

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|---|---|---|---|
| Met Office | Government/Public Administration | Climate, Seasonal and Weather Forecasting | United Kingdom |
| Met Office | Government/Public Administration | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United Kingdom |
| National Oceanography Centre | Government/Public Administration | Marine and Coastal | United Kingdom |
| National Oceanography Centre | Government/Public Administration | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| Plymouth University | Government/Public Administration | Marine and Coastal | United Kingdom |
| wyre borough council | Government/Public Administration | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| noaa/emc | Government/Public Administration | Marine and Coastal; Climate, Seasonal and Weather Forecasting | United States |
| jouan institute | Non-profit | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Andorra |
| CREPS | Non-profit | Marine and Coastal | France |
| MO | Non-profit | Marine Resource | France |
| Polytech | Non-profit | Marine and Coastal; Marine Resource | France |
| Sea-Mer Asso | Non profit | Marine and Coastal | France |
| Sea-Mer Asso | Non profit | Marine Resource | France |
| Helmholtz Zentrum Geesthacht | Non-profit | Marine and Coastal | Germany |
| Helmholtz-Zentrum Geesthacht | Non-profit | Marine and Coastal | Germany |
| CMCC | Non-profit | Marine and Coastal | Italy |
| Deltares | Non-profit | Marine and Coastal | Netherlands |
| AZTI | Non profit | Marine and Coastal; Marine Resource | Spain |
| AZTI | Non-profit | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Spain |
| AZTI | Non-profit | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Spain |
| Earth Ways | Non-profit | Marine and Coastal | United Kingdom |

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|---|---|---|---|
| Science Fair | Non-profit | Climate, Seasonal and Weather Forecasting | United States |
| EMODnet secretariat | Other | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Belgium |
| research of science | Other | Marine Resource | Belgium |
| av | Other | Marine and Coastal; Climate, Seasonal and Weather Forecasting | France |
| BRGM | Other | Marine and Coastal; Climate, Seasonal and Weather Forecasting | France |
| Le Télégramme | Other | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | France |
| lycée alain | Other | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | France |
| personal user | Other | Marine and Coastal | France |
| SINAY | Other | Marine and Coastal | France |
| University | Other | Climate, Seasonal and Weather Forecasting | Germany |
| ERM | Other | Climate, Seasonal and Weather Forecasting | Italy |
| ETT | Other | Marine Resource | Italy |
| Rina | Other | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Italy |
| University | Other | Marine and Coastal | Italy |
| Home | Other | Climate, Seasonal and Weather Forecasting | Netherlands |
| MetService | Other | Marine and Coastal | New Zealand |
| ciencias | Other | Marine Resource; Climate, Seasonal and Weather Forecasting | Portugal |
| faculdade de ciencias | Other | Marine Resource; Climate, Seasonal and Weather Forecasting | Portugal |

| | | | |
|---|---|---|---|
| R2 | Other | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Russia |
| Fertoing | Other | Marine and Coastal; Marine Resource; Climate, Seasonal and Weather Forecasting | Russian Federation |
| SPSU | Other | Marine and Coastal | Russian Federation |
| Azti | Other | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Spain |
| CRN | Other | Marine and Coastal; Climate, Seasonal and Weather Forecasting | Spain |
| UGR | Other | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | Spain |
| Plymouth University | Other | Marine and Coastal | United Kingdom |
| Plymouth University | Other | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| seafarer | Other | Marine and Coastal; Maritime Safety; Marine Resource; Climate, Seasonal and Weather Forecasting | United Kingdom |
| University of Plymouth | Other | Marine and Coastal | United Kingdom |

Table 19. Registered user organisations

EMODnet Physics registered, 143.470 manual data download requests (20.853 reprocessed datasets), more than 1.300.000 web services transactions, 1052 CDI datasets requests.

| | Number of manual downloads | of which CDI | Number of Web Service request |
|---|---|---|---|
| 2019-02 | 34389 | 11 | 48125 |
| 2019-01 | 9686 | 1 | 57149 |
| 2018-12 | 834 | 0 | 51885 |
| 2018-11 | 9190 | 13 | 48347 |
| 2018-10 | 2028 | 6 | 52038 |
| 2018-09 | 13953 | 12 | 43574 |
| 2018-08 | 4693 | 1 | 2993 |
| 2018-07 | 11018 | 37 | 77511 |
| 2018-06 | 4460 | 2 | 44977 |
| 2018-05 | 7993 | 6 | 76993 |
| 2018-04 | 1770 | 26 | 47983 |
| 2018-03 | 2839 | 0 | 105739 |
| 2018-02 | 2039 | 94 | 43936 |
| 2018-01 | 576 | 31 | 113773 |
| 2017-12 | 796 | 36 | 239078 |
| 2017-11 | 6507 | 3 | 48321 |
| 2017-10 | 7338 | 43 | 92449 |
| 2017-09 | 1585 | 397 | 47030 |
| 2017-08 | 2082 | 12 | 39021 |
| 2017-07 | 1615 | 44 | 7064 |
| 2017-06 | 5486 | 25 | 5256 |
| 2017-05 | 2641 | 54 | 5446 |
| 2017-04 | 9952 | 198 | 4852 |
| **Total** | **143470** | **1052** | **1303540** |

Table 20. Downloaded datasets (both manual and webservice 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 100,000 views (more than 50,000 unique views). The landing portal page recorded more than 23,000 views (internal tracking), more than 19,000 views and more than 12,200 unique views (GoogleAnlaytics). Products discovery pages recorded a positive trend of views (more than 5,000) and services interface (geoserver, ERDDAP, THREDDS, etc.) are intensively used (thousands of transactions – see also Table 14 to Table 20).

| | Landing Page | About/ Background | Associated partners | Catalogue | Cookie page | Documents & services | How to contribute | News | QA/QC Protocols | Terms of Use | User's guide & legend | Videos Physics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019-02 | 855 | 25 | 16 | 64 | 32 | 14 | 34 | 16 | 14 | 37 | 17 | 9 |
| 2019-01 | 1161 | 42 | 37 | 45 | 52 | 25 | 61 | 20 | 22 | 47 | 20 | 21 |
| 2018-12 | 1291 | 25 | 24 | 34 | 32 | 18 | 43 | 27 | 14 | 23 | 16 | 16 |
| 2018-11 | 1336 | 49 | 25 | 62 | 68 | 32 | 68 | 19 | 24 | 40 | 32 | 24 |
| 2018-10 | 1095 | 33 | 18 | 55 | 35 | 22 | 39 | 20 | 15 | 23 | 11 | 14 |
| 2018-09 | 992 | 49 | 37 | 93 | 44 | 27 | 58 | 28 | 26 | 62 | 30 | 9 |
| 2018-08 | 784 | 29 | 17 | 86 | 14 | 33 | 25 | 14 | 13 | 48 | 23 | 11 |
| 2018-07 | 1192 | 42 | 19 | 81 | 25 | 24 | 54 | 5 | 13 | 71 | 24 | 11 |
| 2018-06 | 849 | 33 | 19 | 50 | 36 | 13 | 46 | 19 | 16 | 40 | 13 | 14 |
| 2018-05 | 1306 | 39 | 29 | 76 | 36 | 36 | 59 | 156 | 21 | 45 | 33 | 12 |
| 2018-04 | 1290 | 68 | 67 | 118 | 72 | 51 | 108 | 102 | 46 | 81 | 50 | 32 |
| 2018-03 | 1612 | 100 | 84 | 132 | 160 | 92 | 170 | 183 | 85 | 164 | 85 | 61 |
| 2018-02 | 1200 | 62 | 58 | 116 | 99 | 44 | 127 | 128 | 53 | 82 | 46 | 40 |
| 2018-01 | 1239 | 51 | 47 | 49 | 58 | 36 | 73 | 30 | 29 | 59 | 35 | 19 |
| 2017-12 | 633 | 28 | 33 | 45 | 25 | 31 | 27 | 8 | 22 | 35 | 23 | 17 |
| 2017-11 | 859 | 25 | 18 | 52 | 21 | 21 | 19 | 9 | 14 | 33 | 23 | 14 |
| 2017-10 | 1249 | 37 | 38 | 90 | 57 | 43 | 51 | 13 | 28 | 65 | 31 | 18 |
| 2017-09 | 819 | 45 | 39 | 76 | 48 | 79 | 46 | 14 | 44 | 43 | 45 | 31 |
| 2017-08 | 751 | 21 | 22 | 34 | 23 | 26 | 19 | 2 | 20 | 20 | 17 | 13 |
| 2017-07 | 480 | 16 | 14 | 28 | 27 | 14 | 17 | 6 | 12 | 12 | 16 | 10 |
| 2017-06 | 748 | 15 | 14 | 36 | 11 | 8 | 8 | 4 | 5 | 11 | 8 | 5 |
| 2017-05 | 1139 | 25 | 28 | 54 | 17 | 16 | 13 | 9 | 14 | 17 | 22 | 5 |
| 2017-04 | 311 | 8 | 9 | 30 | 11 | 9 | 7 | 12 | 5 | 12 | 11 | 0 |
| **Total** | **23191** | **867** | **712** | **1506** | **1003** | **714** | **1172** | **844** | **555** | **1070** | **631** | **406** |

Table 21. User navigation routes. Data from the internal tracking system.

| | Visit duration (average [s]) | Page views | unique views | tool | Visits | unique | Visit duration (average) | tool |
|---|---|---|---|---|---|---|---|---|
| 01/02/2019 | 02:05 | 1509 | 465 | Google Analytics | 1491 | 449 | 00:01:47 | matomo |
| 01/01/2019 | 02:22 | 1162 | 510 | Google Analytics | 1152 | 487 | 00:01:12 | matomo |
| 01/12/2018 | 02:50 | 603 | 460 | Google Analytics | 551 | 418 | 00:01:00 | matomo |
| 01/11/2018 | 02:47 | 976 | 704 | Google Analytics | 931 | 682 | 00:01:10 | matomo |
| 01/10/2018 | 02:03 | 860 | 632 | Google Analytics | 842 | 623 | 00:00:44 | matomo |
| 01/09/2018 | 02:34 | 768 | 570 | Google Analytics | 719 | 530 | 00:01:03 | matomo |
| 01/08/2018 | 02:43 | 622 | 429 | Google Analytics | 570 | 377 | 00:01:03 | matomo |
| 01/07/2018 | 03:10 | 896 | 632 | Google Analytics | 876 | 576 | 00:00:58 | matomo |
| 01/06/2018 | 02:49 | 623 | 491 | Google Analytics | 596 | 472 | 00:00:54 | matomo |
| 01/05/2018 | 02:18 | 1218 | 863 | Google Analytics | 1129 | 794 | 00:01:01 | matomo |
| 01/04/2018 | 03:39 | 922 | 719 | Google Analytics | 842 | 638 | 00:00:57 | matomo |
| 01/03/2018 | 03:16 | 861 | 639 | Google Analytics | 810 | 594 | 00:01:07 | matomo |
| 01/02/2018 | 01:45 | 909 | 614 | Google Analytics | 787 | 555 | 00:01:13 | matomo |
| 01/01/2018 | 01:46 | 855 | 572 | Google Analytics | 683 | 482 | 00:00:58 | matomo |
| 01/12/2017 | 01:46 | 1421 | 534 | Google Analytics | 587 | 368 | 00:01:01 | matomo |
| 01/11/2017 | 02:18 | 625 | 409 | Google Analytics | 518 | 378 | 00:01:42 | matomo |
| 01/10/2017 | 02:18 | 717 | 502 | Google Analytics | 230 | 175 | 00:01:00 | matomo |
| 01/09/2017 | 02:57 | 474 | 354 | Google Analytics | NA | NA | NA | NA |
| 01/08/2017 | 03:09 | 270 | 219 | Google Analytics | NA | NA | NA | NA |
| 01/07/2017 | 02:23 | 407 | 311 | Google Analytics | NA | NA | NA | NA |
| 01/06/2017 | 03:04 | 513 | 401 | Google Analytics | NA | NA | NA | NA |
| 01/05/2017 | 01:23 | 1805 | 728 | Google Analytics | NA | NA | NA | NA |
| 01/04/2017 | 01:51 | 884 | 482 | Google Analytics | NA | NA | NA | NA |
| **TOTAL** | | **19900** | **12240** | | **13314** | **8598** | | |

Table 22. Landing page analytics.

| | Visit duration (average) | Page views | unique | tool | Visits | tool |
|---|---|---|---|---|---|---|
| 01/02/2019 | 00:01:29 | 3881 | 2230 | matomo | 415 | internal tracking |
| 01/01/2019 | 00:01:24 | 4531 | 2680 | matomo | 501 | internal tracking |
| 01/12/2018 | 00:01:17 | 3697 | 2151 | matomo | 389 | internal tracking |
| 01/11/2018 | 00:01:24 | 6277 | 3658 | matomo | 444 | internal tracking |
| 01/10/2018 | 00:01:22 | 5187 | 3273 | matomo | 289 | internal tracking |
| 01/09/2018 | 00:01:32 | 3843 | 2342 | matomo | 388 | internal tracking |
| 01/08/2018 | 00:01:12 | 3873 | 2485 | matomo | 148 | internal tracking |
| 01/07/2018 | 00:01:20 | 6317 | 3814 | matomo | 272 | internal tracking |
| 01/06/2018 | 00:01:17 | 5377 | 3153 | matomo | 179 | internal tracking |
| 01/05/2018 | 00:01:33 | 4938 | 3179 | matomo | 238 | internal tracking |
| 01/04/2018 | 00:01:27 | 4988 | 3297 | matomo | 166 | internal tracking |
| 01/03/2018 | 00:01:20 | 5488 | 3385 | matomo | 377 | internal tracking |
| 01/02/2018 | 00:01:18 | 5946 | 3621 | matomo | 456 | internal tracking |
| 01/01/2018 | 00:01:22 | 5273 | 3233 | matomo | 526 | internal tracking |
| 01/12/2017 | 00:01:06 | 4532 | 2715 | matomo | 104 | internal tracking |
| 01/11/2017 | 00:01:19 | 4425 | 2647 | matomo | 160 | internal tracking |
| 01/10/2017 | 00:01:31 | 2031 | 1210 | matomo | 113 | internal tracking |
| 01/09/2017 | 03:06:00 | 1121 | 542 | Google Analytics | 363 | internal tracking |
| 01/08/2017 | 02:32:00 | 625 | 309 | Google Analytics | 75 | internal tracking |
| 01/07/2017 | 02:55:00 | 1377 | 744 | Google Analytics | 137 | internal tracking |
| 01/06/2017 | 02:23:00 | 3877 | 1491 | Google Analytics | 115 | internal tracking |
| 01/05/2017 | 01:20:00 | 7733 | 1548 | Google Analytics | 873 | internal tracking |
| 01/04/2017 | 01:29:00 | 5678 | 1218 | Google Analytics | 12043 | internal tracking |
| 01/03/2017 | 01:30:00 | 7777 | 1692 | Google Analytics | 1944 | internal tracking |
| **Total** | | **108792** | **56617** | | **20715** | |

Table 23. Map page analytics. Internal tracking tools count unique visitors

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

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

| Organisation type | % of users | # of users | Main use cases and application areas[21] | |
|---|---|---|---|---|
| Academia/Research | 63.20% | 319 | Marine and Coastal | 287 |
| | | | Climate, Seasonal and Weather Forecasting | 137 |
| | | | Marine Resource | 75 |
| | | | Maritime Safety | 43 |
| Business and private Company | 14.50% | 73 | Marine and Coastal | 64 |
| | | | Climate, Seasonal and Weather Forecasting | 36 |
| | | | Marine Resource | 26 |
| | | | Maritime Safety | 17 |
| Government/Public Administration | 10.90% | 55 | Marine and Coastal | 46 |
| | | | Climate, Seasonal and Weather Forecasting | 36 |
| | | | Maritime Safety | 12 |
| | | | Marine Resource | 12 |
| Non profit | 4.20% | 21 | Marine and Coastal | 18 |
| | | | Marine Resource | 9 |
| | | | Climate, Seasonal and Weather Forecasting | 6 |
| | | | Maritime Safety | 3 |
| Other | 7.30% | 37 | Marine and Coastal | 27 |
| | | | Climate, Seasonal and Weather Forecasting | 23 |
| | | | Marine Resource | 16 |
| | | | Maritime Safety | 10 |
| Users that updated their profile | | 505 | | |

Table 24. Users main use cases and application areas

| Country | % users | Country | % users |
|---|---|---|---|
| United Kingdom | 25.35% | Cyprus | 0.59% |
| France | 9.90% | Canada | 0.40% |
| Italy | 9.50% | Andorra | 0.40% |

[21] The user was able to provide multiple choices

| | | | |
|---|---|---|---|
| Germany | 8.51% | Poland | 0.40% |
| Spain | 6.93% | Brazil | 0.40% |
| Portugal | 5.15% | South Africa | 0.40% |
| Denmark | 3.56% | Switzerland | 0.20% |
| Greece | 3.37% | Azerbaijan | 0.20% |
| Netherlands | 2.57% | Morocco | 0.20% |
| Belgium | 2.57% | Bahrain | 0.20% |
| Russian Federation | 2.18% | Iran, the Islamic Republic of | 0.20% |
| United States | 1.98% | New Zealand | 0.20% |
| Slovenia | 1.58% | Austria | 0.20% |
| China | 1.39% | Latvia | 0.20% |
| India | 1.19% | Atlantic Area | 0.20% |
| Estonia | 0.99% | Anguilla | 0.20% |
| Algeria | 0.99% | Ukraine | 0.20% |
| Finland | 0.99% | Egypt | 0.20% |
| Sweden | 0.79% | Aruba | 0.20% |
| Ireland | 0.79% | Croatia | 0.20% |
| Australia | 0.79% | Singapore | 0.20% |
| Romania | 0.79% | Ghana | 0.20% |
| Turkey | 0.79% | Lebanon | 0.20% |
| Russia | 0.59% | Mexico | 0.20% |
| Afghanistan | 0.59% | | |

Table 25. User Nationalities

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

EMODnet Physics is keeping developing and updating its machine-to-machine services in order to facilitate the use of available datasets to the widest community of users. Table 26 presents some examples/links of the available machine-to-machine services. Table 15 and Table 20 show the recorded positive trends in the use of such services.

| Service | Description | Examples |
|---|---|---|
| PermaURL | All platforms | http://www.emodnet-physics.eu/map/platinfo/piradar.aspx?platformid=10273<br>http://www.emodnet-physics.eu/map/platinfo/pidashboard.aspx?platformid=10273<br>Service description @<br>http://www.emodnet-physics.eu/map/spi.aspx |
| API REST/SOAP | Latest 60 days of data | www.emodnet-physics.eu/map/Service/WSEmodnet2.aspx<br>www.emodnet-physics.eu/map/service/WSEmodnet2.asmx |
| OGS WMS, WFS, WCS | Postgresql + Geoserver | geoserver.emodnet-physics.eu/geoserver/web<br>examples and service description @<br>www.emodnet-physics.eu/map/service/GeoServerDefaultWMS<br>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 26. List of web services and interoperability services

# 11 Recommendations for follow-up actions by the EU

The EMODnet Physics contract had a two-year duration, a very limited timeframe to connect new data providers and give a better and clearer guarantee on continuation. This is of key importance in order not to lose the goodwill that has been built up over time within the Copernicus (CMEMS), EuroGOOS and SeaDataNet communities.

Contract interruption/delay results in uncertainty and considerably harms the position that EMODnet Physics has achieved over the last few years:

EMODnet Physics started reaching and serving a wider user community, including the South Ocean Observing System and the Swiss Antarctic Circumpolar Expedition. There are ongoing discussions with officials from the Red Sea, Mauritius, etc. EMODnet Physics has started working on data management and dissemination of underwater noise products related to MSDF Indicator 11.

EMODnet Physics is supporting activities at the platform level (HFR, Ferrybox, mammals…). EMODnet Physics identifies, together with platform operators, tasks that can have a big impact but a minor investment. Although it made significant progress towards reducing the gap between marine data availability and accessibility, there are a number of key actions (such as the inclusion of more research vessel data, glider data, Arctic Ocean and Black Sea data – with focus on the improvement of data harmonisation and their access – data sampling, transmission, calibration, processing, archiving and retrieval of required variables) that must not be stopped. To note that the other key European infrastructures (CMEMS-INSTAC and SeaDataNet) are also benefitting from this "unlocking" action.

Another example is the support for activities bringing together communities to discuss platform-specific data issues. EMODnet Physics took the lead on these by supporting and organising specific workshops. These activities are crucial to maintaining momentum among platform operators. They bring communities together in order to address and solve various data issues.

It is recommended that EMODnet Physics continues and increases these activities so that the continuing momentum will contribute to a better, data-coordinated European observation system. Participating data providers are given the opportunity of presenting their observing capabilities and whatever data can be of interest for ingestion into EMODnet (as well as/in partnership with CMEMS-INSTAC and SDN). Any possible data-sharing issues are discussed, and active solutions are proposed. This has contributed to the making available of some of the most exhaustive in situ marine data collections (e.g. sea level, temperature and salinity in the water column, sea surface currents etc.).

Activities are underway for the formulation of a feasible approach for the European Ocean Observing System (EOOS). Beyond data collection, good data management and the guarantee that data sets become widely detectable and accessible are key items for the 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 to be an important shop-window making users aware of existing data observation systems and providing easy access to the collected data. It is

therefore 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.

Interventions of EMODnet Physics at the TG-NOISE have contributed to the identification of a very specific and clear topic for the engagement of Regional Sea Conventions. 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 to take care of and follow up.

EMODnet Physics started integrating and making available near real-time river runoff and in situ river runoff trends (monthly and annual means). The MFC community is welcoming this new data to improve the MFCs thermohaline circulation in coastal areas through improved classification of land-marine boundary conditions, with special regard to salinity fields. It is recommended to the EU to keep supporting this activity.

# 12 Annexe: Other documentation attached

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

- EMODnetPhysics_FinalReport.xls – providing supplementary information on the indicators and analytics
- SOOS-AnnualReport-2017.pdf – describing the collaboration between EMODnet Physics and SOOS
- GOOS-ObservingElementSpecification-HFRadar.pdf – indicating the EMODnet Physics HFR catalogue as the reference for the International HFR catalogue

# 13 List of abbreviations and acronyms

| Acronym | Description |
|---|---|
| **AA** | Annual Assembly |
| **ACCOBAMS** | Accordo sulla Conservazione dei Cetacei nel Mar Nero, Mar Mediterraneo e Aree Atlantiche Contigue |
| **ACRI-IN** | Bureau d'études spécialisé en aménagement du littoral, ingénierie maritime et maitrise d'oeuvre maritime et portuaire |
| **ACTIMAR** | ACTIMAR operational oceanography |
| **AIS** | Automatic Identification System |
| **API** | Application Programming Interface |
| **ARGO** | a global array of free-drifting profiling floats |
| **ARPAL** | Agenzia Regionale per la Protezione dell'Ambiente Ligure |
| **AtlantOS** | An integrated observing system for the Atlantic Ocean |
| **AZTI** | Centro tecnológico experto en innovación marina y alimentaria |
| **BFG** | German Federal Institute of Hydrology |
| **BIAS** | Baltic Sea Information on the Acoustic Soundscape |
| **BODC** | British Oceanographic Data Centre |
| **BRGM** | Bureau de Recherches Géologiques et Minières |
| **BSH** | Bundesamt für Seeschifffahrt und Hydrographie – Germany |
| **CDI** | Common Data Index |
| **CEA** | Commissariat à l'énergie atomique et aux énergies alternatives |
| **CEREMA** | Centre Etudes et Expertise sur les Risques Environnement Mobilite et Amenagement |
| **CF** | Climate and Forecast vocabulary convention |
| **Chl** | Chlorophyl |
| **CIIMAR** | Centro Interdisciplinar De Investigação Marinha E Ambiental |
| **CIS** | Common Implementation Strategy |
| **CMCC** | Centro Euro-Mediterraneo sui Cambiamenti Climatici |
| **CMEMS** | Copernicus Marine Environment Monitoring Service |
| **CMEMS DR** | Copernicus Marine Environment Monitoring Service Design Review |
| **CMEMS DU** | Copernicus Marine Environment Monitoring Service Dissemination Unit |
| **CMRE WS** | Centre for Maritime Research and Experimentation Workshop |
| **CNR** | National Research Council |
| **CNR-ISMAR** | Consiglio Nazionale delle Ricerche - Istituto di scienze marine |
| **CNRS** | National Center of Scientific Research |
| **CORA** | Coriolis Ocean Dataset for Reanalysis |

| | |
|---|---|
| **CORIOLIS** | Coriolis is an integrated in situ ocean observation infrastructure for the needs of operational oceanography and climate research |
| **CREPS** | Centre de Ressources, d'Expertise et de Performance Sportive |
| **CSIR-NIO** | Council of Scientific and Industrial Research - National Institute of Oceanography |
| **CSV** | Comma Separated Value |
| **CTD** | Conductivity Temperature Depth probe |
| **DATAMEQ** | Data management exchange quality |
| **DB** | Drifting Buoy |
| **Deltares** | Netherlands Centre for Coastal Research |
| **DFO** | Fisheries and Oceans Canada |
| **DFO MPO GC** | Fisheries and Oceans Canada |
| **DGMARE** | Directorate-General for Maritime Affairs and Fisheries |
| **DHI** | Danish Hydraulic Institute |
| **DHM** | Maritime Hydrographic Directorate - Romania |
| **DIP** | Data Interoperability Project |
| **DIVA** | Data Interpolating Variational Analysis |
| **DLR** | Deutsches Zentrum für Luft- und Raumfahrt (German Aerospace Center) |
| **dlut** | Dalian University of Technology |
| **DMI** | Danish Meteorological Institute |
| **DMSC** | Data Management Steering Committee |
| **DMT** | Droplet Measurement Technologies |
| **DNV GL** | Det Norske Veritas Holding AS |
| **DOI** | Digital Object Identifier |
| **DOOS** | Deep Ocean Observing Strategy |
| **DOX** | Dissolved Oxygen |
| **DTU** | Technical University of Denmark |
| **DUTh** | Democritus University of Thrace |
| **EASME** | Executive Agency for SMEs - European Commission |
| **EC** | European Commission |
| **ECV** | Essential Climate Variables |
| **EGU** | European Geophysical Union |
| **EHU** | University of the Basque Country - Spain |
| **EMFF** | European Maritime and Fisheries Fund |
| **EMODnet** | European Marine Observation and Data Network |
| **EMSA** | European Maritime Safety Agency |
| **EMSO** | European Multidisciplinary Seafloor Observatory |
| **EMU** | Eastern Mediterranean University |
| **ENEA** | Agenzia Nazionale per le Nuove Tecnologie, l'Energia e lo sviluppo economico sostenibile |

| | |
|---|---|
| **ENI** | Ente Nazionale Idrocarburi - National Hydrocarbons Authority |
| **ENIM** | Ecole Nationale d'Ingénieurs de Metz |
| **ENSAM** | École Nationale Supérieure d'Arts et Métiers |
| **ENSSMAL** | École Nationale Supérieure des Sciences de la Mer et de l'Aménagement du Littoral |
| **EOF** | Encuentro de la Oceanografía Física |
| **EOOS** | European Ocean Observing System |
| **EPHE** | Laboratoire EPHE Biogeographie et Ecologie des Vertebres |
| **ERDDAP** | Environmental Research Division's Data Access Program |
| **ERM** | Environmental Resources Management |
| **ERVO** | European Research Vessel Operators |
| **ESA** | European Space Agency |
| **ESONDA** | Dissesto idrogeologico e prevenzione dei rischi |
| **ESSI1.1** | Earth & Space Science Informatics |
| **ET WISC** | Expert Team on World Meteorological Organization Information System Centres |
| **EU** | European Union |
| **EU TG-NOISE** | European Union Technical Group on Underwater Noise |
| **EUDAT** | Research Data Services, Expertise & Technology Solutions |
| **EuroGOOS** | European component of the Global Ocean Observing System |
| **Euskalmet** | Agenzia Vasca de Meteorologia |
| **EUSKOS** | Basque Operational Oceanography System Basque Operational Oceanography System |
| **FB** | FerryBox |
| **FCUP** | Faculdade de Ciências da Universidade do Porto |
| **Febima** | Federal Bureau for the Investigation of Maritime Accidents |
| **FixO3** | Fixed point Open Ocean Observatory network |
| **FR** | France |
| **FUGRO** | Global offshore and onshore geotechnical and survey services - UK |
| **GA** | General Assembly |
| **GEBCO** | The General Bathymetric Chart of the Oceans |
| **GEOMAR** | Helmholtz Centre for Ocean Research Kiel |
| **GeoMETOC** | Geo-meteorological and oceanographic |
| **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 |
| **HF TT** | High Frequency Radar Task Team |
| **HFR** | High Frequency Radar |
| **HyMeX** | The HYdrological cycle in the Mediterranean Experiment |
| **HZG** | Helmholtz-Zentrum Geesthacht - Centre for Materials and Coastal Research |
| **IAPB** | International Arctic Buoy Programme |
| **IAWF** | International Animal Welfare Foundation |
| **ICES** | International Council for the Exploration of the Sea |
| **IDL/FCUL** | Institute Dom Luiz / Faculdade de Ciencias da Universidade de Lisboa |
| **IEO** | Spanish Institute of Oceanography - Spain |
| **IFREMER** | Institut Français de Recherche pour l'Exploitation de la Mer - France |
| **IHE** | Delft Institute for Water Education |
| **IHO** | International Hydrographic Organization |
| **IMDC NV** | International Marine and Dredging Consultants - Belgium |
| **IMDIS** | International conference on Marine Data and Information Systems |
| **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 |
| **INGV** | Istituto nazionale di geofisica e vulcanologia |
| **INSITU TAC** | CMEMS In situ temathic assembly centre |
| **INSPIRE** | Infrastructure for Spatial Information in Europe |
| **INSTAC** | CMEMS In Situ Thematic Assembly Center |
| **INSTAC PU** | In Situ Thematic Assembly Center Production unit |
| **INTAROS** | Integrated Arctic Observation System |
| **INTECMAR** | Public Entity of Regional Government of Galicia |
| **IOC** | Intergovernmental Oceanographic Commission of UNESCO |
| **IODE** | International Oceanographic Data and Information Exchange |
| **IOOS** | Integrated Ocean Observing System |
| **IOPAN** | Institute of Oceanology, Polish Academy of Sciences - Poland |
| **IoT** | Internet of Things |
| **IOW** | Institut für Ostseeforschung Warnemünde |
| **IP** | Internet Protocol |
| **IPET-MOIS** | Inter-Programme Expert Team on Integrated Marine Meteorological and Oceanographic Services |
| **IPMA** | Portuguese Sea and Atmosphere Institute |
| **ISO** | International Organisation for Standardisation |
| **ISPRA** | Istituto Superiore per la Protezione e la Ricerca Ambientale - Italy |
| **IST** | Instituto Superior Técnico - Portugal |

| | |
|---|---|
| **IUAV** | Istituto Universitario di Architettura di Venezia |
| **IUEM** | University Institute European De La Mer |
| **IWG-ODIS-IPCB** | Intersessional Working Group to develop ODIS Implementation Plan and Cost Benefit analysis |
| **IzVRS** | Institute for Water of the Republic of Slovenia |
| **JCOMM OCG** | Joint Technical Commission for Oceanography and Marine Meteorology Observations Coordination Group |
| **JCOMMOPS** | Joint Technical Commission for Oceanography and Marine Meteorology in situ Observations Programme Support Centre |
| **JERICO-NEXT** | Joint European Research Infrastructure for Coastal Observatories |
| **JN** | JERICO-NEXT |
| **JRC ISPRA** | Joint Research Centre - Istituto Superiore per la Protezione e la Ricerca Ambientale |
| **KCI** | KCI is a multidisciplinary engineering firm providing full design, engineering and consultancy services to both Oil & Gas and Offshore Renewables Industries |
| **KO meeting** | Kick Off meeting |
| **L2W** | product for water properties |
| **LaMMA** | Laboratorio di monitoraggio e modellistica ambientale |
| **LEGOS** | Laboratoire d'études en Géophysique et Océanographie Spatiales |
| **LIDO** | Listening to the Deep-Ocean environment. |
| **LLC** | Limited liability company |
| **LNEC** | Laboratório Nacional de Engenharia Civil |
| **LVGMC** | Latvian Environment, Geology and Meteorology Centre |
| **M2C** | Morphodynamique Continentale et Côtière |
| **M2M** | Machine to machine |
| **MARETEC** | Marine Environment and Technology Center - Portugal |
| **MARIS** | Marine Information Service |
| **MARTECH** | MARine TECHnology |
| **MATROOS HFR** | MATROOS Forecast database High Frequency Radar |
| **MED** | Mediterranean |
| **MEDCIS** | Mediterranean Central information System |
| **MEOP** | Marine Mammals Exploring the Oceans Pole to Pole |
| **MERCATOR** | Mercator is the French Operational Oceanography Centre. |
| **Mercator Ocean** | Mercator Océan - France |
| **MESA** | Multirole Electronically Scanned Array radar |
| **MFC** | Monitoring and Forecasting Centres |
| **MI** | Marine Institute - Ireland |
| **MIO** | Mediterranean Institute of Oceanography - France |
| **MIO** | Mediterranean Institute of Oceanography |
| **MNCN** | National Museum of Natural Sciences |
| **MO** | Mercator Ocean |

| | |
|---|---|
| **MONGOOS** | Mediterranean Operational Network for the Global Ocean Observing System |
| **MoU** | Memorandum of Understanding |
| **MSFD** | Marine Strategy Framework Directive |
| **MTS/IEEE** | Marine Technology Society/ Institute of Electrical and Electronic Engineers |
| **NCAOR** | National Centre for Polar and Ocean Research |
| **NERC BODC** | Natural Environment Research Council British Oceanographic Data Centre |
| **NERSC** | Nansen Environmental and Remote Sensing Center - Norway |
| **NetCDF** | network Common Data Form |
| **NIB** | National Institute of Biology Marine Biology Station - Slovenia |
| **NKUA** | National and Kapodistrian University of Athens |
| **NL** | Netherland |
| **NOAA** | National Oceanographic and Atmospheric Administration |
| **NOC** | National Oceanography Center |
| **NODC** | National Oceanographic Data Centre |
| **NOOA** | National Oceanographic and Atmospheric Administration |
| **NOOS** | North West Shelf Operational Oceanographic System |
| **NRT** | Near Real Time |
| **O&M** | Observations and Measurement |
| **OAI-PMH** | Open Archives Initiative Protocol for Metadata Harvesting |
| **OBSEA** | Expandable Seafloor Observatory |
| **OC4** | Ocean Color 4 |
| **ODIP** | Ocean Data Interoperability Project |
| **ODIS** | Ocean Data and Information System |
| **ODV4** | Ocean Data View version 4 |
| **OGC** | Open Geospatial Consortium |
| **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 |
| **OSPAR** | Convention for the Protection of the Marine Environment of the North-East Atlantic |
| **OUC** | Ocean University of China |
| **P09** | MedAtlas Parameter Usage Vocabulary |
| **PANGAEA** | Data Publisher for Earth & Environmental Science |
| **PdE** | Puertos del Estado - Spain |
| **PICO** | Pacific Institute for Community Organization |
| **PIM** | Ligurian Integrated monitoring Project |
| **PLASMAR** | Sustainable Maritime Spatial Planning in Macaronesia |
| **PLOCAN** | Oceanic Platform of the Canary Islands |

| | |
|---|---|
| **PoliTO** | Politecnico di Torino |
| **PSAL** | Salinty |
| **PSMSL** | Permanent Service on Mean Sea Level |
| **PSMSL** | Permanent Service on Mean Sea Level |
| **QA** | Quality Assurance |
| **QA –QC** | Quality Assurance/Quality Control |
| **QC** | Quality Control |
| **QC/QF** | Quality Check/Quality Flag |
| **QF** | Quality Flag |
| **QUITEMED** | Joint programme on noise for the implementation of the Second Cycle of the MSFD in the MEDITERRANEAN SEA |
| **RBINS** | Royal Belgian Institute of Natural Sciences |
| **RemTech** | Remediation Technologies |
| **REST** | Representational State Transfer |
| **RIHMI-WDC** | All-Russia Research Institute of Hydrometeorological Information - World Data Centre - Russian Federation |
| **RINA** | Registro navale italiano |
| **RITMARE** | Ricerca Italiana per il Mare |
| **RIVM** | Dutch National Institute for Public Health and the |
| **ROOS** | Regional organisation of EuroGOOS |
| **ROW** | Radio Oceanography Workshop |
| **RPS Group** | RPS is an international consultancy providing world-class local solutions in energy, mining, infrastructure, urban growth and natural resource management. - US |
| **RSC** | Royal Society of Chemistry |
| **RSHU** | Russian State Hydrometeorological University - Russian Federation |
| **RT** | Real Time |
| **RWS** | Rijkswaterstaat Waterdienst |
| **SACE** | Swiss Antartic Circumpolar Expedition |
| **SC** | Steering Committee |
| **SCRIPPS** | Scripps Institution of Oceanography |
| **SDC** | SeaDataCloud |
| **SDN** | SeaDataNet |
| **SE** | Service Evolution |
| **SEAICE_GLO_SEAICE_L4_NRT_OBSERVATIONS** | Sea Ice Global Near Real Time Observations |
| **SensorML** | Sensor Model Language |
| **SHOM** | Service Hydrographique et Oceanographique de la Marine – France |
| **SIMAC** | Svendborg International Maritime Academy |
| **SIVP** | System Integration and Verification Plan |
| **SIW-METNO** | Sea Ice and Wind |
| **SMHI** | Swedish Meteorological and Hydrological Institute |

| | |
|---|---|
| **SOAP** | Simple Object Access Protocol |
| **SOCIB** | Balearic Islands Coastal Observing and Forecasting System - Spain |
| **SOI** | State Oceanographic Institute - Russian Federation |
| **SONEL** | Système d'Observation du Niveau des Eaux Littorales |
| **SOOS** | South Ocean Observing System |
| **SOOS DMCG** | South Ocean Observing system Data Management Coordination Group |
| **SOS** | Sensor Observation Service |
| **SOS SWE** | Sensor Observation Service - Sensor Web Enablement |
| **SPL** | Sound Pressure Level |
| **SPSU** | St Petersburg University – Russian Federation |
| **SRD** | System Requirements Document |
| **SUM** | Summit |
| **SWE** | Sensor Web Enablement |
| **T&S** | Temperature and Salinity |
| **TAC** | Temathic assembly centre |
| **TEMP** | Temperature |
| **TG** | Technical Group |
| **TG NOISE** | Technical Group on Underwater Noise |
| **THREDDS** | Thematic Real-time Environmental Distributed |
| **TMSI** | Tropical Marine Science Institute - Singapore |
| **TSM** | Total Suspended Matter |
| **TT** | Task Team |
| **TT EISC** | Task Team |
| **TTG** | Technical Task Group |
| **TU Braunschweig** | Technische Universität Braunschweig |
| **TU Delft** | Delft University of Technology |
| **TUT** | Tallin University of Technology |
| **TUT MSI** | Tallin University of Technology – Marine Systems Institute |
| **TWG** | Technical working group |
| **UACE** | Underwater Acoustic Conference Europe |
| **UASLP** | Universidad Autónoma de San Luis Potosí |
| **UC** | University of Cantabria – Spain |
| **UCA** | University of Cadiz - Spain |
| **UCL** | University College London – UK |
| **UCLA** | University of California, Los Angeles |
| **UE** | Unione Europea |
| **UGR** | University of Granada – Spain |
| **UK** | United Kingdom |
| **UL FGG** | University of Ljubljana Faculty of Civil and Geodetic Engineering - Slovenia |
| **ULiège** | University of Liège |

| | |
|---|---|
| **UOA** | University of Athens |
| **uPa** | microPascal |
| **UPC** | Universitat Politècnica de Catalunya. |
| **UPMC** | University Pierre and Marie Curie |
| **ur-EMODnet** | EMODnet prototype |
| **URL** | Uniform Resource Locator |
| **US** | United States |
| **USTHB** | Université des Sciences et de la Technologie HOUARI BOUMEDIENE |
| **UWN** | Under Water noise |
| **vADE** | Advanced Radar System by SMHI |
| **VLIZ** | Vlaams Instituut voor de Zee |
| **WCS** | Web Coverage Service |
| **WERA HFR** | WEllen RAdar - High Frequency Radar |
| **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 |
| **WOD** | Worlds of Discovery |
| **WP** | Work Package |
| **WS** | Workshop |
| **WSP** | WSP is one of the world's leading engineering professional services firms – UK |
| **WxS** | Web X Service |
| **XBT** | Expendable Bathythermograph |
| **XG** | Xunta Galicia |

Table 27. Acronym table