EMODnet

European Marine Observation and Data Network

EMODnet Thematic Lot n° 4 – CHEMISTRY

EASME/EMFF/2016/1.3.1.2 – Lot 4/SIS2.749773

Start date of the project: 06/03/2017 - (24 months)

EMODnet Phase III – Interim Report

Reporting Period: 06/03/2017 – 05/03/2018

The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) No 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund.

Contents

Disclaimer

Executive summary

This report gives the progress in the first year of the EMODnet Chemistry Phase III contract, which runs for two years from 6 March 2017. It is a follow-up of the earlier developments in Phase I and Phase II of EMODnet Chemistry projects, which took place since June 2009, and that resulted in the portal: http://www.emodnet-chemistry.eu.

Phase III aims at a continuation of services, assembling, processing and making accessible more measurements and deriving products of chemical substances for eutrophication and contaminants, and extending the scope by including gathering, processing, and publishing of marine litter data. Major challenges are to make the resulting products fit for purpose of Marine Strategy Framework Directive (MSFD) implementation, in particular for contributing to assessment of Good Environmental Status (GES) according to Descriptors 5 – Eutrophication, 8 – Contaminants, 9 – Contaminants in seafood and 10 – Marine Litter, increasing confidence, and achieving acceptance in the EMODnet Chemistry products and services by MSFD stakeholders.

EMODnet Chemistry dedicates the first year of activities to:

- Consolidate the collection and management of data for Eutrophication and Ocean Acidification, by updating the regional standardised harmonized validated data collections now covering six regional seas;
- Refine or revise the existing offering of DIVA products for Eutrophication and Ocean Acidification to better match RSCs needs and tune activities in support of MSFD implementation;
- Start dialogue with OSPAR and MCS, ICES, UNEP/MAP, BSC, MEDITS, DeFishGear to agree on a shared approach for the development of the European Marine Litter database;
- Strengthen the interaction and active collaboration with MSFD TG on Marine Litter, ML Baselines project and JRC while developing guidelines and forms for gathering marine litter data and micro-litter. The aim is to develop from existing expertise and get acceptance of EMODnet achievements;
- Start marine litter data collection, metadata compilation with the development of the first marine litter maps at European scale;
- Discuss the new dedicated maps for contaminants;
- Customise EMODnet Chemistry portal, its viewing and downloading services, its data and metadata formats and tools to users' needs. This includes extensions in the CDI interface to allow additional search criteria, extensions in the metadata format and SDN vocabularies to handle information on data quality, on Limit of Detection and Quantification, on marine litter, analysis of requirements for INSPIRE compliance.

The gathering of data for Contaminants actively started after the first annual meeting and is planned to continue throughout the second year.

All EMODnet Chemistry deadlines were respected.

During the first year, EMODnet Chemistry reached a number of important milestones marking a significant change for EMODnet Chemistry visibility and consideration:

- EEA decided to cancel the WISE-SoE 2017 data call and to follow-up on the use of EMODnet Chemistry data for three EEA indicators (i.e. 'Hazardous substances in marine organisms', 'Nutrients in TCM waters' and 'Chlorophyll in TCM waters'). EIONET National Focal Points have been encouraged to make contact with their EMODnet chemistry national partner(s) to make available their MSFD monitoring

data. This opportunity will demonstrate the robustness of EMODnet to support the long term availability of data and the completeness of EMODnet to provide qualified and updated information by complementing OSPAR and HELCOM data reported to and available at ICES. Additional up-to-date information are expected to complement data provided by EMODnet Chemistry partnership as a result of the positive synergy. This step will contribute in streamlining data flow at EU level;

- MSFD TG ML endorsed EMODnet Chemistry proposal for gathering and managing data sets on marine micro-litter on a European scale, based on adopting and adapting SeaDataNet standards (CDI metadata format and ODV data format) and tools (NEMO, MIKAD). As part of this process, EMODnet Chemistry formats for gathering beach litter and sea floor litter data (based on existing OSPAR, ICES, TG ML, UNEP/MAP, MEDITS standards) but extended to handle marine litter data gathered for ML Baselines are considered;
- EMODnet Chemistry started a close cooperation with Copernicus for contributing with oxygen, chlorophyll-a, and nutrients aggregated, validated and harmonized data collection products to CMEMS INSTAC. A Memorandum of Understanding concerning cooperation on in-situ biogeochemical marine data between Copernicus Marine Environment Monitoring Service (CMEMS) and EMODnet Chemistry is drafted. As part of this synergy, CMEMS INSTAC will promote and encourage potentially additional data providers from Europe to include their datasets in EMODnet Chemistry;
- Preliminary partial maps for seafloor litter and for beach litter at European scale were released after the first year as a synergic effort and active interaction with OSPAR, HELCOM, EEA, DeFishGear, MEDITS, facilitated by MSFD Technical Group on Marine Litter and JRC.

1 Introduction

EMODnet Chemistry Phase III has started in March 2017, with the overall objective of providing access to marine chemistry data sets and derived data products concerning **eutrophication**, **ocean acidification** and **contaminants**. The chemicals chosen reflect importance to the Marine Strategy Framework Directive (MSFD) . Compared to previous phases of EMODnet Chemistry the scope has been extended to **marine litter** collected on beaches, in fishermen's nets, or in specific surveys whereby it is stipulated that digital layers of plastic or litter must be available after the first year.

The geographic coverage is also broadened, including now six major European sea regions: Norwegian Sea and Barents Sea, Baltic Sea, N.E. Atlantic (Celtic Seas, Iberian coast and Bay of Biscay and Macaronesia), Greater North Sea, Mediterranean Sea and Black Sea, thereby adopting the geographical definitions of MSFD.

EMODnet Chemistry consortium brings together **45 participants from 27 countries** (20 EU member states) along European seas, mostly national marine monitoring agencies and major marine research institutes. The partners combine long standing expertise and experiences of collecting, processing, quality controlling and managing of marine chemistry data and data products together with expertise in distributed data infrastructure development and operation. In addition, the consortium **includes 3 international organisations**, ICES – International Council for the Exploration of the Sea, BSCS - Black Sea Commission Secretariat, and UNEP/MAP - United Nation Environment Programme / Coordinating Unit for the Mediterranean Action Plan, while OSPAR (Oslo Paris Commission) and HELCOM (Helsinki Commission) have provided a Letter of Support to be actively involved in the project.

The Chemistry portal and related activities build on products and services developed within the previous phases, aim for complete interoperability with services developed by the other thematic groups and with the INSPIRE Directive and are open to receive data provided through EMODnet ingestion facility.

In particular, the Chemistry lot has a request to consider the Marine Strategy Framework Directive in the identification of the measurements and of the digital map layers. For this reason, consistent efforts are dedicated to deepening the dialogue with MSFD technical working groups, with RSCs and with Member States.

In implementing this service, the following principles are respected:

(1) Data are freely available, searchable and downloadable free of charge and free of restrictions of use respecting the ownership data policy,

(2) Data and data products are accompanied by metadata covering ownership, assessment of accuracy and precision, indication of method used for their construction (for data products),

(3) Open Geospatial Consortium (OGC) based standards are used to share data products of common interest, in respect of INSPIRE rules,

(4) The base resolution of seabed products is three arc seconds.

(5) The web portal is operating since the start date of the contract. To begin with, it offered products and services developed by previous phases and has been progressively updated to offer products and services developed under this contract as they become available.

Specific tasks applicable to the Chemistry lot and faced during the first year:

Task 1: Implementation of a common method to access to data with the adoption of common and standard data and metadata formats, common vocabularies and common management tools. Data held by the national bodies are made available in a unified and standard way, without further processing.

Task 2: Development of products from one or more data sources that provide users with information about the distribution of parameters in time and space. These are made available free of charge and free of restrictions of use.

Task 3: Development of procedures for machine-to-machine connections to data and data products.

Task 4: Development of a new restyled and enriched web portal allowing users to find, visualise and download data and data products.

Task 5: Ensuring the involvement of regional sea conventions, with the creation of the MSFD Board of Experts.

Task 6: Facilitating interoperability with data distributed by non-EU organisations, with standards and protocols used by Australian, Canadian and United States colleagues.

Task 7: Installing a process to monitor performance and deal with user feedback, following definitions and instructions provided by the EMODnet secretariat and TRUST-IT.

Task 8: Operating a help desk offering telephone queries, e-mail contacts and an on-line chat service by means of a live operator available from 9:00 to 17:00 (Brussels time) from Monday to Friday to support EMODnet Chemistry users.

This report gives the progress in the 1st year of the EMODnet Chemistry Phase III contract which runs for 2 years from 6 March 2017.

2 Highlights in this reporting period

The highlights for the period March 2017 – March 2018 are listed below:

- Set-up of the EMODnet Chemistry Board of MSFD experts, with representatives identified by Regional Sea Conventions (RSCs), by JRC and by the marine research community. The first online workshop of the Board of MSFD experts took place in November 2017 and was focused on D5 (Eutrophication) while the second one was organized in March 2018 focused on D8 and D9 (Contaminants).
- EMODnet Chemistry contributed to the Black Sea State of Environment report of the Black Sea Commission by providing data on Nutrients and Contaminants. EMODnet Chemistry also contributed to the Mediterranean Quality Status Report 2017 (QSR2017) of UNEP-MAP (Barcelona Convention) for the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast. This concerned the development of the Use Case on EO5 (CI 13 and 14) with EMODnet Chemistry providing nutrient and chlorophyll-a data to derive products.
- EMODnet Chemistry has specified and set-up two central EMODnet internet databases, one for **beach litter**, modelled after the OSPAR-MCS approach and taking into account TG-ML and UNEP/MAP requirements, and one for **seafloor litter**, modelled after the ICES-DATRAS approach and taking into account TG-ML and MEDITS requirements.
- EMODnet Chemistry established agreement with OSPAR about the set-up of a web service to harvest regularly the OSPAR-MCS beach litter data for inclusion in the central EMODnet database on beach litter. The web service is operational and the first harvest has taken place.
- EMODnet Chemistry established agreement with ICES about regular harvesting from DATRAS (the Database of Trawl Surveys), which includes also Baltic International Trawl Surveys (BITS) data, used for national fish trawl litter, for inclusion in the central EMODnet database on benthic litter. The first harvest has taken place.
- EMODnet Chemistry has established a close cooperation with the JRC project on establishing Marine Litter Baselines. JRC has collected ML data sets for a few years from Member States and these data sets are elaborated together and loaded into the central EMODnet database for beach litter. This contributes to having an initial European scale database for generating the initial ML maps as planned for end March 2018.
- EMODnet Chemistry contributed to the EEA thematic report on contaminants and eutrophication in Europe's seas. The aim was to collate available data (contaminants in water, sediments and biota plus bio-effects + total nitrogen, dissolved inorganic nitrogen (all types), total phosphorus, dissolved inorganic phosphate in the water column) and to identify 'problem areas' and 'non-problem areas' with regard to contaminants and to eutrophication in transitional, coastal and marine waters. A MoU was drafted and signed between EMODnet Chemistry and EEA to formalize terms and conditions to use the regional aggregated data products.
- A new design, layout, contents, and revised sitemap were drafted and implemented for the EMODnet Chemistry portal. In the new layout, primary focus is given to discovery and access of i) Data (CDI service) and ii) Data Products (DIVA Maps and aggregated validated and harmonized data collections) developed and maintained by EMODnet Chemistry with relevance for MSFD. The portal also communicates more clearly to users that it deals with marine chemistry concerning Eutrophication, Pollution, Ocean Acidification and Marine Litter.

- All data providers have updated and further populated the EMODnet Chemistry data infrastructure, based upon SeaDataNet standards and services, with new CDI and ODV entries, focusing on data concerning eutrophication (nutrients, chlorophyll and oxygen). In November 2017 the 1st Robot data harvesting for nutrients, chlorophyll and oxygen has taken place and this collection has been handed over to the Sea-basins coordinators for validation, harmonization and aggregation of the heterogeneous collection in order to generate EMODnet Chemistry data products. This work has made considerable progress and will deliver products according to planning end of April 2018.
- Intensive interaction with TG - DATA has resulted in contributions of EMODnet Chemistry to the recommendations for MS for accessing data and information according to MSFD Art. 19(3) which now includes that MS are allowed to make use of infrastructures such as EMODnet and SeaDataNet for publishing data underpinning their assessment reporting. Moreover EMODnet Chemistry has demonstrated to TG-DATA by a use case for D5C1 “Nutrients concentrations in water” that EMODnet metadata and data formats (SeaDataNet standards) can be mapped to INSPIRE following the INSPIRE data implementation rules.
- Guidelines for gathering micro-litter (= micro plastics) adopting and adapting the SeaDataNet CDI and ODV formats were drafted by EMODnet Chemistry and after review and endorsement by TG-ML and JPI-Oceans finalized and published at the EMODnet Chemistry portal. These guidelines now serve EMODnet Chemistry data providers in their gathering and CDI service population of micro plastics datasets which has a deadline for December 2018.

3 Summary of the work done

Following the project scheduling, the work done during the first year was mainly focused on the collection of data for D5 (deadline M10), on the development of the marine litter databases and related data formats, compulsory to start marine litter data collection, and on the discussion of new dedicated maps for contaminants to be developed during the second year. The progress in the period March 2017 – March 2018 is described below per task specified in Section 1.4.1 of the Tender Specifications; all tasks were covered during the reporting period.

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

The main data access method is the CDI Data Access Service, adopted and adapted from SeaData, regularly refined and updated to meet stakeholder's requirements (e.g. with possibility to search data by matrix of chemical groups and MSFD regions). In addition, a customised service (API) to access the regional aggregated and validated collections is planned to meet the requirements of EEA and RSCs.

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

EMODnet Chemistry delivered a preliminary set of partial maps for marine litter, showing litter densities distribution in time as well as monitored areas. In addition, harmonized, aggregated and validated regional data collections concerning Eutrophication are created, gathering data from EMODnet Chemistry network of NODCs, data centres and monitoring agencies. These data products are nearly ready. For Eutrophication, DIVA maps will be produced as further step, taking into consideration the regional seas needs expressed during the on-line workshop with the MSFD Board of Experts as well as the project tasks.

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

EMODnet Chemistry offers a number of web services to access and view metadata, data and data products which are detailed in Chapter 10, indicator 8. For giving EEA and Regional Sea Conventions and other MSFD stakeholders direct access to the validated, aggregated and harmonised regional data collections it is planned to develop an API.

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

To increase visibility and interest of users, EMODnet Chemistry web portal was completely re-designed to give direct and easier access to data and products, to updated news and events, with complete explanation of tools and functionalities. The restyled and upgraded portal is in operation since the end of November 2017.

Task 5: Ensure the involvement of regional sea conventions:

A specific Board of MSFD experts (including representatives of Regional Sea Conventions, of Member States and selected expertise) has been created and animated with a dedicated mailing list. The Board met in two remote conferences, dedicated to Eutrophication and Contaminants, and was organised to strengthen the interaction and to get feedback on products and services. In addition, EMODnet Chemistry was invited to the 33rd BSC Regular Meeting and to ICG EUT meeting. Active interaction is ongoing with OSPAR for beach litter data management.

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

The EMODnet Chemistry network of data centres includes several nodes from non-EU countries from Eastern Europe and North Africa and it builds upon the SeaDataNet pan-European infrastructure, which has been widely implemented since the nineties. In addition, it take advantage of the links and communication started within ODIP, the Ocean Data Interoperability Platform developed as a European

effort together with Australia, Canada, and USA. A reference to EMODnet data infrastructure is included in the Joint WMO-IOC Strategy for Data Management (2018-2021).

The formats as used by EMODnet Chemistry are in line and interoperable with international practices. This is assured by using the SeaDataNet standards for eutrophication and contaminants data which are proven to be interoperable with ICES and IODE standards and practices in USA, Canada, Australia and others as proven through the Ocean Data Interoperability Platform (ODIP) activities. For the Marine Litter formats close cooperation takes place with TG-ML, ICES and other stakeholders, and taking good care that the EMODnet Chemistry adopted formats and approaches are widely supported by ML experts.

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

The usage of the different services giving access to data and products is constantly monitored through a number indicators defined by EMODnet Secretariat and further recently tuned by TRUST-IT. Feedback from users are collected, analysed, answered rapidly if needed and continuously reported on three monthly basis (see Section 5). The Chemistry portal volunteered to test the installation of the central monitoring system (PIWIK), subsequently implemented operationally.

Task 8: Operate a help desk offering support to users:

The help-desk is available by online chat, email and telephone from 9:00 to 17:00 (Brussels time) from Monday to Friday. The online chat access icon is located at the right bottom of all pages and provides an immediate contact with a support agent. It is also possible to leave there a message while the service is offline. All contacts are recorded together with the reaction to them. The online chat is the system most widely used in the reporting period.

4 Challenges encountered during the reporting period

Overview of the main challenges encountered during the period March 2017 – March 2018 and the measures taken to address them.

Main challenge	Measures taken
The involvement of MSFD experts to the annual meeting was quite hard due to overlapping of several other commitments	We plan to continue the interaction by remote meetings, focused on specific themes
Evaluation of the fitness of EMODnet Chemistry products for the assessment of GES according to MSFD. In particular, we needed to review the choice of parameters, the spatial resolution and the temporal resolution	A short questionnaire was prepared and distributed to the Board of MSFD experts prior to the online meeting
Definition of dedicated maps for contaminants, including selection of substances to focus on.	Internal calls for short but focused meetings, ad-hoc remote meeting with the Board of MSFD experts
The development of marine litter databases and maps at European scale in one year	Seek for synergy with relevant regional marine litter data collection systems through RSCs engagement, arrange formal cooperation
Integration of litter categories lists from several relevant systems	Synergy with MSFD TG on Marine Litter, ML Baselines and JRC
Set up of appropriate tracking systems to gather relevant information needed for the reporting of the performance indicators	Request for timely and jointly definition of requirements

5 Allocation of project resources

In this section, information about the efforts spent during the reporting period on the achieving the main objectives and tasks of the project is provided, as an overview of resource usage (percentage of project resources) divided into the following categories:.

Categories	Resource usage (%)
Making data and metadata interoperable and available (Tasks 1 and 6)	15.2
Preparing data products (Task 2)	13.2
Preparing web-pages, viewing or search facilities (Tasks 3 and 4)	5.8
Managing user feedback (Tasks 7 and 8)	1.4
Project management	4.5
Outreach and communication activities (Task 5)	3.6
Others	6.2

6 Work package updates

This section lists the activities that occurred during the period March 2017 – March 2018, using the work package as a header.

WP1 – Project Management

As soon as the outcomes of the procurement procedure were received, the coordination activity started. The first actions concerned i) the collection of all administrative documents integrating the evidence already provided in the submission phase and, ii) the organisation of the 1st Technical Working Group meeting (TWG), followed by the kick-off meeting (1st Coordination Group meeting including also 1st Steering Committee meeting), foreseen respectively for month 1 and month 3.

As further step, the Consortium Agreement (CA) was circulated among the 27 partners and the Subcontract template was bilaterally exchanged with the 18 subcontractors. A couple of critical requests of amendments were shared with EASME to get advice on how to proceed. The final CA with all signatures is available on the Extranet since August 1st, 2017. Bilateral Subcontracts were finalised by 14 subcontractors and are available on Extranet as well. Further contacts are on-going with 4 subcontractors (the two Crimean MHI and IMBR, UNEP/MEDPOL and BSCS). A dedicated Agreement, setting the cooperation framework with BSCS, was finalised and is about to be signed by the interested parties.

A Memorandum of Understanding between EMODnet Chemistry and EEA, identifying terms and conditions for sharing data and results (as regional aggregated data products) to be used as part of EEA's state of the Seas reports, was signed and is available on line (under the section Documents).

Additional MoUs are under finalization and cover different subjects:

- The MoU with INFO-RAC to formalise the synergy between EMODnet Chemistry and INFO-RAC information platforms and improve marine data management in the Mediterranean region by adopting and adapting EMODnet Chemistry standards and tools (for data related to D5, D8, D9 and D10) and by encouraging data sharing from additional data centres. This will be beneficial for regional projects, MSFD implementation and UNEP/MAP; the MoU with UNEP/MAP will set the cooperation framework for the subcontract involvement within EMODnet Chemistry 3;
- The MoUs with OSPAR and ICES for marine litter data exchanges;
- The MoU with CMEMS, the Copernicus Marine Environment Monitoring Service (led by Mercator-Océan) to define the collaboration, including the joint development and deployment of delayed mode services to access datasets from both EMODNet Chemistry and CMEMS INSTAC, the In Situ Thematic Assembling Centre in charge of the in-situ data delivery for other components (MFCs Marine Forecasting centres) of CMEMS.

During the reporting period, the following meeting were organised as part of WP1 activities:

- The first Technical Working Group meeting led by MARIS, with OGS, IFREMER, ICES, AWI, ULg, ISPRA, NERC-BODC and Deltares, aimed to set the strategy for the marine litter data collection, the updating and optimization of viewing services, related data and metadata;
- The first Steering Committee meeting led by OGS, with MARIS, IFREMER, IMR, AU-DCE, SMHI, HCMR, NIMRD, ICES and ISPRA, aimed to agree on the 1st year work plan and deliverables;
- The first Coordination group meeting with a session dedicated to the Board of MSFD experts, aimed to share the work plan, with deadlines and deliverables with the whole group and to start the communication with the Board of MSFD experts. The need to get feedback on existing data

products to tune future development was strongly underlined and a new strategy opting for the organisation of short on-line events was establish;

- The 2nd Steering Committee meeting led by OGS, with MARIS, IFREMER, IMR, AU-DCE, SMHI, HCMR, NIMRD, ICES and ISPRA, aimed to monitoring intermediate progress and planning further activities;
- The second Technical Working Group meeting led by MARIS, with Deltares, AWI, ULg, OGS, IFREMER, ICES, ISPRA and NERC-BODC, aimed to discuss the status of technical development and the next steps.

Agendas, presentations and minutes of the above-mentioned meetings are made available on the Chemistry portal.

Regular meeting with the six Regional Leaders started with the release of the first Robot harvest and continued with monthly basis at least. These events are crucial to coordinate the development of regional datasets and data products and guarantee the adoption of shared protocols and tools.

Active collaboration with EMODnet Data Ingestion project is ensured with constant dialogue and the participation to planned meetings (Limassol, Cyprus, 10-12/4/2017) and EMODnet Steering Committee meetings (September 2017, March 2018).

Quarterly progress reports have been submitted by email and approved by EU EASME. These reports includes highlights in this reporting period, meetings held since last report, work package updates (including updates in project management, data collection and metadata population, generation of data products, technical development and operation, uptake, outreach and interaction), list of specific challenges or difficulties encountered during the reporting period, user Feedback, outreach and communication activities, updates on Progress Indicators. During the first year, the following indicators were periodically reported:

- Indicator 1 - Volume of data made available through the portal
- Indicator 2 - Organisations supplying each type of data based on (formal) sharing agreements and broken down into country and organisation type (e.g. government, industry, science)
- Indicator 3 - Organisations that have been approached to supply data with no result, including type of data sought and reason why it has not been supplied
- Indicator 4 - Volume of each type of data and of each data product downloaded from the portal
- Indicator 5 - Organisations that have downloaded each data type
- Indicator 6 - Using user statistics to determine the main pages utilised and to identify preferred user navigations routes
- Indicator 7 - List of what the downloaded data has been used for (divided into categories e.g. Government planning, pollution assessment and (commercial) environmental assessment, etc.)
- Indicator 8 - List of web-services made available and user organisations connected through these web-services

Tests for upgrading the present reporting and for the adoption of additional elements are reported as part of WP4 activities.

WP2 – Data collection and metadata population

At the project kick-off meeting, the aims, work plan and deadlines for WP2 were recalled to all consortium members. The focus of WP2 is on a continuation gathering data concerning **eutrophication (nutrients, chlorophyll and oxygen)** and selected **contaminants**, following the results of the previous EMODnet Chemistry Phase II. The scope has been expanded with **riverine input of nutrients**. Also a review of the data already included in the infrastructure has been requested to integrate current metadata with additional information on monitoring/research purpose (with EDMERP references) and on Quality Assurance and Quality Control (QA/QC) procedures.

Following the kick-off all data providers have undertaken activities for gathering and populating new and updating existing CDI and ODV entries into the SeaDataNet CDI service and review existing entries. The focus has primarily been on data concerning eutrophication (**nutrients, chlorophyll and oxygen**) because of the 1st deadline of **October 2017.**

An inventory on available riverine data on nutrient inputs has been prepared and is available at the portal (http://www.emodnet-chemistry.eu/products/riverdatainventory).

A lot of support has been given by MARIS for guiding the CDI catalogue population process, including regular updates and encouragements to data providers about the status of progress compared to expectations. This has resulted in a major increase of the total number of chemistry CDIs in the 1st year from **841356 to 942038** records. More details can be found in the key indicators in Chapter 10. The **1st round of data harvesting** for eutrophication was completed. It included nutrients, chlorophyll-a, oxygen, others ('ALKY', 'CORG', 'DOCC', 'PCO2', 'TCO2', 'COCC', 'HMSB'). Use has been made of the new MSFD regions, as received from EEA, to split the data harvest over the agreed sea regions. ; The coverage of the Arctic waters is derived from the ICES Ecoregions map. The regional coordinators have received their harvested data collections for eutrophication in November – December 2017 period. In total circa **608.000** CDIs and ODV files were delivered as **unrestricted** data and circa **92.000** as **restricted** data, for eutrophication. These data collections are provided by **58** data centres from **31** countries.

In order to approach problems faced during the previous phases of EMODnet Chemistry in managing **contaminants** data collected in sediment and biota matrixes, updated guidelines for dataset preparation and formatting have been defined, based on the well consolidated experience of the partnership and on the outcomes of other similar EU projects, and have been circulated to the whole EMODnet Chemistry partnership. These guidelines have been taken on board and data providers are now working on reviewing existing entries and populating new entries in the CDI service for **contaminants** which as a deadline by **May 2018**.

Marine litter is a new topic in EMODnet Chemistry and has a focus on:

- Beach litter (nets, bottles etc.)
- Seafloor Litter (i.e. litter collected by fish trawl surveys)
- Micro plastics

As part of WP4, two central EMODnet internet databases were specified and set-up, one for **beach litter**, modelled after the OSPAR-MCS approach and taking into account TG-ML and UNEP/MAP requirements, and one for **seafloor litter**, modelled after the ICES-DATRAS approach and taking into account TG-ML and MEDITS requirements. The database for beach litter has been populated by harvesting from the OSPAR – MCS database, while an intense cooperation is ongoing with JRC as part of their EU project on Marine Litter baselines to process together MS data contributions for a few years in order to make these ready for inclusion in the EMODnet beach litter database and ready for deriving baselines by JRC. This work has made considerable progress and loading of the additional MS data is well underway and together with the

OSPAR-MCS data will provide an excellent basis for the first European wide beach litter map. As a follow-up EMODnet Chemistry is planning a structured updating of the beach litter database using harvests from OSPAR-MCS and submissions from additional MS and EMODnet Chemistry consortium members.

The database for seafloor litter has been populated by harvesting from the ICES-DATRAS (the Database of Trawl Surveys), which includes also Baltic International Trawl Surveys (BITS) data, used for national fish trawl litter. Further communication is ongoing with the Mediterranean community, in particular MEDITS (DCF related surveys) and DeFishGear (EU project), for arranging their input for the EMODnet seafloor database, also on a regular interval. EMODnet Chemistry is supported by TG-ML and JRC in this.

In order to arrange contributions for both EMODnet ML databases from relevant EMODnet Chemistry consortium members and others, IFREMER and OGS have defined Guidelines and Forms for gathering beach litter (nets, bottles etc) and seafloor litter (i.e. litter collected by fish trawl surveys). These guidelines are published at the EMODnet Chemistry portal.

For micro plastics it was decided to adopt and adapt the SeaDataNet CDI and ODV standards. A guideline for this was drafted by OGS and reviewed by TG-ML, JRC, and the JPI-Oceans BASEMAN project. This has resulted in a finalised guideline for describing marine **micro-litter** data sets using CDI and ODV files which has been published at the EMODnet Chemistry portal. Following this, EMODnet Consortium data providers are now underway with gathering and populating their first entries for micro plastics which requires careful guidance of the first submissions in order to ensure a consistent approach.

As part of the ML approach also new vocabularies for ML have been defined and these have been added by BODC to the overall SeaDataNet vocabularies.

A **cooperative working relationship with JRC** has been established in order to harmonise and compile beach litter datasets collected in the context of the litter baselines work (19 different data formats, 3 different litter codes). The proposal to provide all available data for future accessibility through EMODnet was sent to MS through TG ML. End of March was the deadline for MS to flag if there are any datasets that could for some reason not be included.

In this context weekly call meetings have been undertaken since the collaboration was set up (26-01-2018). Last March, 27th , the first face to face technical meeting was held to plan the future relevant steps for the setting up of the first pan-European database of Beach Marine Litter.

WP2 contributes to the following tasks:

- Task 1: Implementation of a common method to access to data with the adoption of common and standard data and metadata formats, common vocabularies and common management tools. Data held by the national bodies are made available in a unified and standard way, without further processing.
- Task 6: Facilitating interoperability with data distributed by non-EU organisations, with standards and protocols used by Australian, Canadian and United States colleagues.

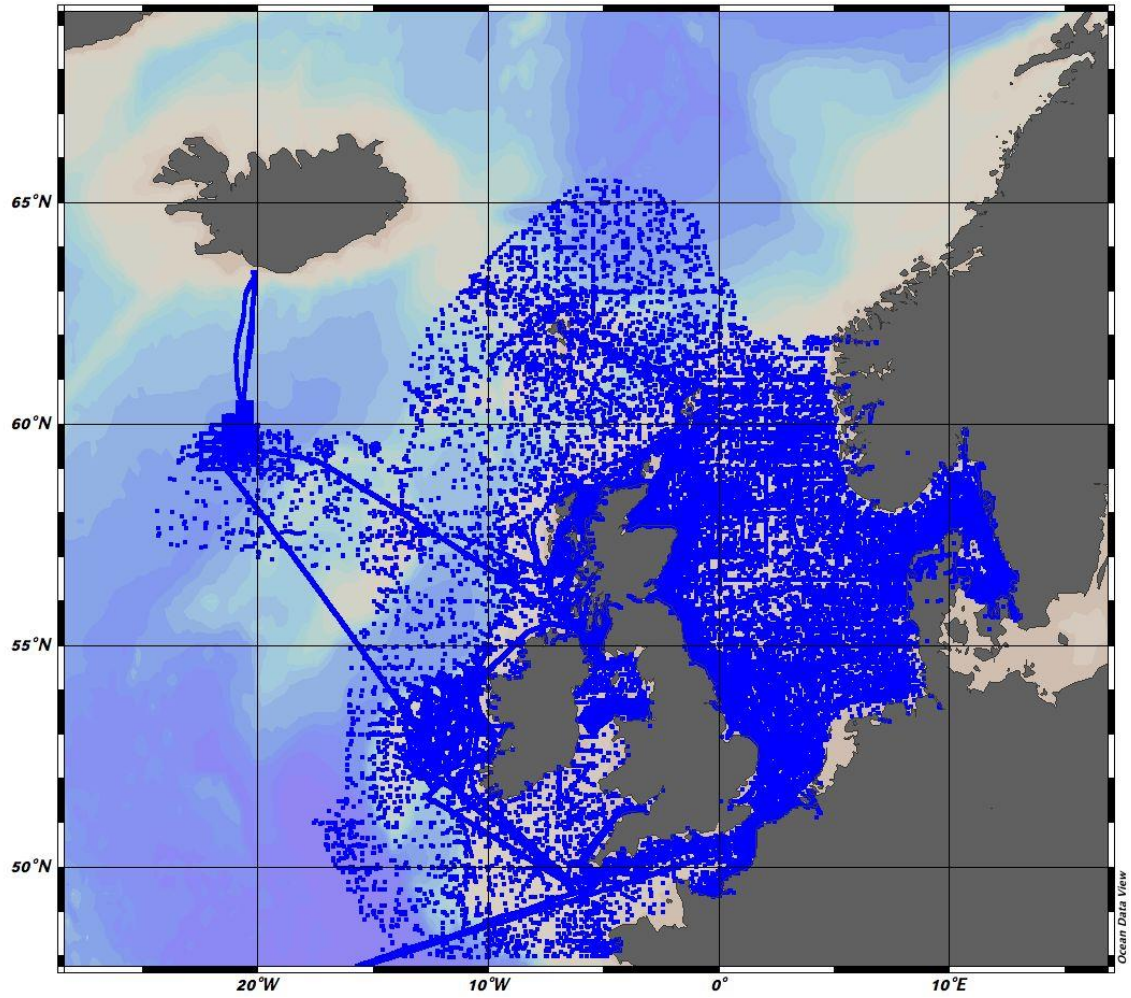
Both tasks have progressed well as described in the WP2 report above.

WP3 – Generation of data products

Generating harmonised, aggregated and validated data collections and DIVA maps of eutrophication

North Sea

Introduction and inventory



Stations in the North Sea region

The North Sea region was changed compared to the EMODnet II project, as data to the North was re-assigned to the new EMODnet III region "Norwegian and Barents Sea", and in the Sound and Great Belt, some of the samples was transferred to the Baltic Sea Region, to comply with other definitions of the two regions within the EU water framework directive. As the North Sea convention (OSPAR) and Baltic Sea convention (HELCOM) has an overlap in the Kattegat region, it is not possible to directly use these convention boundaries in EMODnet.

Data was extracted, and later amended due to problems discovered with some data providers data, so the final extract was received 22nd October 2017. Data from restricted datasets was gathered into one ODV file in October, but due to very large amounts of data, several attempts and problems with very slow

access to network drives made it difficult to gather all unrestricted dataset, as it took up to a week (and ended in an unrecoverable error) to let ODV import a subset of the unrestricted files. The Baltic regional leader found the same problem using network drives, so in the end all data was stored locally (on the C: drive) which reduced the import of files to 1-2 days, but due to data files in the 2 Gb range, still only possible to read them in over two sessions, and then merge the datasets. Some new P01 terms for nutrients and acidification was found during aggregation of the total merged dataset, and P35 was updated accordingly and aggregation re-done with the new P35 aggregation. The final dataset with all data aggregated was ready by the beginning of January, and consisted of 4.798.137 ODV data points, many from ferry-box data with high temporal resolution.

Data availability for the individual parameters in the North Sea (: pH <7; oxygen saturation <50%)*

Parameter	Checking	Total no. of Profiles	<0 (pH 7) (#values)	=0 (pH 7) (#values)	>0 (pH 7) (#values)
Water body dissolved oxygen concentration [umol/l]	Range	160699	2137	13344	2661557
Water body dissolved oxygen saturation [%]	Range	5030	54*	0	66193
Water body nitrate [umol/l]	Range+DIN<TN	58453	45	33993	308151
Water body nitrate plus nitrite [umol/l]	Range+DIN<TN	391559	128	23536	410060
Water body nitrite [umol/l]	Range+DIN<TN	390247	68	30233	661293
Water body ammonium [umol/l]	Range+DIN<TN	95776	72	230898	230826
Water body total nitrogen [umol/l]	Range+DIN<TN	46928	0	4	183543
Water body phosphate [umol/l]	Range+OP<TP	456830	8	11644	845002
Water body total phosphorus [umol/l]	Range+OP<TP	52662	0	4	266958
Water body chlorophyll-a [mg/m^3]	Range	28735	128037	171	127866
Water body silicate [umol/l]	Range	342735	161	5050	641430
Water body pH [pH units]	Range	3509	30*	2	20003
Water body total alkalinity [mEquiv/l]	Range	1744	0	0	16341

QC of the dataset

Some problems with 3 stations from MUMM, which was had dates in the depth fields was investigated and set to 3 m after consulting with MUMM. No errors were found in the underlying CDIs, so perhaps the error was introduced due to corruption of the data file on the hard drive or going through the process of merging and aggregating data.

One station “898” from 1990 by NRD was at depth -99 (typically used for unknown in old reports), in this case, it seems that the values represents the bottom sample (bottom depth reported as 375 m).

No duplicate stations were found, the main focus was checking orthophosphate (OP) vs. Total Phosphor (TP) and DIN (dissolved inorganic nitrogen sum of nitrite/nitrate and ammonium) vs Total Nitrogen (TN). The DIN was calculated from the sum of ammonium and nitrate+nitrite if available, otherwise sum of ammonium, nitrate and nitrite. In many cases, only nitrate+nitrite, nitrate or ammonia was available. In these cases, the concentrations was still compared to TN, but the resulting DIN can be an underestimation of the “real” DIN.

Range checking was performed for checking of values below (not including 0). For some (Silicate), most samples below 0 were marked with QF 3 or 6 before intervention. For others, the QF was set to <DL (6).

High values for nutrients (except silicate) were typically found in fjords or very coastal samples. None of the samples above was excluded by default, as they were plausible. For silicate, high values were observed in deep waters in the North Atlantic, with profiles where concentrations became higher with depth. Table one summarizes values less than 0 (<7 for pH) equal to 0 (7 for pH) and values above 0 (7 for pH). All values less than or equal to 0 have been appointed Quality Flag "less than detection limit". For EDMO code 729, values have previously been recorded as the measured value, even if negative. Several other EDMO codes are reported with 0 with the quality flag 1, and as detection limits are not know, changing the QF to "below detection limit" still leaves the original value, not to the expected value of the detection limit.

The checking of DIN vs TN revealed 13 profiles where the DIN was more than 10% higher than TN, from two EDMO codes. The samples spanned 1990 to 2015, and in five cases, the problem was that TN < ammonium, in two cases TN< nitrate, as the sole representatives of DIN. In one case, TN was clearly 10 times to low, when inspecting the profile. In the rest of the cases, at least two of nitrite, nitrate and ammonium was available in the DIN calculation. In many cases, ammonium is not expected in open waters, so this parameter is not measured unless in coastal areas. Most measurements of nitrate is performed with a method, that measures the sum of nitrite and nitrate by reduction of nitrate to nitrite and measurement of the sum by a color reaction with nitrite, also evident from the relative few places where nitrate is measured separately. Nitrite is normally, but not always, measured in a separate analysis without the reduction. The number of changes was very small compared to the total number of available TN/DIN ratios, in all cases (except the multiplication by 10) the TN value was set to quality code 3 (probably bad value), to exclude it from the DIVA calculations. An alternative way could have been to set it at the DIN level, as a minimum level

Checking of OP vs TP found more problems with more than 20% higher content of OP than TP. Four EDMO codes was represented, representing 66 profiles in all, out of 52668 profiles with TP. In all but one case, TP was set to QF 3, but in the last case, the profile indicated that OP was the probable problem, so OP was set to QF=3. In most cases, the TP<OP originated in bottom water samples, indicating that high salinity could cause problems for the determination of TP (probably due to free chlorine build up during the oxidation process). The 66 profiles were representing 50 stations in all, with some stations represented up to five times over several cruises and years, from 1976 to 2015, with an overrepresentation of results from 2003. In most cases, profiles were checked, and either problems was one or two measurements around the halocline, or from a certain depth (halocline) to the bottom. In some cases, the bottom sample was lower for TP but not OP. It seems that there might be a problem with EDMO code 729 data from 2013 – 15, which might have been reported in µg/l instead of µmol/l (see also Baltic Seas), this is currently under investigation, and will be solved by new CDI's with the correct unit. It will be corrected before DIVA calculation of EMODnet chemistry products.

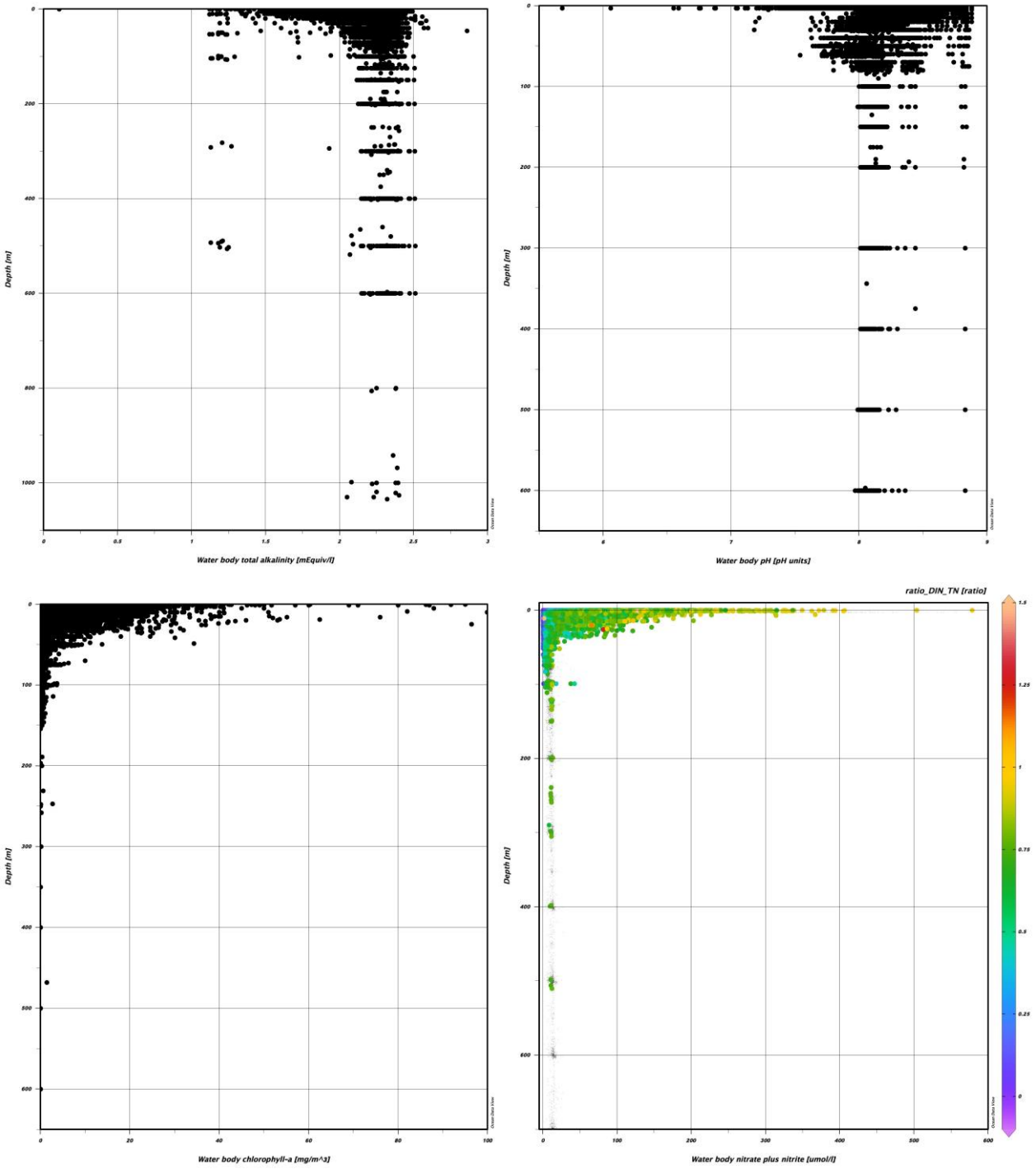
Silicate was only checked by range.

Total alkalinity was within 0.1 – 2.8 mEquiv/l, the lowest value was found in almost freshwater (salinity ~ 1 psu), No samples were changed. The resulting scatterplot are shown below.

The measurement of pH is ranging from 5.68 -9.1 (average 8.16). One outlier was found, where the profile was linear around pH 8.1 except one result at 75 m measured as 6.1. The result QF was changed to 3. Other than this, 30 results below pH 7 was found but not changed. The maximum depth for pH measurements was 600 m, probably due to a restriction in the pressure operating limit for pH electrodes on a CTD. The resulting scatterplot are shown below.

Chlorophyll-a was recorded by both fluorimeters and measurements. In many cases, the results were marked with quality flag 6 (below detection limit) even though the profiles seemed good. If this is due to lack of calibration of the instrument before or after deployment was not possible to assess, so nothing was changed. The upper range of 100 mg/m^3 was mainly inshore samples and sometimes bottom

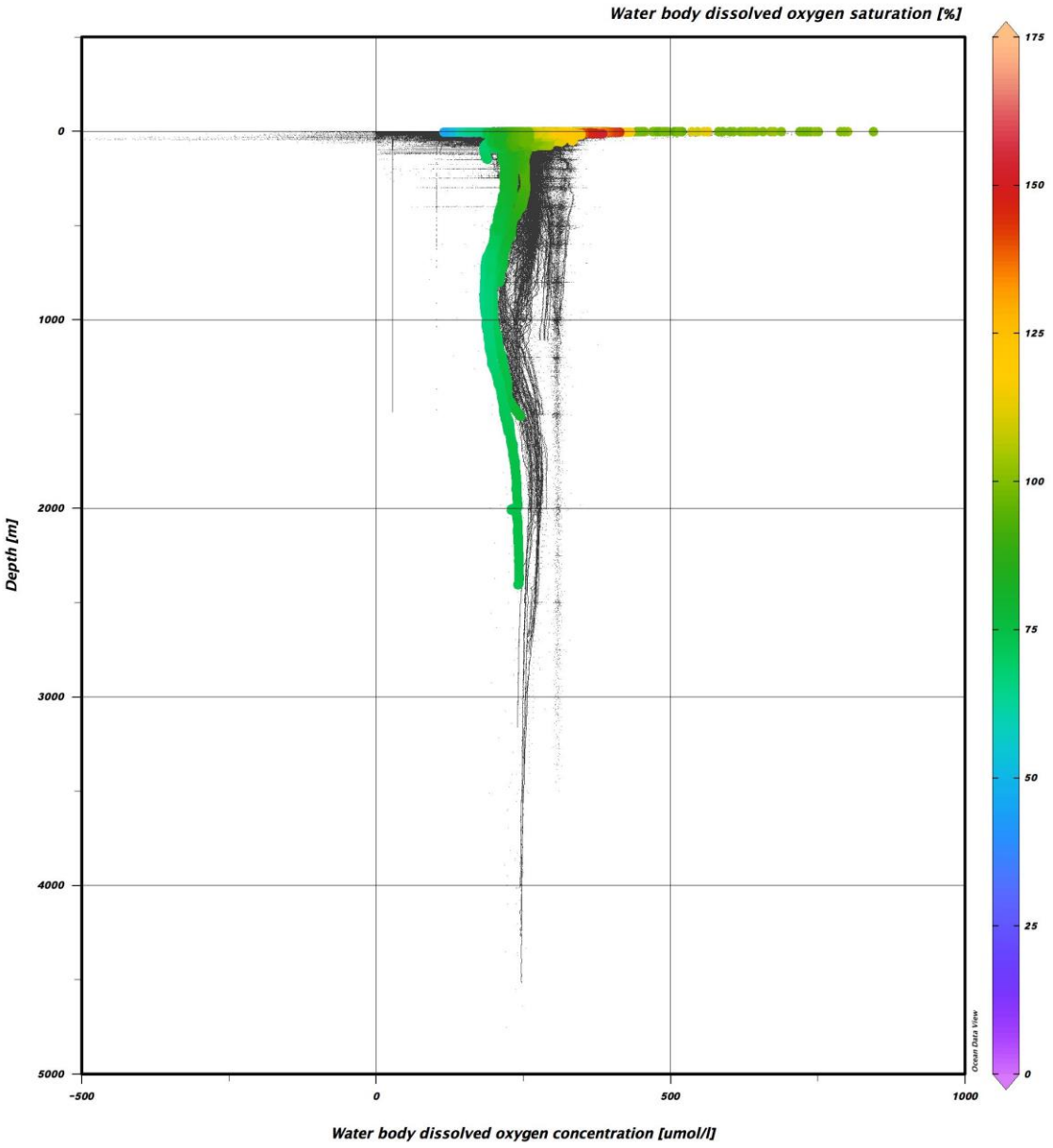
samples, which could be influenced by other particles or dead algae re-suspended from the sediment. When profiles were available, in most cases they looked reasonable, but could also be lack of calibration.



Examples of scatterplots for parameters in the North Sea: Total alkalinity, pH, chlorophyll-a and the distribution of nitrate+nitrite colour coded for the DIN to TN ratio (yellow marks the limit where DIN > TN and quality flag have been set to 3 for TN)

Oxygen was reported both as umol/l, where EDMO code 545 (SMHI) used negative value to indicate the presence of hydrogensulfide. The negative value is the amount of oxygen needed to oxydise all hydrogensulfide, i.e. the oxygen deficit before oxygen levels can rice above 0. In the dataset for oxygen

saturation, 54 results were in the range 6-8 % for EDMO code 1578, indicating that these values most likely are wrong units, as this would be normal levels for ml/l O_2 levels.



North Sea oxygen measurements as umol/l and % saturation (colour coded). Notice SMHI data below 0 umol/l indicating hydrogensulfide concentration in the water column

Conclusion

For most of the results, only a very small fraction (permille or less) was corrected in the data point (1-2 results) or quality flag (<100 changed to QF 3, probably bad value), except for results below detection limits (reported as 0 or lower), where up to 50% of the nutrient results was changed to QF 6 (below detection). Unfortunately, due to lack of knowledge of the detection limit used, it was impossible to set the value to the detection limit at the same time, so values was kept as 0 or negative values, which has to be taken into account during the making of DIVA products.

Baltic Sea

Introduction and inventory

The Baltic Sea dataset was received by the regional coordinator in late November 2017. Initial work was focused on making modifications to a number of files due to incorrect format. This is a general problem known from previous phases of the EMODnet Chemistry project and although improvements have been made this is one of the more frequent issues in the feedback to data suppliers. The issue is a clear sign that all data suppliers do not check their files in a correct way (by using the correct import option in ODV) before delivery. The crucial known format errors are listed below.

- Mismatch between header and semantic header
- Missing parameters in header
- Missing tabs in line (the whole line is discarded during import)

In addition there are non-crucial errors (data could be used but files should be updated) such as incorrect primary variable, duplicated LOCAL_CDI_ID etc.

Obvious format errors that could be handled were fixed and the result was a main data collection including 187.599 depth profiles. Table below shows the number of each parameter after aggregation.

Total number of aggregated profiles in the original dataset and the number of profiles that so far has been flagged as "probably bad" or "bad".

Parameter	No of profiles	No of profiles flagged
Depth [m] (total number of profiles)	187 598	1 031
Water body dissolved oxygen concentration [umol/l]	154 987	10
Water body nitrate [umol/l]	33 235	0
Water body nitrate plus nitrite [umol/l]	55 845	33
Water body nitrite [umol/l]	32 541	15
Water body ammonium [umol/l]	71 969	24
Water body total nitrogen [umol/l]	82 377	31
Water body phosphate [umol/l]	91 908	29
Water body total phosphorus [umol/l]	72 137	29
Water body chlorophyll-a [mg/m^3]	70 550	4
Water body silicate [umol/l]	71 172	28
Water body pH [pH units]	20 898	-
Water body total alkalinity [mEquiv/l]	6 901	-

In addition, there is a dataset with restricted data containing a total of 5183 profiles.

Quality control

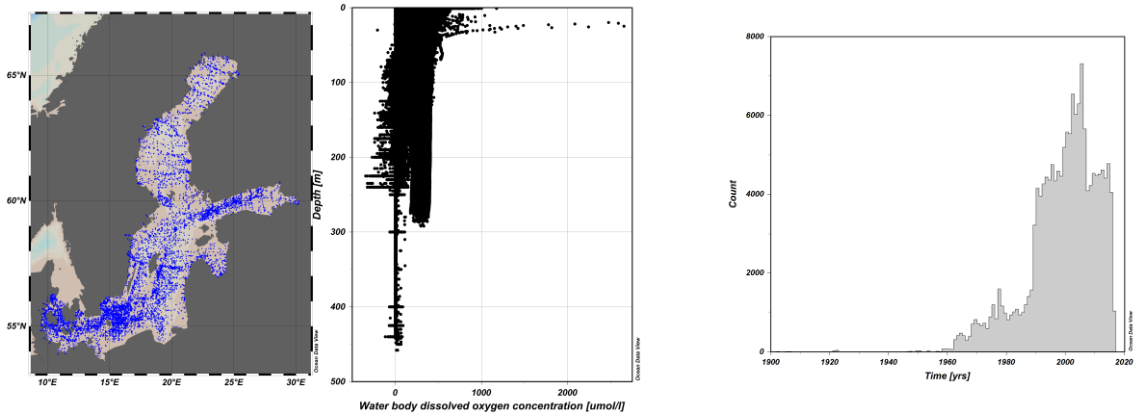
A summary of the number of profiles that has been flagged so far is listed in the following figure. Visual quality control was made following the "out of range" boundaries given in the **Methodology for data QA/QC and DIVA products**. Most out of range values were costal or fjord data which are known to be high and therefore not flagged. Other out of range values as well as "spikes" were flagged with QF 3 or 4. EDMO 729 were contacted for having unreasonable depth of 77, 78 and 99. It turns out depth is unknown and the depth parameter was flagged as bad. The same data supplier seems to have reported the wrong unit for some of the nutrients. This is being checked and we are waiting for a reply on how to proceed.

Additionally, a number of profiles with missing value given as -999 were removed and one station were removed due to wrong position.

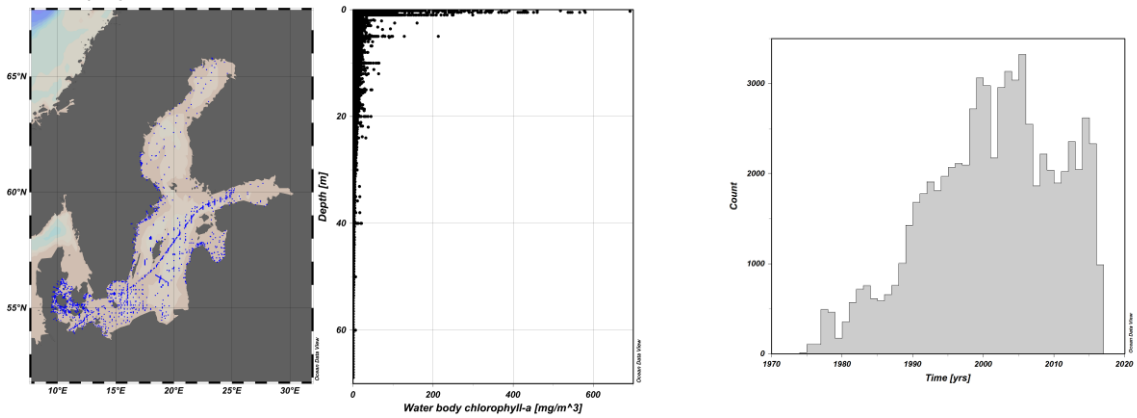
Looking at CTD data some profiles had to be removed for having value 0 in the whole profile. A big number of oxygen CTD data from EDMO 729 are very noisy with a lot of spikes. To manually flag all the bad data will be very time consuming and it's not clear how this will be handled. Figures below show the special and temporal distribution of some of the preferred parameters after quality control. DIN calculation has not been made yet but the distribution for the components (NO3, NO3+N02 etc.) is similar to phosphate.

The quality of pH and Alkalinity has not been checked at this time.

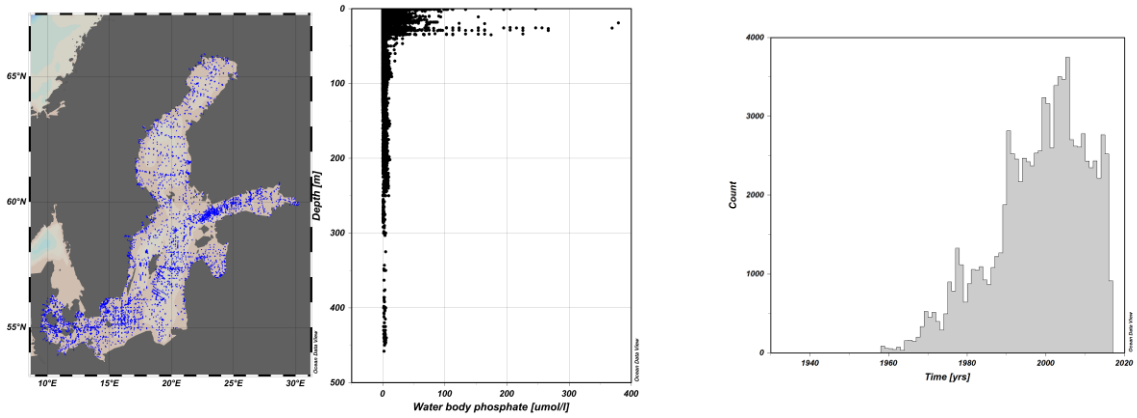
Oxygen



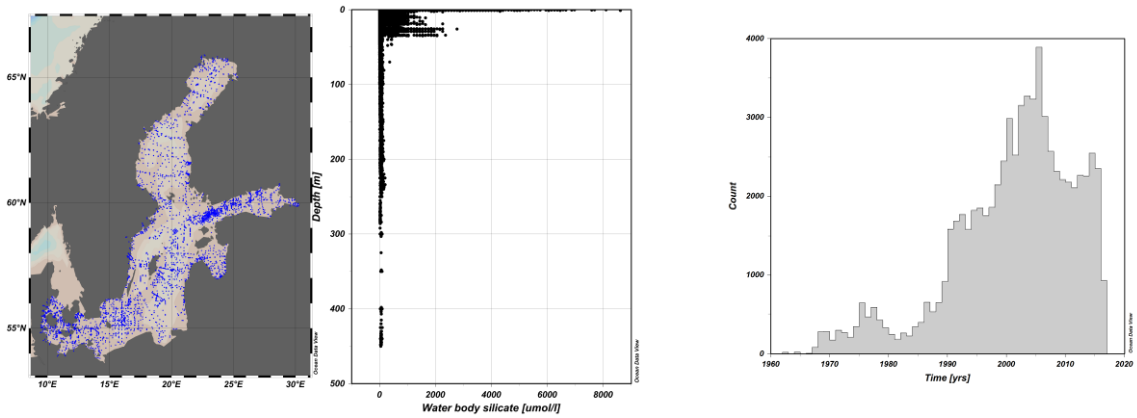
Chlorophyll-a



Phosphate



Silicate



Spatial and temporal distribution of oxygen, chlorophyll, phosphate and silicate in the Baltic Sea. Note that the scales for temporal distribution are different for each parameter.

Conclusions and future work

In general the quality of the data itself has improved since the last phase of the project. Format errors of the ODV files are still an issue that needs improvements. In addition some partners needs to make effort to improve the general data quality. This mostly regards CTD-data.

Since some questions remain regarding the N-parameters the DIN calculation has not yet been made for the Baltic Sea. Consequently the DIN/TN ratio has not been included in the QC process at this time.

It is unclear how to handle oxygen data. EDMO 545 has delivered negative oxygen. This is calculated as the amount of oxygen needed to oxidize all hydrogen sulfide. For future work on diva products several maps will be produced to compare the result with and without negative values. Since oxygen from CTD includes a lot of bad data there will most probably be relevant to also make maps both with and without CTD data.

Norwegian and Barents Seas

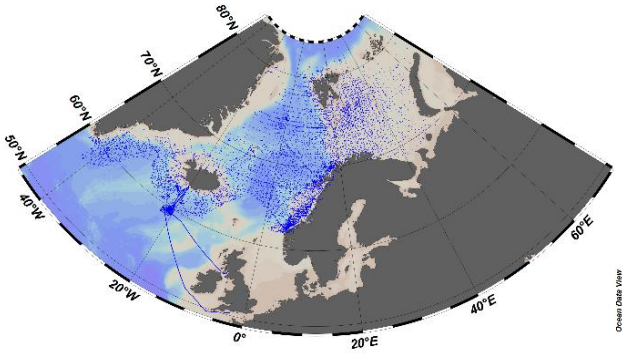
Introduction and inventory

The eutrophication data set for the Norwegian and Barents Seas was received by IMR as regional leader in November 2017. Some problems were discovered in IMR data. The problems were fixed, and MARIS was asked to harvest the data again. The new version of the data set (v3) was received from MARIS in January 2018.

The import and aggregation of the data was done by AWI using ODV. The aggregated unrestricted data set contains 258 839 profiles from 7 partners, and the restricted data set has 844 profiles from 1 partner.

ICES Ecoregions were used to define the region. In addition to the Norwegian and Barents Seas, it also includes the Arctic Ocean, Greenland Sea and Icelandic Waters as shown below:

ICES Ecoregions considered in the analysis



Station distribution

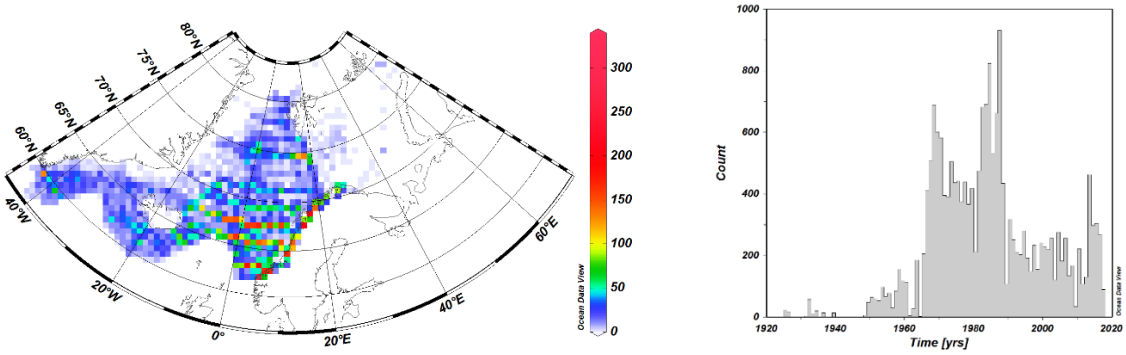
Some of the ferry-box data were outside the defined region, and were removed from the data set. 6 duplicate stations were also deleted, and the unrestricted data set now contains 220 031 profiles.

Variable	Profiles	Period
Phosphate	34986	1933-2017
Silicate	31339	1959-2017
Nitrate	26296	1932-2017
Nitrite	25346	1959-2017
Chlorophyll-a	28296	1980-2017
Dissolved oxygen	189114	1925-2017
Phaeopigments	18277	1980-2017
Salinity	194303	1925-2017
Temperature	194299	1925-2017

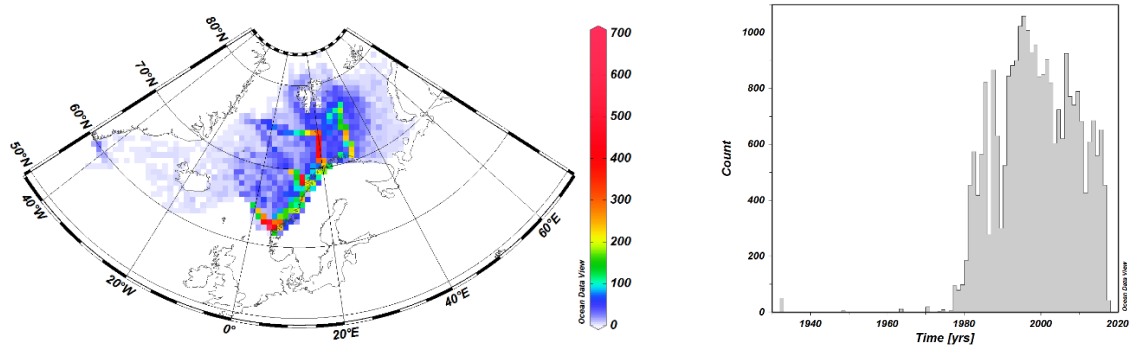
Variable	Profiles	Period
pH	2033	1925-2010
Dissolved oxygen saturation	346	1991-2012
Total alkalinity	312	1965-2010
Nitrate plus nitrite	311	1991-2012
Dissolved inorganic carbon	105	1993-2002
Particulate organic carbon	40	1991-1995
Ammonium	37	1979-2011
Total phosphorus	34	1969-1997
Particulate nitrogen	26	1991

The table shows the number of profiles and temporal resolution for all variables. Before 1960 (or 1980 for some variables) the data set contains very little data.

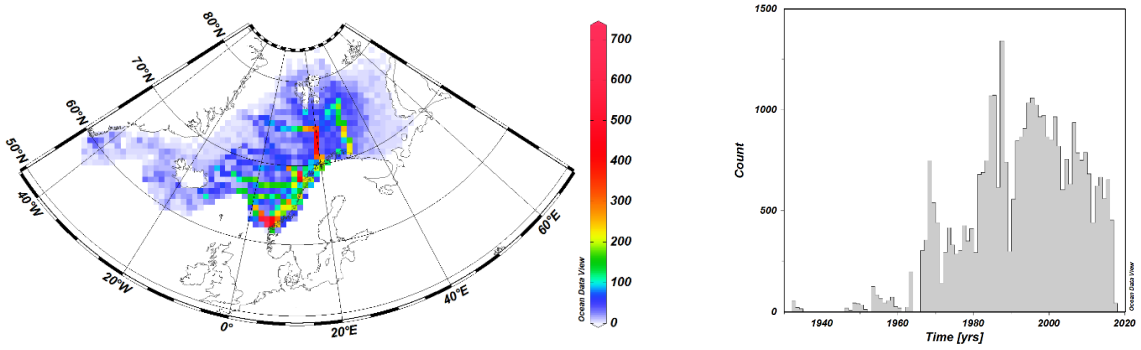
Oxygen (without glider data): Very little data in the Barents Sea



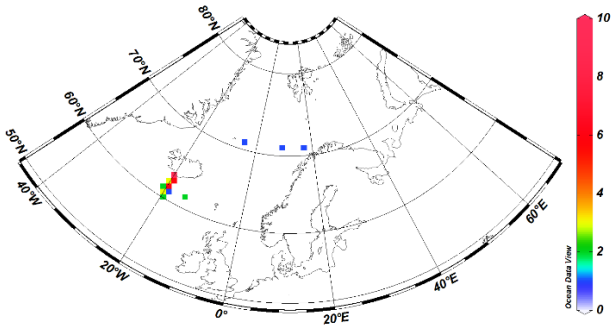
Nitrate: Most of the data in standard sections and along the Norwegian coast

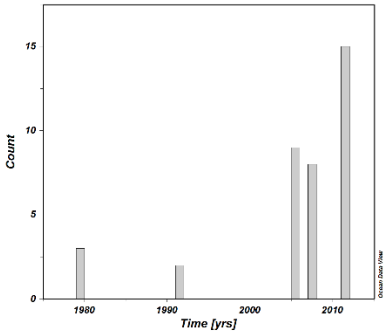


Phosphate:



Ammonium: Almost no data



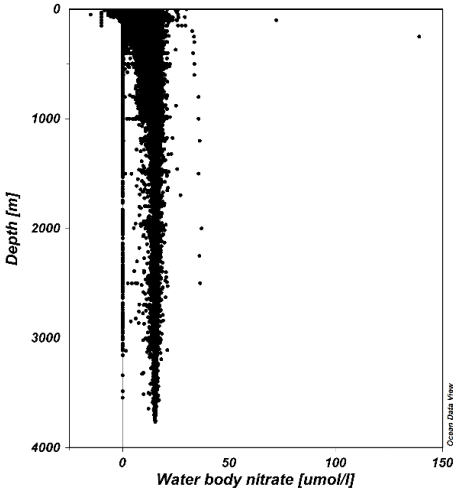


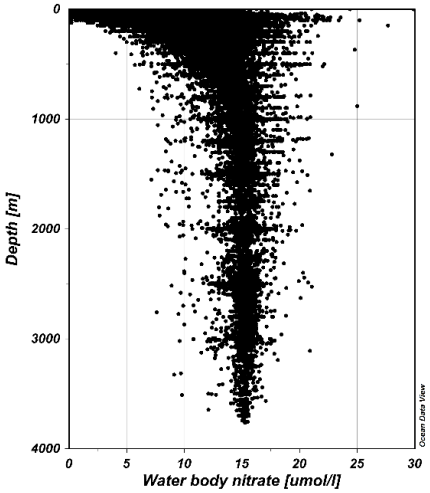
QC of the data set

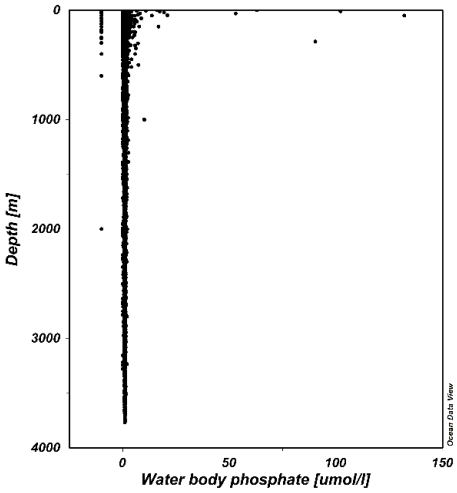
Quality controls is done for phosphate, silicate, nitrite, nitrate, nitrite+nitrate, ammonium, dissolved oxygen and chlorophyll-a. The QC is almost finished for most parameters, but for oxygen and chl-a there is still some work to do. Some of the errors and issues encountered are listed here.

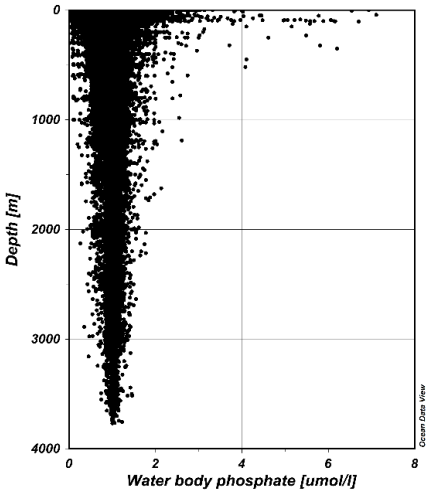
- Negative values -> QF=4
- Values outside broad range -> QF=4
- 0 used both as missing value (QF=9) and below LOD (QF=6). Sent email to originator, but no reply yet
- Data with QF=0 -> change to 1 if ok, else QF=4
- QF=2 used for bad data -> change to 3 or 4
- QF=6 not used for data below LOD -> change to QF=6 if LOD is known (IMR data)
- Data from same depth in 2-3 lines – mixed 2 stations or 2 oxygen/chl-a sensors?
- Silicate has many stations with very high values -> QF=4
- Nitrate has stations with very low values – possibly nitrite
- Comma errors in oxygen – 30 instead of 300
- CTD data very noisy, and chlorophyll sensors not calibrated

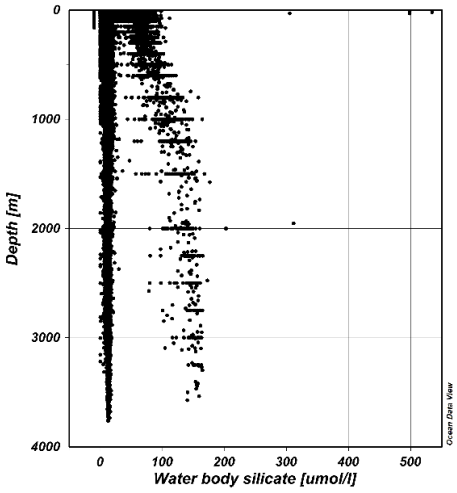
Examples of data before and after QC (not quite finished):

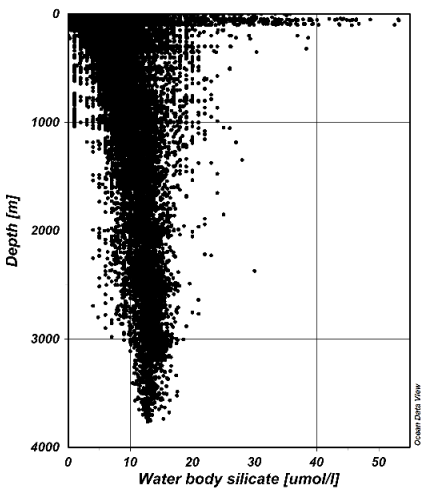

Depth [m]
Water body nitrate [umol/l]
Ocean Data View


Depth [m]
Water body nitrate [umol/l]
Ocean Data View


Depth [m]
Water body phosphate [umol/l]
Ocean Data View


Depth [m]
Water body phosphate [umol/l]
Ocean Data View


Depth [m]
Water body silicate [umol/l]
Ocean Data View


Depth [m]
Water body silicate [umol/l]
Ocean Data View

Quality flags before and after QC (numbers are points, not profiles):

	0	1	2	3	4	5	6	8	Total
Nitrite	46683	221096	485	664	46	6036	0	0	275 753
Nitrate	52127	245659	1043	821	3957	7022	0	0	310 629
Nitrite+nitrate	0	4021	0	199	0	0	0	0	4 220
Phosphate	49941	316875	6394	1115	4035	11745	0	0	390 105
Silicate	51608	295378	543	401	4009	4792	6	0	356 737
Dissolved oxygen	19599	1532440	220	8256	32	1095	0	0	1 561 642
Chlorophyll-a	18235	1009012	42293	147417	11852	513	0	85424	1 314 746
Ammonium	0	388	0	2	0	0	0	0	390

	0	1	2	3	4	5	6	8	Total
Nitrite	0	147771	266	755	224	1570	125135	0	275 723
Nitrate	0	255946	812	25240	4335	5401	18848	0	310 581
Nitrite+nitrate	0	3977	0	243	0	0	0	0	4 220
Phosphate	0	363179	6224	1227	5569	11720	2058	0	389 977
Silicate	0	321212	500	490	12783	4472	17188	0	356 645
Dissolved oxygen	19598	1470572	196	54845	938	1073	0	0	1 548 012
Chlorophyll-a	18219	867567	42083	203195	97745	513	0	85424	1 314 746
Ammonium	0	388	0	2	0	0	0	0	390

Conclusions

Since this region (and the regional leader) is new in EMODnet Chemistry, it has taken quite long time to find out how to do the QC and what the other regions have done earlier. QC for nitrite, nitrate, phosphate and silicate is almost finished, but the experts at IMR will review the data once more before finalizing. Oxygen is also mostly finished except for the data with QF=0. For chlorophyll-a there are CTD and ARGO data that need more checking, and also the QF=0 data.

North-East Atlantic Sea

The first year contribution of IFREMER – the task leader for the North-East Atlantic region was focused on data aggregation and quality control of the eutrophication and ocean acidification datasets.

On 20 November 2017, IFREMER received the harvested by robot/MARIS datasets for the region which included 38.886 CDIs files with 19% of restricted data. The dataset originated from 12 CDI-partners.

The new version ODV 5.0.0 (developed by AWI) was used to merge CDI metadata and ODV data into metadata enriched ODV collections and to aggregate variables codes from P01 to P35, while keeping the P01 codes information inside the data collection.

This new version helped to detect the file format errors and warnings as well as the new file checker OCTOPUS developed in the framework of SeaDataCloud. After this first step of metadata quality control, only 6% of the harvested files contained errors, warnings or duplicates. Around 200 hundred duplicates were found between the new partner - Marine Institute and the Instituto Espanol de Oceanografia which submitted the same CANIGO Leg2 cruise datasets. The duplicates from the Marine Institute had been deprecated in the central MARIS portal.

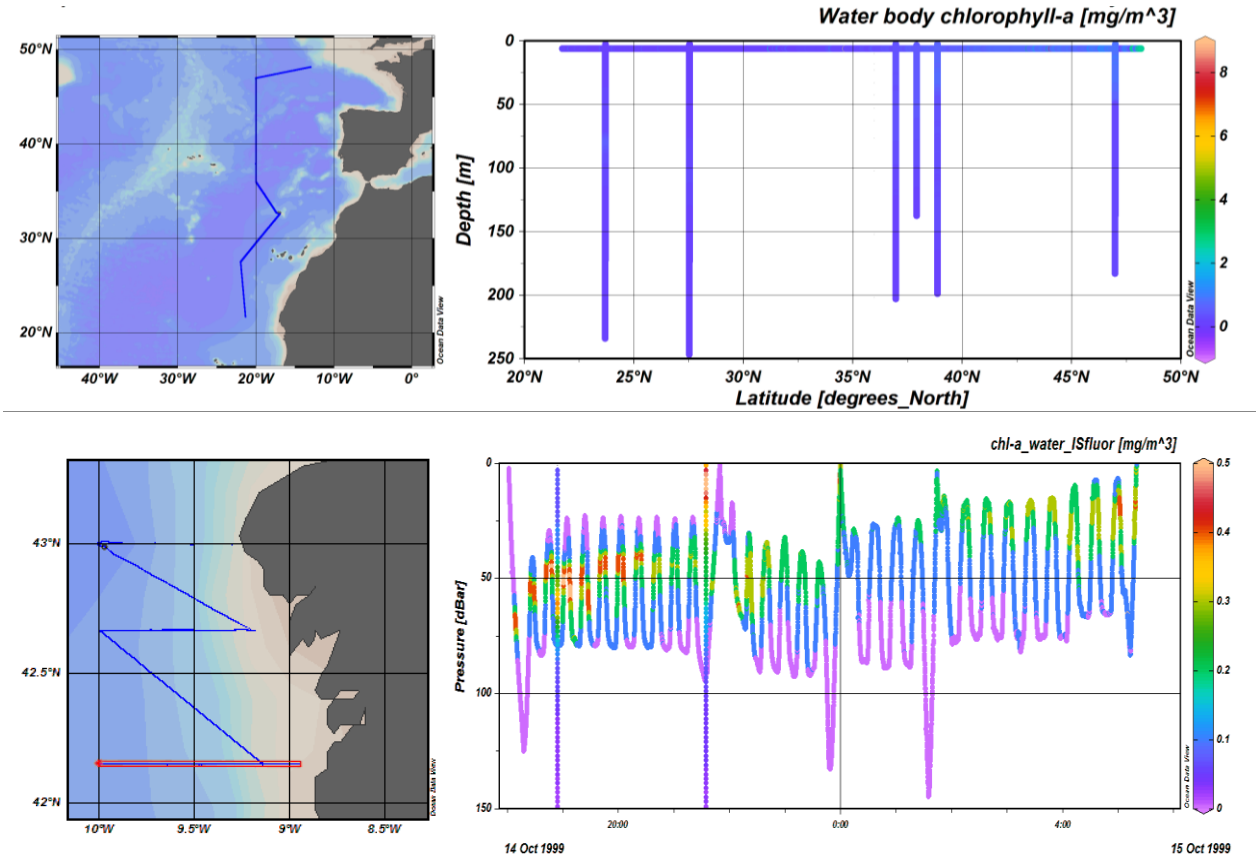
The distribution of stations by parameters of the P35 aggregated collection is summarized in the following tables. After the steering committee of the second plenary meeting in Roskilde, it was commonly decided to focus on: Dissolved oxygen, Chlorophyll-a, Phosphate, Silicate and Dissolved Inorganic Nitrogen (DIN = Nitrate + Nitrite + Ammonium).

Number of stations for each "priority" parameters on the left and for each remaining eutrophication and ocean acidification parameters on the right.

Parameters	Nb Stations
Phosphate	16.475
Silicate	10.105
Nitrate + Nitrite	2.774
Nitrate	6.869
Nitrite	7.629
Ammonium	6.057
Dissolved oxygen	28.373
Chlorophyll-a	85.763

Parameters	Nb Stations
Total Nitrogen	125
Total Phosphorus	59
Urea	285
PH	5.779
Total Alkalinity	439
Dissolved Inorganic	32
Particulate Organic Carbon	973
Phaeopigment	1.120

The very high number of data for Dissolved oxygen and particularly for Chlorophyll-a is biased by high frequency data from Ferrybox or from Scanfish (see Figure below).



North-South trajectory of continuous Chl-a measurements (60s sampling) by a Ferrybox (up), some vertical profiles of CTD are also evidenced to calibrate the data; and West-East section of continuous Chl-a measurements (1s sampling) by a Scanfish (down).

The quality control checks were done following the common project methodology (broad range control checks to exclude erroneous high values, dealing with negative values, identification of zero value, wrong units,...). All errors encountered during aggregation and quality control were documented and corrected (using ODV software and in house developed scripts) in close collaboration with data originators (for confirmation and updating of the local data sets).

The data quality control step is almost finished for all the "priority" parameters but there is still some work to do to compute the DIN using the guidelines from the North Sea regional leader. Indeed, the quality control of nutrients in the Atlantic Sea is more complicated than for the other parameters because of the scarcity of Total Nitrogen and Total phosphorus which could help to check the ratio with the dissolved components.

The quality controlled Atlantic Sea aggregated data set for eutrophication and ocean acidification contains an average of 90% "Good" flagged data (QV=1, 2, 5, 6, 8) and an average of 10% "Bad" flagged data (QV=3, 4). In the following table the number of Good/Bad flagged data per parameters are presented.

Number of Good/bad flagged data per parameters.

Parameters	Total nb of values*	Good* (flag=1,2,5,6,8)	%	Bad* (flag=3,4)	%
Dissolved Oxygen	8173255	7763361	95	409879	5
Chlorophyll-a	1834714	1265311	69	569403	31
Phosphate	167445	166010	99	1435	1
Silicate	85502	81841	96	3661	4

* these values could lightly evolve after the last feedbacks from data originators and after DIVA analysis.

Chlorohyll-a is the parameter with the worst percentage of good data because of the high number of uncalibrated fluorimeter data, for example originated from Ferry-box.

The spatial, temporal distribution and vertical plots for the eutrophication and acidity parameters profiles are illustrated in the figures displayed in the next page.

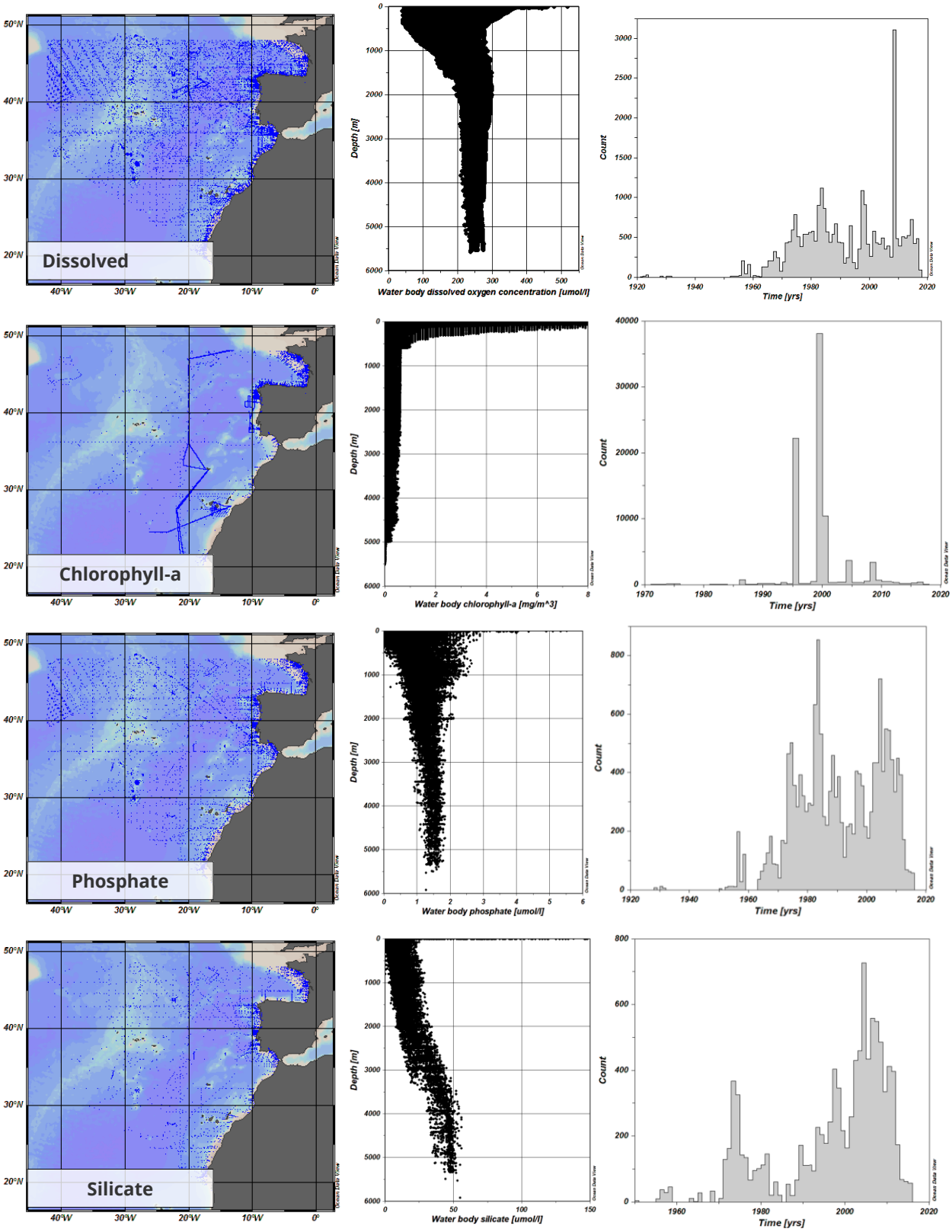
Dissolved oxygen is the parameter that has the best coverage from the 1960s, for the other parameters the coverage becomes good enough from the 1980s. Despite this apparent good spatio-temporal coverage, one have to keep in mind that these statistics are for all the stations on all the period and for all depths. We have a great loss of coverage by dividing by depth and by time window of 6 years.

Conclusions

The aggregation and quality control of the nutrients and ocean acidification datasets were improved and more efficient due to the useful upgrades of the EMODnet Chemistry/SeaDataCloud tools (ODV and OCTOPUS).

The validation loop between the data producers, the regional leaders and the central portal has also made a step forward to the increase in quality of the datasets, especially to be compliant in format and metadata. However, the loop does not solve all the delay issues. This is still very time consuming to make the quality control of these datasets and especially to exchange with the data producers to wait for their validation. Furthermore, some CDIs are still not updated and many errors highlighted during the previous phase are still here.

Eventually, the data quality control becomes trickier in Chemistry with the new high technologies of continuous water body measurements (such as Pocket Ferry-box).



Station positions, vertical data distribution and data temporal distributions for the actual QCed aggregated collections (Oxygen, Chl-a, Phosphate, Silicate).

Mediterranean Sea

During the first year, the contribution of HCMR –the regional leader for the Mediterranean Region was focused on the quality control and validation of the aggregated collections of eutrophication data.

Description of initial aggregated data collections prior to quality control and validation

End of November 2017, HCMR received the harvested data from MARIS. For the Mediterranean Region the aggregation was done by Reiner Schlitzer in communication with the coordinators and the regional leaders on which P35 terms to include in the aggregated collection. The received data included 31 different P35 parameters. The process and quality control was focused on nutrients (PO4, SiO2, NO2+NO3, NO3, NO2, NH4), dissolved oxygen and chlorophyll.

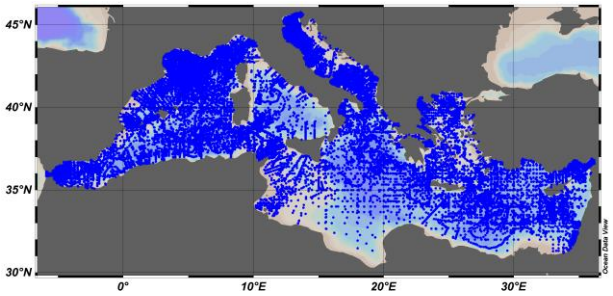
The received data set was composed of 101,526 vertical profiles and 10,336 time series, originated from 23 data providers of 18 countries. Out of them, 60% (67,291) were non-restricted data (SDN License/unrestricted) and 40% (44,571) were restricted (by negotiation/no access/academic/moratorium). The contribution per partner is given in the Table below:

Country	EDMO code	Organisation Name	Total CDIs
Croatia	700	Institute of Oceanography and Fisheries (IOF)	1924
Cyprus	711	Cyprus Oceanography Center (OC-UCY)	563
Denmark	730	International Council for the Exploration of the Sea (ICES)	63
France	486	IFREMER/IDM SISMER - Scientific Information Systems for the SEA (IFREMER/IDM/SISMER)	16411
Greece	269	Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC) (HCMR/HNODC)	9895
United Kingdom	43	British Oceanographic Data Centre (BODC)	16
Ireland	396	Marine Institute (MI)	50
Israel	710	Israel Marine Data Center (ISRAMAR)	333
	963	Israel Oceanographic and Limnological Research (IOLR)	3623
Italy	120	OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Division of Oceanography	49624
	134	Institute of Marine Science S.S. of Lerici (SP)	481
	144	CNR, Institute of Marine Science (ISMAR) - Ancona	2939
	149	CNR, Institute of Atmospheric Sciences and Climate (ISAC) (Rome)	552
	3009	ISPRA-Institute for Environmental Protection and Research (ISPRA)	1490
Malta	708	International Ocean Institute - Malta Operational Centre (University Of Malta)/Physical Oceanography Unit (UMT.IOI.POU)	128
Montenegro	2432	Institute of Marine Biology (IMBK) (IMBK - IBMK)	734

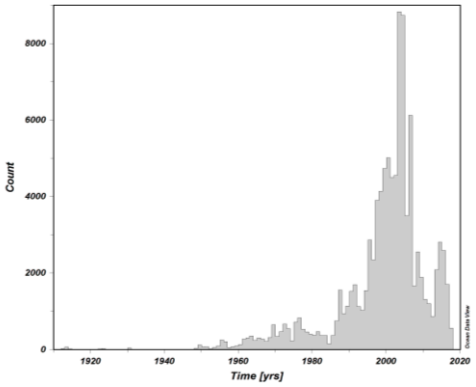
Morocco	691	National Institute of Fisheries Research (INRH)	498
Portugal	590	IHPT, Hydrographic Institute (IHPT)	1
Russian Federation	681	All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC)	3517
Slovenia	1229	National Institute of Biology - NIBMarine Biology Station	7494
Spain	353	IEO/Spanish Oceanographic Institute (IEO)	5872
Tunisia	1232	Institut National des Sciences et Technologies de la Mer – INSTM	758
Turkey	696	Institute of Marine Sciences, Middle East Technical University	4896

Contribution per partners' country, EDMO code and number of CDIs for the Mediterranean eutrophication data.

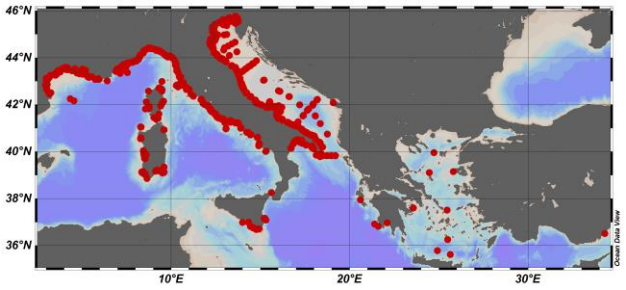
The spatial and temporal distribution of the initial data (vertical profiles in top row and time series data in bottom row) are illustrated in Figure below:



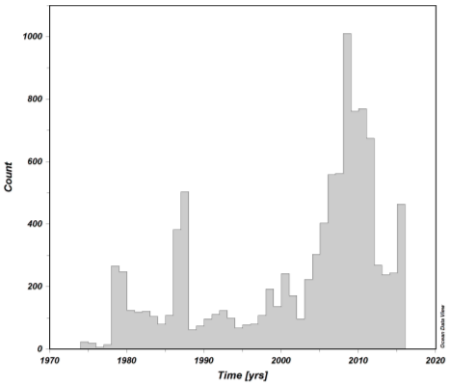
Spatial distribution of vertical profiles (total number: 101.526)



Temporal distribution of vertical profiles



Spatial distribution of time series (total number: 10.336)



Temporal distribution of time series

Spatial (left column) and temporal distributions (right column) of Mediterranean eutrophication profile data (top row) and time series (bottom row).

The numbers of the initial data per parameter and per quality flag as received by the data providers and before the regional quality control are given below, in the first Table for the vertical profiles and the second Table for time series:

Parameters	Total Profiles	Total points	Flag 0	Flag 1	Flag 2	Flag 3	Flag 4	Flag 5	Flag 6	Flag 7	Flag 8
Dissolved Oxygen	74,465	9,516,153	419,413	8,612,198	202,574	118,615	163,353	0	0	0	0
Chlorophyll-a	26,315	5,802,112	449,571	4,443,766	32,035	431,807	171,156	42,000	75	0	231,702
Nitrite	21,608	126,360	6,672	116,828	111	218	364	1	2,166	0	0
Nitrate	19,832	134,828	10,406	117,709	2,360	2,508	1,314	0	531	0	0
Nitrite + Nitrate	7,368	42,605	1,727	39,465	222	153	103	15	920	0	0
Ammonium	14,170	63,184	2,191	59,107	27	396	564	0	895	4	0
Phosphate	29,144	177,092	7,353	163,126	1,931	2,291	860	3	1,528	0	0
Silicate	25,033	161,123	6,262	151,334	1,861	547	1,107	0	12	0	0

Number of profiles and measurements points for eutrophication in Mediterranean Sea per parameter and quality flag before the regional quality control.

Parameters	Total ts	Total points	Flag 0	Flag 1	Flag 2	Flag 3	Flag 4	Flag 5	Flag 6	Flag 7	Flag 8
Dissolved Oxygen	8,254	266,691	886	227,367	21,395	8,251	8,763	0	27	0	2
Chlorophyll-a	1,538	124,604	0	108,907	7,422	6,628	913	0	734	0	0
Nitrite	6,387	35,838	588	32,003	0	0	0	0	3,247	0	0
Nitrate	6,448	35,887	615	33,534	0	0	0	0	1,738	0	0
Nitrite+Nitrate	5,007	14,401		10,477	2,999	0	0	0	925	0	0
Ammonium	6,758	52,336	526	45,681	2,056	904	0	0	3,169	0	0
Phosphate	6,827	54,597	549	42,293	3,430	1,294	0	0	7,031	0	0
Silicate	5,594	44,811	548	41,286	1,854	176	0	0	947	0	0

Number of time series and measurements points for eutrophication in Mediterranean Sea per parameter and quality flag before the regional quality control.

Quality control

The latest ODV version 5 was used for the quality control. The quality control includes checks of the format, the metadata and the measurements. Mismatches between the metadata in the CDIs and local ODV data files were identified. Most of them concerned errors in the semantic header. The corresponding CDI partners (4 in total) were contacted in order to correct theirs local ODV files and/or update their CDI records in the central catalogue.

The common project methodology was used for the check of the measurements and the harmonization at regional scale. In summary these checks include: broad range control checks to exclude erroneous high

values, negatives and defaults assigned as not null values and identification of zero values (http://nodc.ogs.trieste.it/doi/documents/EMD2chem_QCreport_V8-072015.pdf).

The numbers of observations that have been corrected and the changes at their quality flags are shown in the Table below:

Parameters	Corrected Measurements	QF changed to				
		1	2	3	4	6
Dissolved Oxygen	575,805	224,845	1	15,453	335,506	0
Chlorophyll-a	1,521,226	443,639	0	179	350,924	726,484
Nitrite	13,782	5,889	0	11	8	7,874
Nitrate	16,341	7,503	0	0	2,777	6,061
Nitrite+Nitrate	2,167	1,691	0	0	0	476
Ammonium	5,013	1,835	0	1	4	3,173
Phosphate	13,900	7,080	0	3	17	6,800
Silicate	7,548	6,246	0	0	0	1302
Total	2,155,782	698,728	1	15,647	689,236	752,170

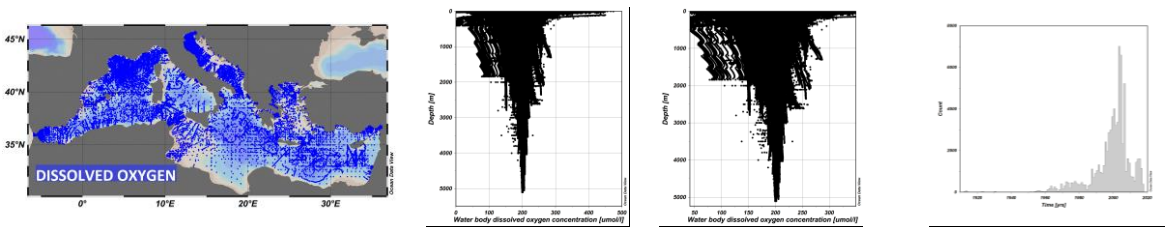
Number of corrected measurements points per Quality Flag (QF) for the vertical profiles

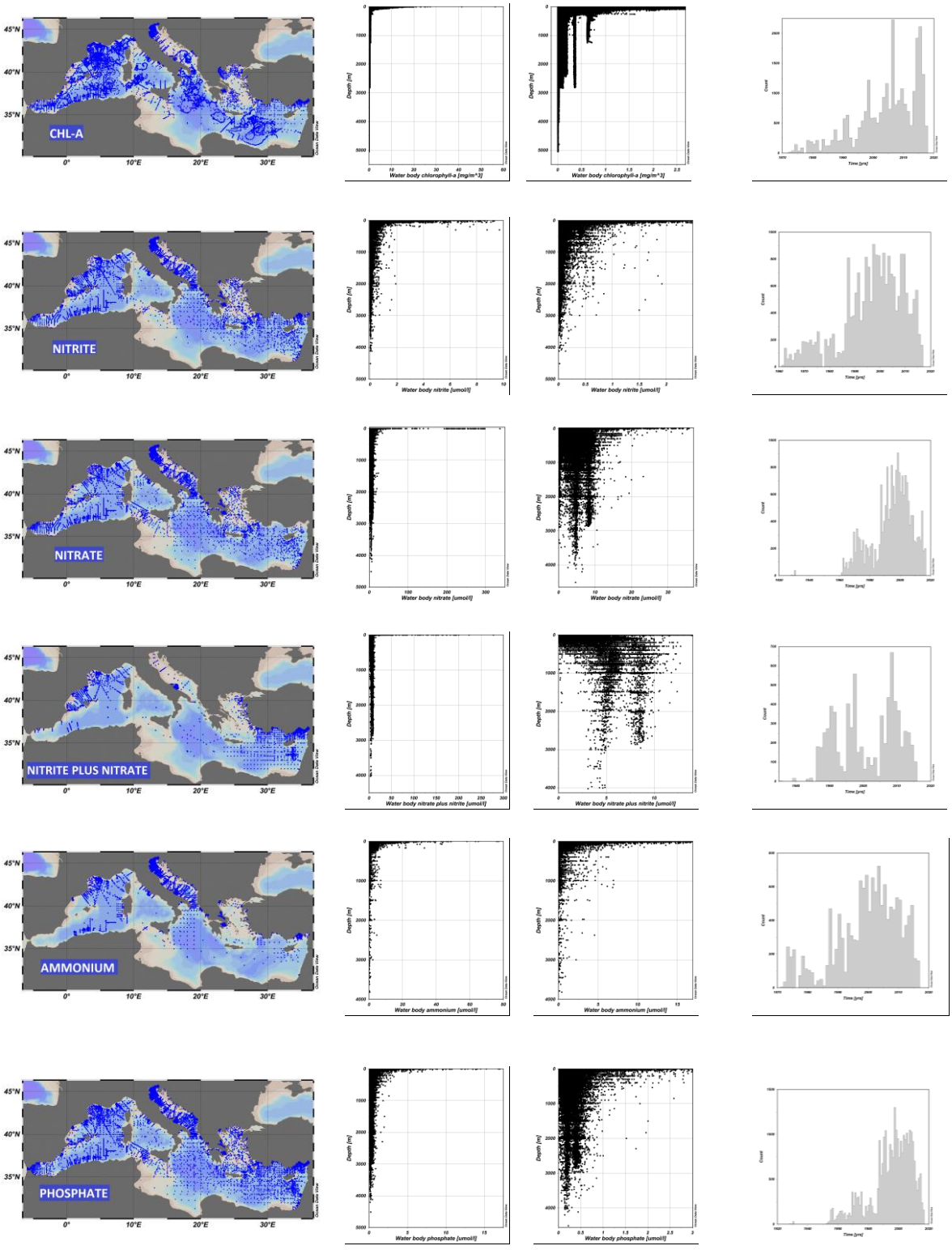
The quality control for the time-series collection is still ongoing by the time this report is written.

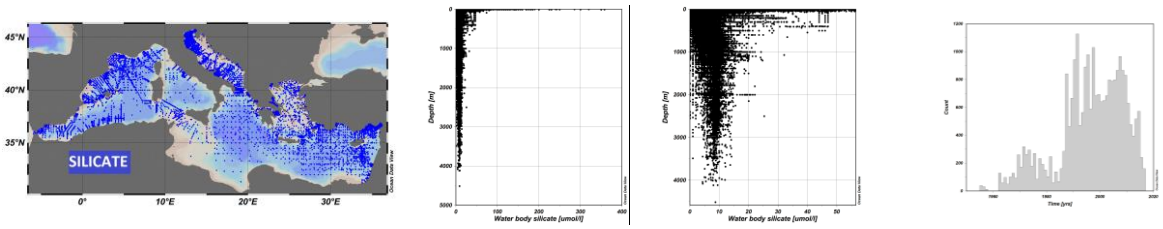
Final data sets

The spatial, vertical and temporal distributions per parameter of the quality controlled eutrophication profile data are illustrated in Figure 2 below.

The final data set of the quality controlled aggregated eutrophication data contains at an average of 96% “Good” flagged data (QF=1, 2, 5, 6, 8) and an average of 4% “Bad” flagged data (QF=3, 4). The numbers of Good/Bad flagged data per parameter are summarized in the final Table.




CHL-A
NITRITE
NITRATE
NITRITE PLUS NITRATE
AMMONIUM
PHOSPHATE



Spatial (1st column), vertical (2nd and 3rd columns) and temporal (4rth column) distributions per parameter of Mediterranean eutrophication profile data.

Parameters	Total Measurements	Good	%	Bad	%
Dissolved Oxygen	9,516,153	8,880,148	93.32	636,005	6.68
Chlorophyll-a	5,802,112	4,872,831	83.98	929,281	16.02
Nitrite	126,360	125,764	99.53	596	0.47
Nitrate	134,828	128,271	95.14	6,557	4.86
Nitrite+Nitrate	42,605	42,350	99.40	255	0.60
Ammonium	63,184	62,594	99.07	590	0.93
Phosphate	177,092	174,173	98.35	2,919	1.65

Numbers and percentage of "Good" and "Bad" flagged data in the Mediterranean Sea profile collection.

Key factors

In the previous phase of EMODnet Chemistry several erroneous data were identified during the regional quality controls which were eliminated from the central pool. In the current phase, some of these errors still exist in the harvested data. The Mediterranean Regional Leader will contact the corresponding partners to find out how these errors still remain at their local data system. Catalogues with errors will be sent again to partners with the required actions for the errors corrections.

Black Sea

In the first year, contribution of NIMRD to the WP3 for the Black Sea activities was focused on data aggregation, quality control and validation of data concerning eutrophication and ocean acidification.

On 20 November 2017 NIMRD, the Regional Leader for the Black Sea, received the harvested data collection related to eutrophication (nutrients, chlorophyll and oxygen) and acidity (from pH, pCO2, Total Inorganic Carbon, alkalinity).

The MSFD Black Sea area (enlarged with Marmara Sea besides Black Sea and Sea of Azov) data collection contained 57575 files in ODV Spreadsheet format and the corresponding extended CDI metadata file (data.csv). The datasets originated from 24 CDI-partners from 41 data originators and included more than

350 different P01 codes. Out of total number of the Black Sea CDIs, 82% are non-restricted data (SDN License/unrestricted) while 18% are restricted (by negotiation/academic/moratorium).

The new version ODV 5.0.0 (developed by AWI) was used to merge CDI metadata and ODV data into metadata enriched ODV collections and to aggregate variables codes from P01 to P35, while keeping the P01 codes information inside the data collection. The applied quality controls checks were done on regional data set for: format checks, wrong P01/P06 codes, unit conversions, broad range control checks to exclude erroneous high values, negatives, identification of zero values, duplication eliminations and comparison of interpolated data with spatially averaged profiles. All errors encountered during aggregation and quality control were documented and corrected (using ODV software and in house developed scripts) in close collaboration with data originators (for confirmation and updating of the local data sets).

When not present in original data, Water body dissolved inorganic nitrogen (DIN) was calculated by summing up the Nitrates, Nitrites and Ammonium. DIN calculation was done with the help of ODV Software tool (Derived variables).

For Data Aggregation and Data Quality Control the common project methodology has been followed (http://nodc.ogs.trieste.it/doi/documents/EMD2chem_QCreport_V8-072015.pdf). The total number of CDI records (aggregated quality controlled vertical profiles) are presented in the Table below.

Total number of aggregated, QControled CDIs (vertical profiles) for Black Sea.

	Parameter	No. of vertical profiles
1	Water body dissolved oxygen concentration [umol/l]	44204
2	Water body dissolved oxygen saturation [%]	8549
3	Water body nitrate [umol/l]	16903
4	Water body nitrate plus nitrite [umol/l]	2678
5	Water body nitrite [umol/l]	27660
6	Water body ammonium [umol/l]	21594
7	Water body dissolved inorganic nitrogen [umol/l]	15686
8	Water body total nitrogen [umol/l]	10917
9	Water body phosphate [umol/l]	30769
10	Water body total phosphorus [umol/l]	11777
11	Water body chlorophyll-a [mg/m^3]	3355
12	Water body silicate [umol/l]	27248
13	Water body pH [pH units]	32104
14	Water body total alkalinity [mEquiv/l]	19658

The quality controlled Black Sea aggregated data set for eutrophication and ocean acidification contains an average of 92% “Good” flagged data (QV=1, 2, 5, 6, 8) and an average of 8% “Bad” flagged data (QV=3, 4). (conform: http://seadatanet.maris2.nl/v_bodc_vocab_v2/search.asp?lib=L20, SeaDataNet measurand qualifier flags). In the following Table the number of Good/Bad flagged data per parameters are presented.

Number and percentage of "Good" and "Bad" flagged data in the Black Sea data collection

	Parameter	Total no. of values	Good	%	Bad	%
1	Water body dissolved oxygen concentration [umol/l]	259829	251492	96.79	8337	3.21
2	Water body dissolved oxygen saturation [%]	55524	39396	70.95	16128	29.05
3	Water body nitrate [umol/l]	50503	50245	99.49	258	0.51
4	Water body nitrate plus nitrite [umol/l]	20722	20369	98.30	353	1.70
5	Water body nitrite [umol/l]	78642	78281	99.54	361	0.46
6	Water body ammonium [umol/l]	55230	55080	99.73	150	0.27
7	Water body dissolved inorganic nitrogen [umol/l]	44303	43956	99.22	347	0.78
8	Water body total nitrogen [umol/l]	23029	22662	98.41	367	1.59
9	Water body phosphate [umol/l]	108232	105148	97.15	3084	2.85
10	Water body total phosphorus [umol/l]	27251	27057	99.29	194	0.71
11	Water body chlorophyll-a [mg/m^3]	26839	10680	39.79	16159	60.21
12	Water body silicate [umol/l]	87490	86991	99.43	499	0.57
13	Water body pH [pH units]	113184	110128	97.30	3056	2.70
14	Water body total alkalinity [mEquiv/l]	42148	37300	88.50	4848	11.50

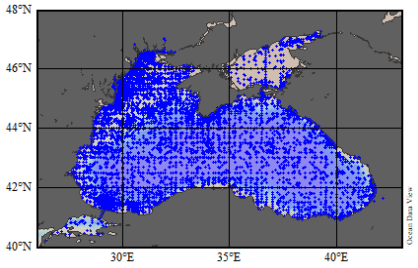
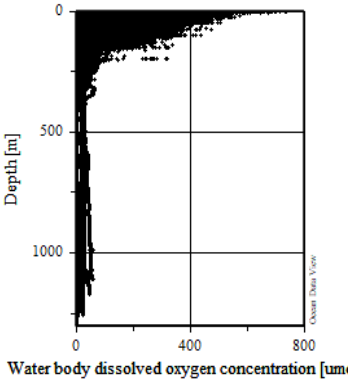
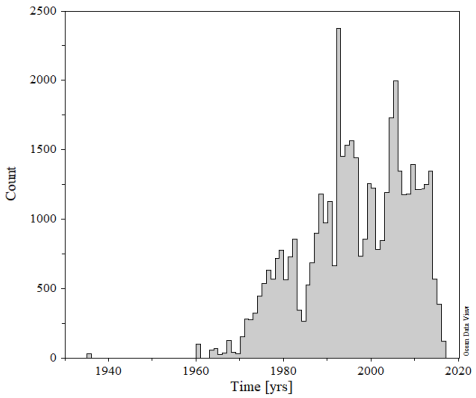
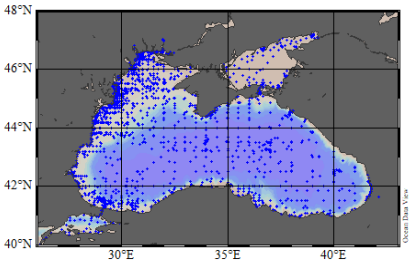
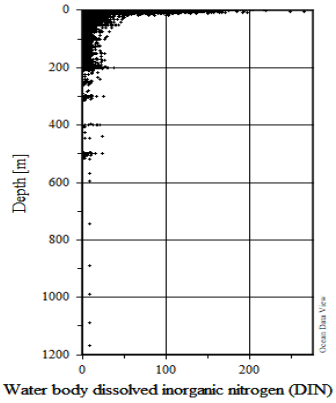
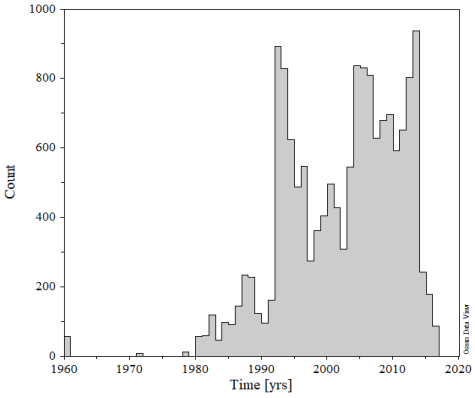
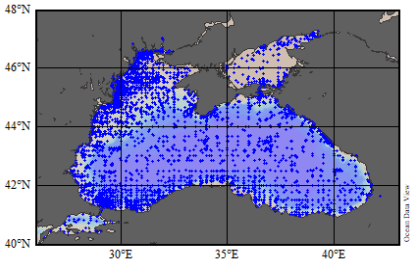
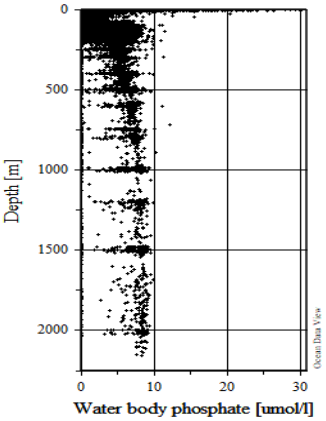
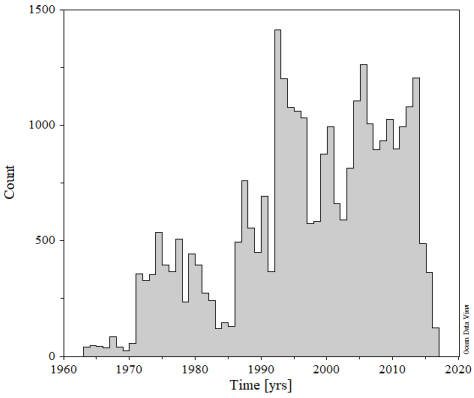
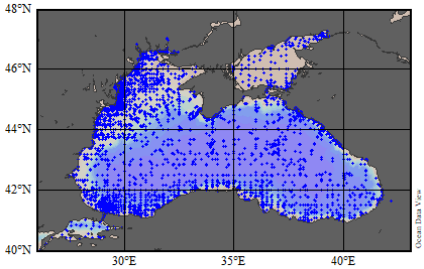
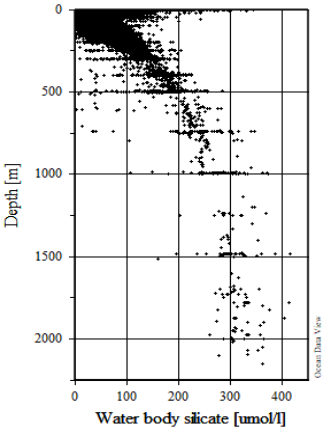
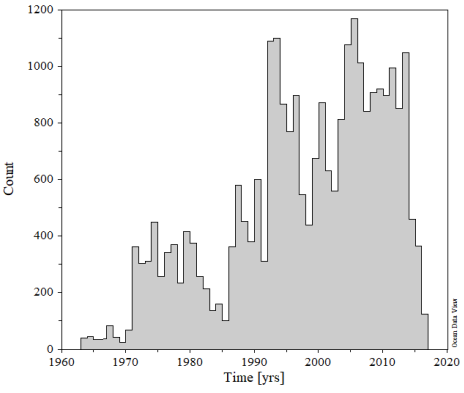
* the final numbers might be different after d DIVA analyses

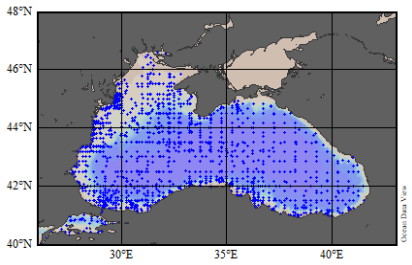
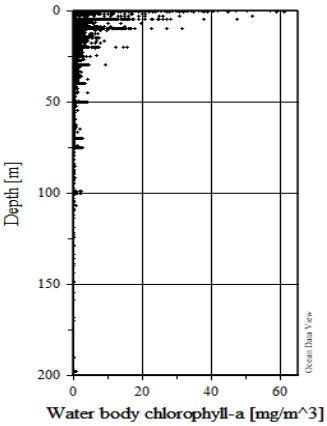
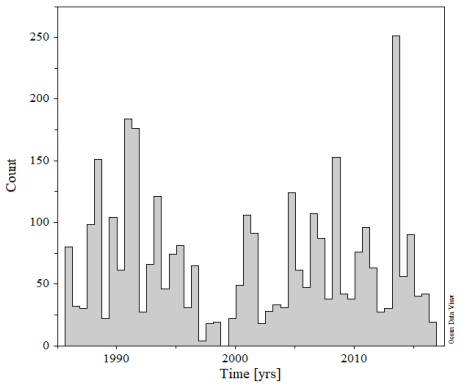
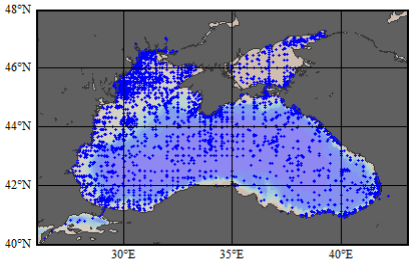
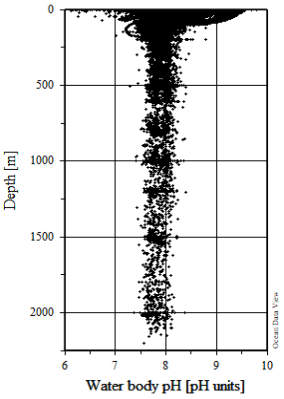
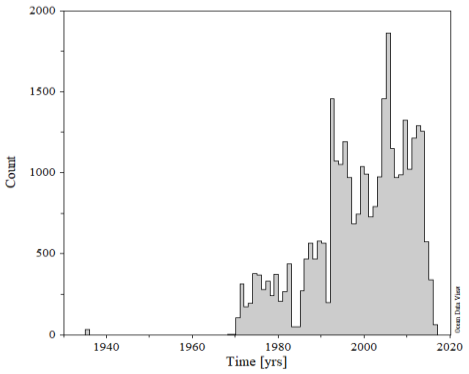
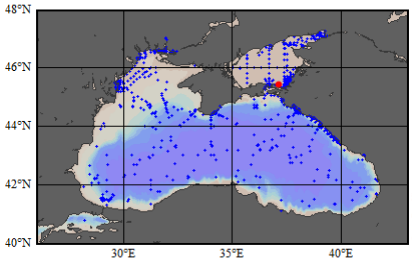
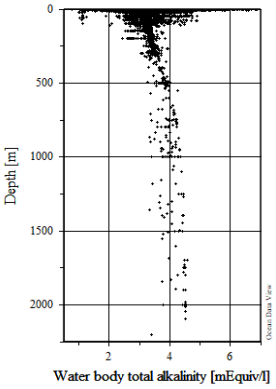
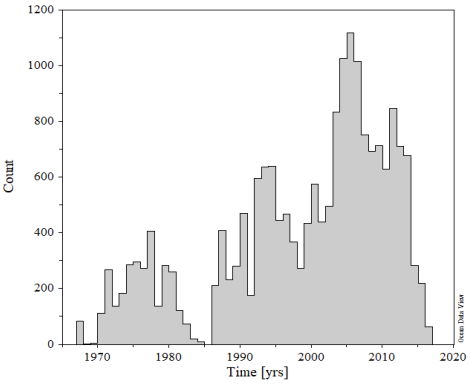
The spatial, temporal distribution and vertical plots for the eutrophication and acidity parameters profiles are illustrated in **Figure**…. As a general comment, oxygen, phosphates and silicate and have better spatial coverage than the other parameters, while Chlorophyll-a is not present in Azov Sea. The temporal distribution from year to year is not uniform, the best represented period being 1980-2016 for all parameters.

Key factors

Work has been spent finding and flagging bad and questionable values, but in general the quality of the data has been fairly good. The main issues, and the most time consuming work, has been to handle format errors in the ODV files. Most of these errors have been obvious and actions have been taken to correct them.

The feedback loop between the Black Sea Regional Leader and the partners during the EMODNET Chemistry Phase II was a very useful and productive activity which improved the quality of the regional pool. Nevertheless, not all the CDIs / ODVs Files were correctly updated or not updated at all. This shows that the feedback loop is very important for improving data quality towards a better harmonized workflow.

	Spatial distribution	Vertical profiles	Temporal distribution
Oxygen			
DIN			
Phosphates			
Silicates			

	Spatial distribution	Vertical profiles	Temporal distribution
Chlorophyll-a			
pH			
Alkalinity			

Station positions, vertical data distribution and data temporal distributions for the available aggregated collections (oxygen, DIN, phosphate, silicate, chlorophyll-a, pH and Alkalinity).

Generating dedicated maps on contaminants

EMODnet Chemistry Phase 3 is in charge of producing dedicated maps for contaminants along the coasts that could be a useful tool in environmental impact assessment analysis requested by many EU directives, in particular Marine Strategy Framework Directive and Water Framework Directive, and Regional Sea Conventions agreements.

As there is a large heterogeneity of data from monitoring on contaminants, it is very important to find, as a very first step, a set of basic parameters, units and matrix that are common for all basins, with the objective of developing products that are comparable at European scale. In order to achieve such objective a first list of specific contaminants, measurement units and associated matrix has been proposed and discussed in kick-off, annual and technical meetings held on during this first year of activity. Such list will also serve as a basis to provide detailed information to the wide EMODnet Chemistry partnership for the data collection scheduled for M15 = May 2018.

As a further step, data need to be regionally harvested, quality controlled and validated, and maps will be produced from the validated data. Deadline for updated data collections and dedicated maps on contaminants is M20 = October 2018.

A detailed analysis of the requirements indicated in Report MSFD 2018 amended by the New Commission Decision 2017/848 of 17th May 2017 regarding Descriptor 8 and 9 and their linkages with Water Framework Directive has been carried on. In particular threshold values and performance criteria on Limit of Quantification for priority hazardous substances required by Environmental Quality Standard Directive 2008/105/EC for water and biota has been taken into account.

The following table summarize the proposed list of contaminants:

Matrix	**Contaminants**
Water	Pesticides and biocides: DDT, HCB Antifoulants: TBT, TPT Heavy metals: mercury, cadmium, lead Hydrocarbons (PAH): Anthracene, Fluoroanthene, Benzo(a)pyrene
Sediments	Pesticides and biocides: DDT Antifoulants: TBT Heavy metals: mercury, cadmium, lead Hydrocarbons (PAH): Anthracene, Naphtalene, Hexachlorobenzene
Biota	Pesticides and biocides: total DDT Heavy metals: mercury and its compounds Hydrocarbons (PAH): Fluoroanthene, Benzo(a)pyrene, Hexachlorobenzene

Proposed parameters for contaminant maps

Measurement units have also been proposed according to the units indicated for Good Environmental Status assessment in the recent EU directives (2013/39/UE; Comm. Dec. EU 2017/848) as:

- Water: all data expressed as µg/l

- Sediment: all data expressed as µg/kg of dry weight
- Biota: all data expressed as µg/kg of fresh weight for biota following RSC guidelines (BUT: mussel in dry weight).

Dedicated maps on contaminants will cover the following temporal ranges, according to MSFD report timeline based on a 6-year cycle starting from 2012:

- Before 2012
- From 2012 to today
- For 6-year windows

A crucial issue has been identified regarding "fitness for use for environmental quality assessment", on monitoring data below and above Limit of Quantification (LOQ), data with LOQ above or below 30 percent of EQSD threshold values, data below and above EQSD threshold values. Also species groups selection for contaminants in biota has been highlighted as an important theme to compare environmental assessment at European level.

Types of maps discussed and proposed are the following ones:

a) Maps showing values: above or below LOQ. Example:
   - Green points: below LOQ
   - Orange points: above LOQ

b) Maps showing data with LOQ above or below EQSD threshold values:
   - Green points: LOQ below 30% of EQSD threshold values
   - Red points: LOQ above 30% of EQSD threshold values

c) Maps showing matrix monitored:
   a) Blue points: water
   b) Brown points: sediments
   c) Green points: biota

d) Maps showing species group monitored (at least for DDT, Fluoranthene, HCB, Mercury and Benzo(a)pyrene) according to EQSD thresholds for biota:
   - Green point: Molluscs
   - Orange point: Crustaceans
   - Blue point: Fish
   - Grey point: Others

e) Maps showing the range of concentrations (excluding from the analysis data equal or below LOQ):
   - concentrations corresponding to: 0-20 percentile, blue colour
   - concentrations corresponding to: >20-40 percentile, green colour
   - concentrations corresponding to: >40-60 percentile, yellow colour
   - concentrations corresponding to: >60-80 percentile, orange colour
   - concentrations corresponding to: >80-100 percentile, red colour

The following additional maps have also been proposed to be discussed further on:

f) For sediments: Maps showing availability of a normalizer (TOC or Loss on ignition for organic substances, Li, Al or clay-silt fraction for metals):
    - blue points: normalizer available
    - orange points: No normalizer available

g) Maps showing concentration values above or below EQS threshold values:
    - Green points: concentration values below EQS threshold values,
    - Red points: concentration values above EQS threshold values

An example of calculation of map on LOQ is the following:

- Map on LOQs for Fluoranthene, HCB, Mercury and Benzo(a)pyrene in biota:
    - Red point: LOQ > 0.3*Threshold value (wet weight)
    - Green point: LOQ <= 0.3*Threshold value (wet weight)

Such proposal has also been discussed on second MSFD Board online workshop on 16th march 2018 with minutes available at the following link: http://www.emodnet-chemistry.eu/newsevents/events/MSFD_board_of_experts_for_EMODnet_Chemistry_Contaminants_online_workshop_16_March_2018_Online

Generating validated maps for marine litter and beach litter

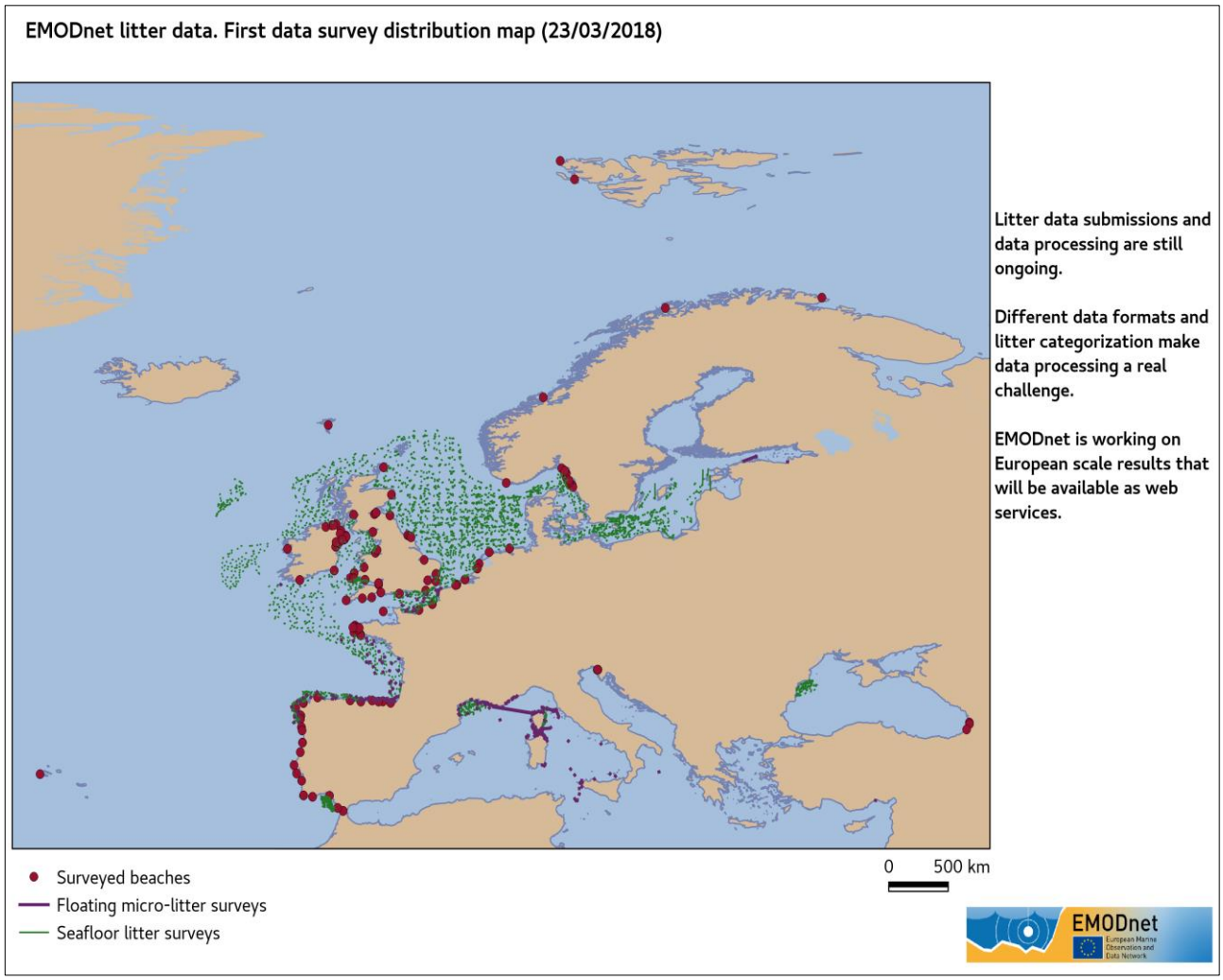
As already presented in the summary of the work done in the reporting period, the scope of EMODnet Chemistry data management has been extended to marine litter following the requirements of the Marine Strategy Framework Directive Descriptor 10.

EMODnet Chemistry phase 3 is responsible for producing maps for beach macro litter, seafloor macro litter and floating micro-litter. The production of the first maps was due by the end of the first year of the project.

Quality control and harmonization of data was performed during the ingestion process to remove duplicates and to correct inconsistencies.

Due to the various types of data input formats, litter reference codes, sampling devices, etc. the work on harmonisation to develop common products on a European scale is still on going.

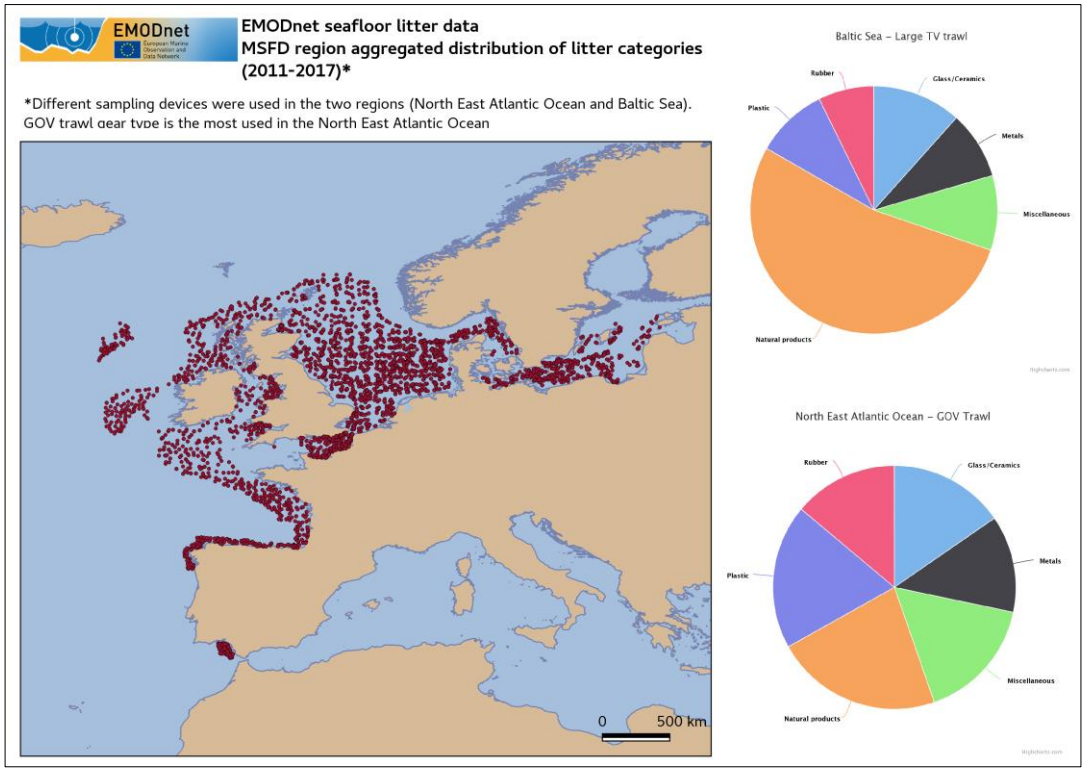
As a first result, static maps with sampling locations have been produced.



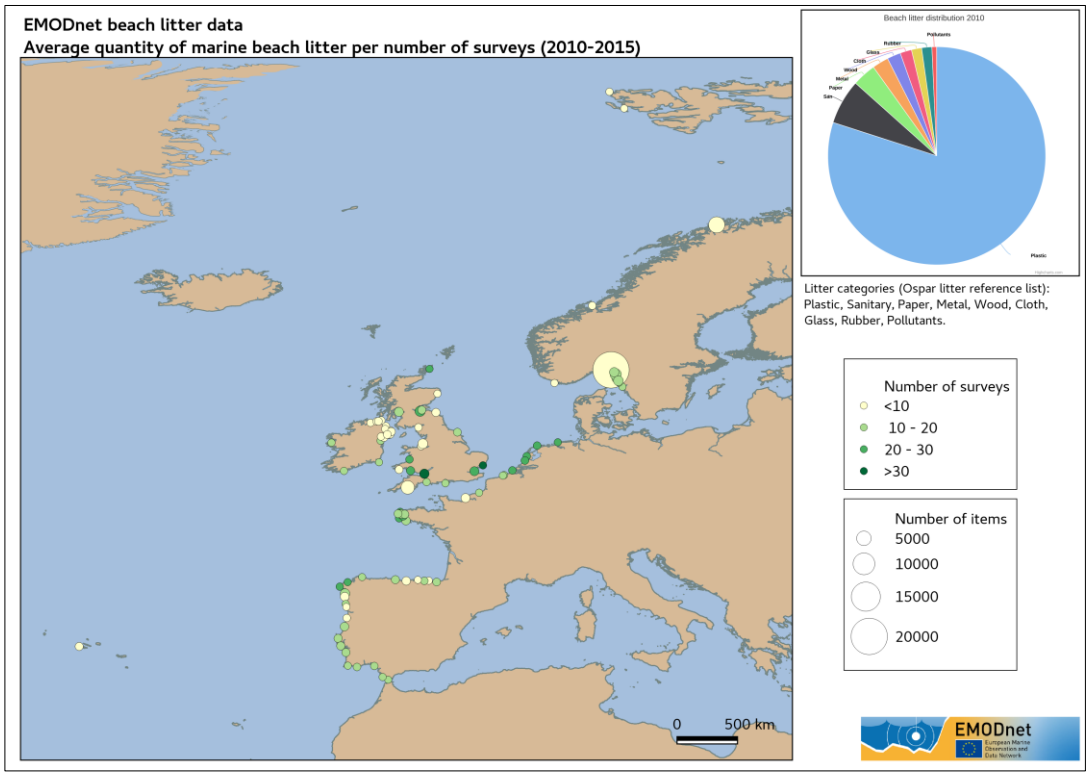
The achievement of this first, apparently simple, result has required an unexpected load of work coming from the handling of the extreme heterogeneity of the three types of marine litter (beach, sea floor and floating micro) also to the different quality of data received.

A partial preliminary version of data products based on the most homogeneous sets of data (as mentioned above, OSPAR and ICES):

Seafloor litter:



Beach litter:



As data gathering progresses and harmonisation and aggregation of data is improved new standardised and uniform data products will be developed. An increasing spatial coverage is expected and visualization products from specific database queries will be created to meet the needs of different groups of stakeholders.

Web services for the access to the validated information and visualization of the products will be also developed. The first work on this aspect has been already made, with initial tests to load litter maps on EMODnet Chemistry viewing and downloading service and working on dynamic styling for the mapping with Geoserver.

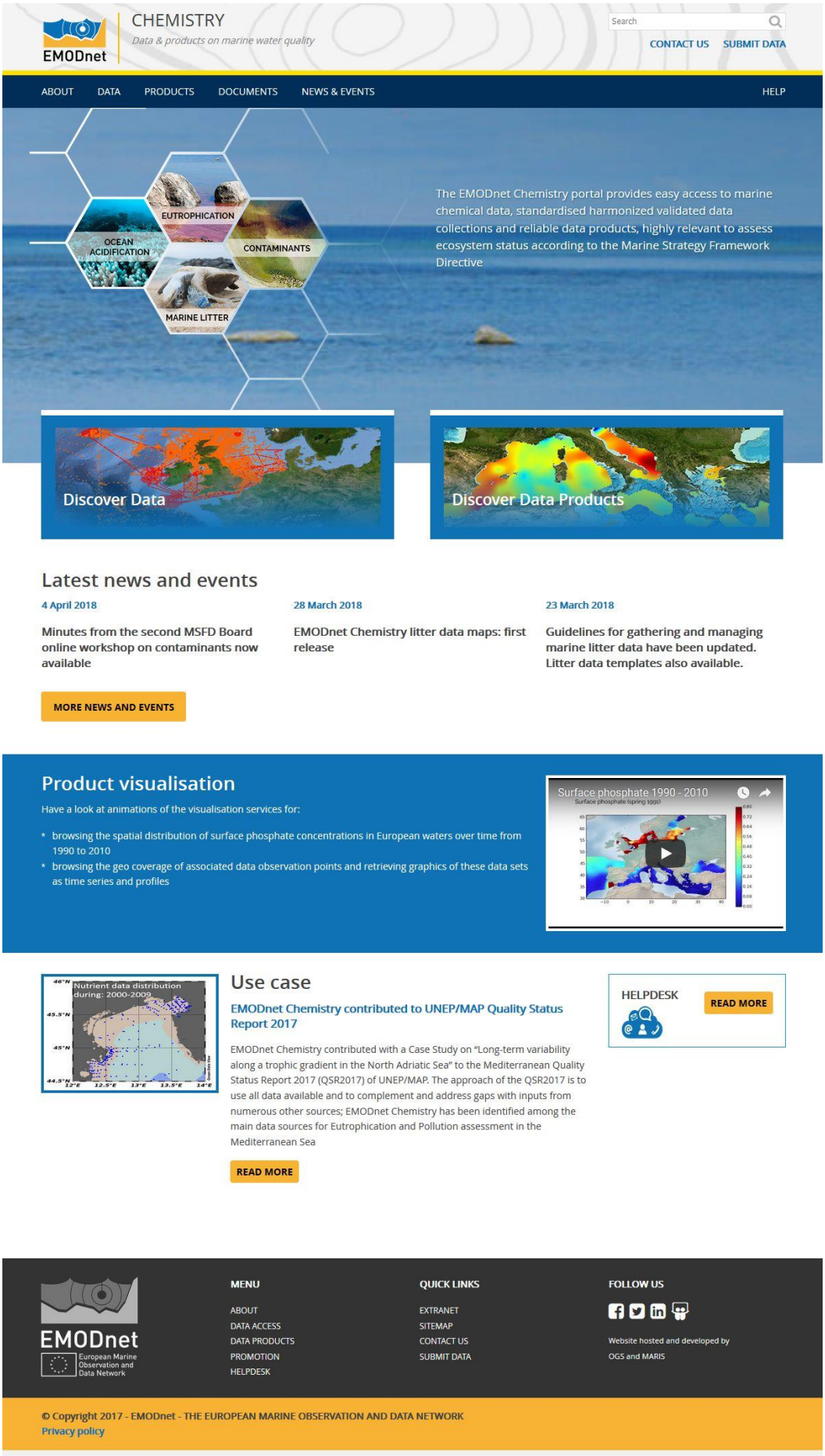
WP4 – Technical development and operation

The EMODnet Chemistry portal has been completely redesigned in styling, texts, and sitemap by OGS and MARIS in order to put the services for discovery and access of marine chemistry data and data products in a central position. For users it is now directly clear that the EMODnet Chemistry portal is dealing with data themes of relevance for MSFD, namely **Eutrophication**, **Pollution**, **Ocean Acidification** and **Marine Litter**. Also the new EMODnet styling and site instructions as provided by TRUST-IT have been adopted. The upgraded portal has been officially launched at the end of November 2017 and is maintained. As part of the portal upgrading also the styling and structure of the various services has been overhauled. This concerns:

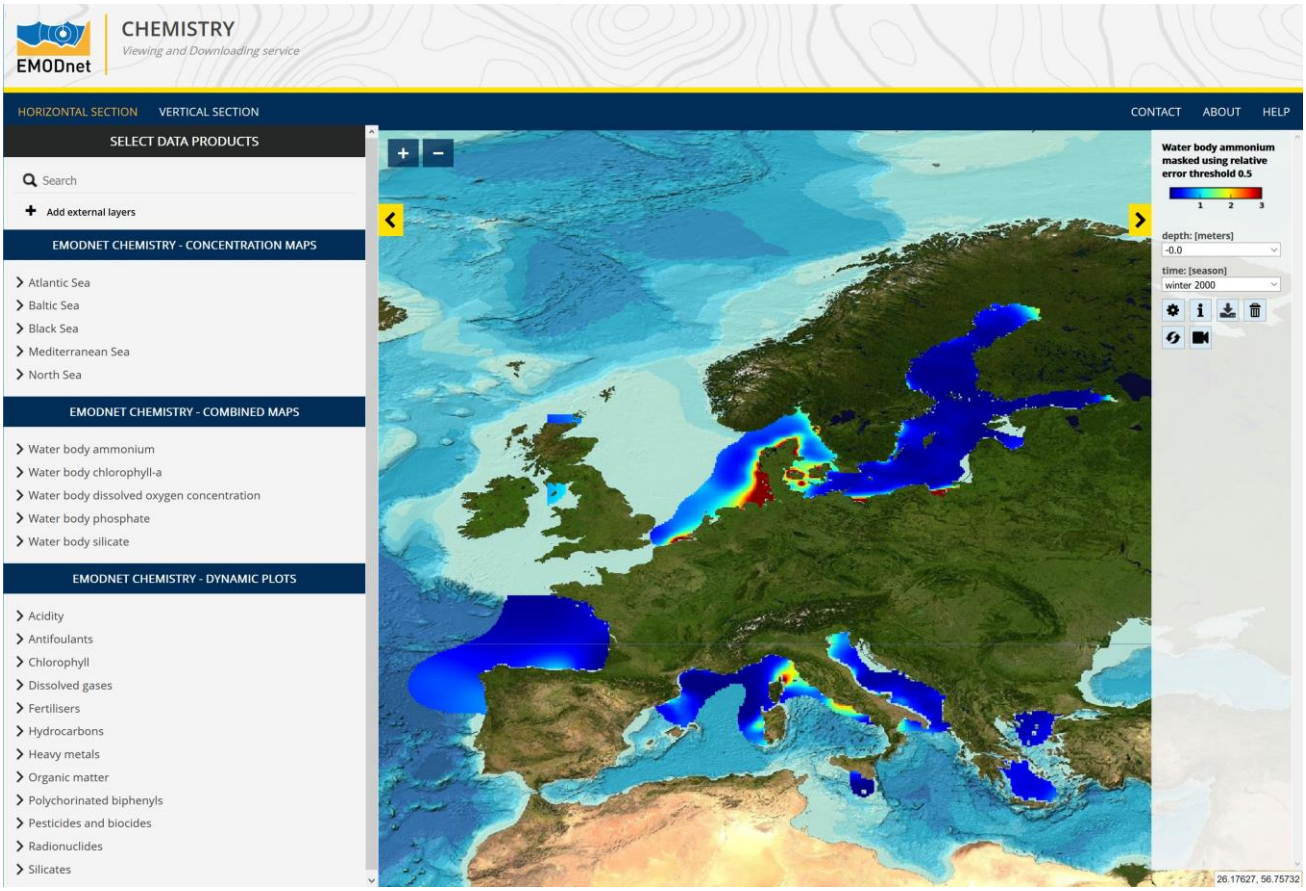
- **CDI Data Discovery and Access Service:** the CDI matrix of chemical groups per sea region has been redesigned by MARIS and the geographical coverage and naming of sea regions has been adapted to the MSFD regions which were provided as shape files by EEA. Moreover the standard Chemistry CDI user interfaces for extended search and quick (facet) search have been upgraded in styling;
- **OceanBrowser Viewing Service:** this service, giving facilities for viewing, browsing and downloading Chemistry DIVA data products has been restyled by MARIS and ULiege and some functionality has been revised;
- **Sextant Products catalogue service**, giving facilities for searching and downloading Chemistry DIVA data products through the link with the OceanBrowser viewing service has been restyled by IFREMER and embedded by OGS as API in the new portal pages. The number of DIVA product entries in the catalogue has been reviewed and reduced from 160 to 45 by concatenating coverage per regions to European cover. Moreover DOIs have been attributed to each of the products and DOI landing pages have been published with download and viewing links.

There are also **advanced viewing services for time series and profiles** by Deltares which allow users to generate and view dynamic plots for selected parameters from data sets, selected from the harmonised, aggregated and validated data collections. It is planned also to revise these viewing services, in particular for displaying contaminants, following requirements which are being discussed with the MSFD Board of Experts.

The new EMODnet Chemistry portal Home page is shown in the following:


EMODnet
CHEMISTRY
Data & products on marine water quality
Search
CONTACT US
SUBMIT DATA
ABOUT
DATA
PRODUCTS
DOCUMENTS
NEWS & EVENTS
HELP
EUTROPHICATION
OCEAN ACIDIFICATION
CONTAMINANTS
MARINE LITTER
The EMODnet Chemistry portal provides easy access to marine chemical data, standardised harmonized validated data collections and reliable data products, highly relevant to assess ecosystem status according to the Marine Strategy Framework Directive
Discover Data
Discover Data Products
Latest news and events
4 April 2018
Minutes from the second MSFD Board online workshop on contaminants now available
28 March 2018
EMODnet Chemistry litter data maps: first release
23 March 2018
Guidelines for gathering and managing marine litter data have been updated. Litter data templates also available.
MORE NEWS AND EVENTS
Product visualisation
Have a look at animations of the visualisation services for:
* browsing the spatial distribution of surface phosphate concentrations in European waters over time from 1990 to 2010
* browsing the geo coverage of associated data observation points and retrieving graphics of these data sets as time series and profiles
Surface phosphate 1990 - 2010
Nutrient data distribution during: 2000-2009
Use case
EMODnet Chemistry contributed to UNEP/MAP Quality Status Report 2017
EMODnet Chemistry contributed with a Case Study on "Long-term variability along a trophic gradient in the North Adriatic Sea" to the Mediterranean Quality Status Report 2017 (QSR2017) of UNEP/MAP. The approach of the QSR2017 is to use all data available and to complement and address gaps with inputs from numerous other sources; EMODnet Chemistry has been identified among the main data sources for Eutrophication and Pollution assessment in the Mediterranean Sea
READ MORE
HELPDESK
READ MORE
EMODnet
European Marine Observation and Data Network
MENU
ABOUT
DATA ACCESS
DATA PRODUCTS
PROMOTION
HELPDESK
QUICK LINKS
EXTRANET
SITEMAP
CONTACT US
SUBMIT DATA
FOLLOW US
Website hosted and developed by OGS and MARIS
© Copyright 2017 - EMODnet - THE EUROPEAN MARINE OBSERVATION AND DATA NETWORK
Privacy policy

All viewing services are adapted to the new styling. In addition, the presentation of Ocean Browser is completely renewed, giving the possibility for simultaneous layer selection and viewing. In the following, the example with combined maps for ammonium:



The Technical Working Group (TWG) made a plan for handling Marine Litter. It was decided to opt for i) developing 2 central EMODnet databases for beach litter data respectively seafloor litter data and ii) adopting and adapting the SeaDataNet CDI – ODV standards for micro plastics data. Also it was decided to seek intensive cooperation and tuning with existing initiatives in the European field of marine litter data management, such as TG-ML for protocols and classifications, OSPAR-MCS, ICES-DATRAS, and MEDITS, for data collection and management, and a number of relevant projects, in particular DeFishGear, JRC project on ML baselines, and JPI-Oceans Baseman project. Following the TWG plan, OGS has developed both central EMODnet databases which were made ready for ingesting beach litter respectively seafloor litter datasets. More details about this are given in the WP2 progress report. Further work is ongoing for finalising the front-ends for querying and plotting data in European maps with statistic views. The beach litter database was modelled after the OSPAR-MCS approach and the seafloor litter database after ICES-DATRAS approach, while OGS also had to deal with identified differences in classifications used by different parties for making the databases also fit for data ingestions from MEDITS and DeFishGear. The close cooperation with TG-ML proved very useful.

Further technical work was undertaken for harmonising monitoring site statistics. Integration of PIWIK/MATOMO was proposed by TRUST-IT as a standard web statistics application and all portals were asked to include a script in their portals. This script reports web activity to the PIWIK/MATOMO account that is configured at the EMODnet Central Portal. MARIS undertook a successful test to see how the stats

from a portal with distributed services, each provided with the PIWIK script, could be combined together in an overall stats whereby visitors are normalised between the portal and services. Still open items for investigation together with the central portal technicians are how PIWIK/MATOMO can track use of web services and how user downloads of data products should be tracked.

Progress was made with developing a prototype Virtual Research Environment (VRE). The pilot concerns the workflow for generating an aggregated and harmonised data collection and DIVA maps for one region and to try out how this workflow can be implemented in a VRE in a controlled environment, only accessible for project partners. There is synergy with the SeaDataCloud VRE development which has recently delivered specifications for the VRE architecture and functions. SeaDataCloud has its focus on generating a Temperature & Salinity climatology for which the workflow is quite comparable to the Chemistry process for eutrophication. In both cases use will be made of online versions of ODV and DIVA which are developing well and already have developed demonstrators. For ODV this concerns a **Data Extractor** and a **Prototype Data Editor.** For DIVA it concerns a Jupyter notebook application. This allows interactivity of the user with the DIVA process while at the same time documenting the process as a story, which can be reproduced and amended. As next step the EMODnet Chemistry workflow will be described in high detail in order to model the various steps. This will be done in interaction with Regional Coordinators.

The technical developments are coordinated by the Technical Working Group (TWG) which came together April 2017 at Venice – Italy and January 2018 at Delft – The Netherlands. Following the meetings extensive minutes - action lists have been prepared and circulated. In addition, several members of the TWG have participated in the central EMODnet Technical Working Group which met July 2017 at Genua – Italy.

WP2 contributes to the following tasks:

- Task 3: Development of procedures for machine-to-machine connections to data and data products.
- Task 4: Development of a new restyled and enriched web portal allowing users to find, visualise and download data and data products.

Both tasks have progressed well as described in the WP4 report above.

WP5 – Uptake, outreach and interaction

Help Desk

EMODnet Chemistry Help Desk offers a quick communication with both users and partners via three channels: online chat, email and phone. A web page describing these channels is easily accessible, but even without reading it, web site visitors cannot ignore the online chat access icon, which is located at the right bottom of all pages. They can click on it for having an immediate contact with a support agent, or also leave there a message while the service is offline. We've embedded a JavaScript code which provides this functionality. Support agents communicate with users via a web application or even a smartphone app. The agents are well informed of all updated EMODnet Chemistry activity and the underlying infrastructure. Usually there is no need to contact SeaDataNet or other collaborating partners. The system allows also whispering: direct chat between agents which could help providing a better response. In case of a missed chat, an email is sent to all group, so an email contact could be made as soon as possible. The chat is logged and being reported in the help desk online sheet. An extensive research has been done in order to find the best chat solution, which is actually free: https://www.tawk.to/ . Also support calls via email and phone are registered in the same online sheet. Help via email is using anti-spammers verification. For the phone assistance we have a dedicated phone number: +390402140491. A voice

introduction has been created by a text-to-speech script so the accent is very clear. The introduction content is: "Welcome to the EMODnet Chemistry Helpdesk. After the beep, please provide the reason for calling, your name and phone number. We will contact you as soon as possible. All data will be handled respecting the General Data Protection Regulation, and eventually transmitted to the European Commission.". Calling users listen to this introduction, and can record a voice message, which is being attached to an email message. The recording is immediately removed from the system.

Interaction and regular dialogue with MSFD stakeholders

As outlined in the proposal, an MSFD board of experts was established within month 3 of the inception of EMODnet Chemistry Phase III. Although the previous phase of EMODnet Chemistry had had a continuous interaction with MSFD stakeholders, such as the regional sea conventions (RSC's), and the Commission and its agencies (DG ENV, EEA, JRC), the stakeholders themselves had expressed the need for a different approach in this phase. The main aim of the MSFD board of experts is therefore to ensure that the thematic experts working within the context of RSC's and the EEA/JRC are consulted, and included in the specification of map and data products resulting from the EMODnet Chemistry. In simple terms, the board of experts should:

- Advise on (suitable) products (and choices of data scope)
- Monitor development of services (i.e. vocabs)
- Be in continuous dialogue

This would ensure a more direct connection between the data product technical generation (EMODnet), and the existing expert use cases as seen in the ecosystem assessments coming from the RSC's (such as the OSPAR Interim Assessment 2017 and HELCOM Holistic Assessment II, 2017).

The MSFD board of experts comprises 38 experts from across the MSFD marine regions. Their expertise is specific to the data products envisaged within the scope of EMODnet Chemistry – Eutrophication (Descriptor 5 in MSFD), Contaminants (D8) and Marine Litter (D10). The membership is mainly national experts working within the context of RSC assessments and indicators, but also includes project managers and specialists from the EEA, JRC and RSC Secretariats.

Although many of the experts were invited to the kick-off meeting of EMODnet Chemistry phase III, this was not a very practical means to arrange the interaction on the three Descriptors. Therefore, each Descriptor, and its pool of experts, was split into separate workshop dialogue meetings. Each workshop was planned as a relatively short online web conference to maximise the attendance of the experts. The workshop is preceded by a package of information from EMODnet, including a questionnaire that outlines the kind of information that EMODnet would be seeking clarification or acceptance of. Due to the differences between the Descriptors, and also the maturity of the data products that can be generated, the questionnaires and the workshops have so far been quite different in nature even though they have followed the same template.

The first workshop was convened on 27th November, 2017 and focussed on D5 Eutrophication. Eutrophication data and data products are the longest established in EMODnet, and as such the questionnaire reflected on the current product offering and how this could be aligned with the needs of assessments input for MSFD purposes. The summary and video of the meeting can be found under news and events on the EMODnet Chemistry website. Overall the specific feedback was very useful and was brought forward into the technical steering group of EMODnet Chemistry, as well as the annual meeting and steering group discussions on the next generation of products.

Partially because of this interaction and follow-up discussions with the EEA, as well as a growing interest from the EEA on streamlining its own data services which run through the EIONET network, there was a significant change in approach announced by the EEA on the 21st December. The EEA announced that it would rely on EMODnet in combination with ICES to fulfil its data needs for the three EEA indicators on 'Hazardous substances in marine organisms' (CSI 049/MAR 001), 'Nutrients in TCM waters' (CSI 021/MAR 005 and 'Chlorophyll in TCM waters'. Their justification being that although they had good coverage of the northern MSFD regions as ICES was already providing these data, that there was poor coverage of data for the Mediterranean and Black Sea coming through the EIONET data flow. So it is hoped that the synergy of these sources can provide a good basis for the EEA indicators. This also challenges the EMODnet project as in addition to the existing contractual milestones and deliverables, there are now expectations and dependencies from the EEA which are not entirely aligned with the existing planned timings of data harvesting and data product generation envisaged by the project.

The 2nd workshop was convened on the 16th March, 2018 and focussed on D8 contaminants. The workshop was quite different from the Eutrophication workshop as many of the participants were less familiar with EMODnet Chemistry, and also EMODnet was proposing an entirely new set of products that are quite different from the ones that are currently published on the EMODnet products portal. The workshop and video are yet to be published on the EMODnet website, briefly the feedback was generally positive to the proposal which will incorporate maps of specific contaminants based on their relation to limits of quantification and Ecological Quality Standards (EQS) values. As the idea of the board of experts is to have a continuous dialogue, a follow-up workshop will be held in the Autumn ahead of the public release of the D8 products to provide an opportunity for the experts to evaluate the products and to be included in the publication process.

The 3rd workshop is yet to be scheduled as it will follow up on the recently released data products for D10 Marine litter. However, the connection to MSFD needs is well established as the JRC/Georg Hanke and Francois Galgani (co-chairs of TG Litter) have been heavily engaged in developing the data streams and the data visualization maps, as well as Alessandra representing EMODnet at the TG Litter meeting in 2017.

EMODnet Chemistry has also been engaged with the more technical part of the MSFD community via activities related to TG Data. EMODnet, together with SeaDataCloud was able to provide support to example for use in a guideline that was developed on the publication of datasets under Article 19.3 (of the MSFD). In the latest meeting of WGDIKE in February, the Commission clarified how through INSPIRE implementation obligations, an EU member state can make use of services provided by a supra-national organisation such as an RSC or EMODnet. This has an implication for MSFD reporting as INSPIRE is referenced in the MSFD Directive, and we may in the future see such a case that EMODnet is used in this way.

Interaction with TG DATA

In addition, EMODnet Chemistry strives for INSPIRE compliance and this is planned by adopting the central transformation services that SeaDataNet is developing for converting SeaDataNet data sets (CDI and ODV / NetCDF formats) to relevant INSPIRE application schemas, depending on types of data. The feasibility of transforming SeaDataNet formats into INSPIRE data standards has already been positively analysed by BODC and SYKE, following the INSPIRE data implementation rules, as part of the SeaDataCloud project. The INSPIRE Directive aims to create a European Union (EU) spatial data infrastructure to enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to this data across Europe. Implementation of the INSPIRE Directive is based on harmonised common data models and standardised ways to share the data. Of primary concern for EMODnet

Chemistry – SeaDataNet are the INSPIRE Themes 'Environmental Monitoring Facilities (EF)' and 'Oceanographic Features (OF)', which have both been defined based upon the OGC Observations & Measurements (O&M) model. In addition to the EF and OF data specifications, a SeaDataCloud technical guideline document has been composed detailing the requirements for the sharing of observations and measurements data.

The MSFD Directive 2008/56/EC defines some obligations, in accordance with Member States (MS), for the implementation of strategies for achieving or maintaining good environmental status (GES) in the marine environment. One of these obligations, described in the **Article 19(3)**, prescribes that MS shall make data resulting from Article 8 and Article 11 available in agreement with the Directive 2007/2/EC (**INSPIRE**). In this context, the **Technical Group on Marine Data (TG-DATA)**, formed in 2012, has taken actions for improving the MSFD Article 19(3) and providing recommendations for the publication of datasets under the MSFD Article 19(3). These guidelines propose some examples and best practices.

EMODnet Chemistry is participating in TG-DATA and was asked to work out together with the MEDCIS project an INSPIRE use case for nutrients data in the Mediterranean Sea. This concerned MSFD Criterion D5C1 "Nutrients concentrations in water". For the use case the results of the SeaDataCloud transformation analysis were successfully applied. Test data were provided by SeaDataCloud and EMODnet Chemistry partner IOF (Croatia). The data were provided with metadata in the SeaDataNet CDI format, and data in SeaDataNet ODV format. The solution developed and proposed in the SeaDataCloud project to deliver data in a INSPIRE compliant way was adopted and adapted.

The classes used in this work are:

- Environmental Monitoring Facility (EMF);
- Feature of Interest (FoI);
- Procedure (Proc) and
- Observed Property (Obs).

The resulting mapping between SeaDataCloud formats and INSPIRE elements can be found at: http://nodc.ogs.trieste.it/INSPIRE_compliant/INSPIREmatching_MEDCIS.xlsx

This mapping has been developed using the matching tables for the EF theme, as improved by SeaDataCloud and uploaded in the INSPIRE Thematic Clusters platform: https://themes.jrc.ec.europa.eu/file/view/170503/inspire-ef-matching-table

A complete version of XML files are downloadable at the following link: http://nodc.ogs.trieste.it/INSPIRE_compliant where an example of nutrients data acquired in Mediterranean is described by INSPIRE standards.

The exercise demonstrates the completeness of SeaDatanet / EMODnet Chemistry metadata with respect to INSPIRE requirements and the feasibility to map SeaDataNet / EMODnet Chemistry data to INSPIRE models. It also demonstrates that the EMODnet Chemistry platform, powered by SeaDataNet, could be used by Member States to expose monitoring data following Article 19(3), i.e. compliant with INSPIRE, through a centralized transformation service, to be developed to convert formats. This use case as reported to TG-DATA has major potential for paving the way for Member States to adopt SeaDataNet standards for part of their monitoring data and EMODnet Chemistry as a distribution platform for providing references to their data in INSPIRE format to MSFD without having to undertake extra INSPIRE efforts themselves.

7 User Feedback

List of feedback received by EMODnet Chemistry during the period March 2017 – March 2018.

The full Help Desk service with telephone, online chat and email with answer in 2 working days is now operative. It's clear that the online chat is the preferred helpdesk channel. No calls were received via email/phone. Website visitors got quick support via this channel. EMODnet Chemistry agents were handling also questions about SeaDataNet infrastructure, contacting SeaDataNet helpdesk only upon need.

Date	Name	Organization	Type of user feedback (e.g. technical, case study etc.)	Response time
23/05/17	Neil	ICES	The user had urgent need for a specific presentation and couldn't find it since the portal was in updating process. The file was promptly sent to him even before updating the portal.	<1 min
09/06/17	Aysun	IHE Delft Institute for Water Education	An error. User having problem with registration to Copernicus	<1 min
07/24/17 11:37 AM	Tiago Santos	CEFAS	The user was quering the "Emodnet-chemistry CDI search" with some selected options (he attached a file with the criteria), when he added the result to the basket he received an error (a screenshot has been added). The problem has been reported to the web search interface's administrators.	<1 min
07/31/17 12:53 PM	Tiago Santos	CEFAS	The user asked for the possibility to do a search "based on a list of files in a txt file" (for example by submitting this list through the "Emodnet-chemistry CDI search" interface). The issue has been reported to the web search interface's administrators.	<1 min
18/10/2017	Peter Herman	Deltares	Netcdf files not correctly created. The problem is due to some bug in the program that created the netcdf files. The issue will be solved when the new products are out (spring 2018).	<1 min.
10/11/2017	Eyglo Olafsdottir	MARINE AND FRESHWATER RESEARCH INSTITUTE	Some questions related the data submission.	<1 min.
18/01/2018	Hong Minh Le	Royal Belgian Institute of Natural Sciences	A question about finding information.	<1 min.
12/02/2018	BMM		A question about why are there two different OceanBrowser interfaces	<1 min.

22/03/2018	Raymond		User wonders how to handle the downloaded ODV data files.	<1 min.
09/03/2018	Chantal Vanhove	European Commission	User: I would be interested to know when the map on marine litter will be available. Agent: we hope we'll have something within next months	<1 min.
23/03/2018	Raymond	Royal Belgian Institute of Natural Sciences	User: Thank you for answering. I would have hoped for something more explicit. Is is possible to e-mail me when you have a clear view on the release? People at DG MARE, and especially Directorate A which is responsible for Maritime Affaires and Blue Economy, are keen to use the map. Thank you in advance.	<1 min.

8 Meetings held/attended since last report

List of the internal and external meetings held/participated by the contractor during the period March 2017 – March 2018.

Date	Location	Title	Internal/External + Short Description
14-15/03/2017	Brussels,, Belgium	Workshop on Marine Litter Baselines	Workshop dedicated to understand the availability of data on marine litter in the various compartments/matrices
28-31/03/2017	Kuala Lumpur, Malaysia	24th Session of the IOC Committee on IODE	Informative information on EMODnet Chemistry were provided to IODE representatives
03-04/04/2017	Venice, Italy	First EMODnet Chemistry Technical Working Group	With MARIS, OGS, IFREMER, ICES, AWI, ULg, ISPRA, NERC-BODC and Deltares, aimed to set the strategy for the Marine Litter data collection, the updating and optimization of viewing services, related data and metadata
10-12/04/2017	Limassol, Cyprus	EMODnet Data Ingestion Meeting	Discussing ingestion priorities for Chemistry and pathways
24-28/04/2017	Las Palmas de Gran Canaria	Maritime Spatial Planning, Ecosystem Approach and Supporting Information Systems (MaPSIS)	EMODnet chemistry results in support to EU marine policies: use cases
11/05/2017	Skype	Meeting with UNEP/MAP	Meeting with UNEP/MAP, OGS and HCMR to identify how to use EMODnet Chemistry data for the Mediterranean QSR.
16/05/2017	Trieste, Italy	1st EMODnet Chemistry Steering Committee meeting	With OGS, MARIS, IFREMER, IMR, AU-DCE, SMHI, HCMR, NIMRD, ICES and ISPRA, aimed to agree on the 1st year work plan and deliverables
17-18/05/2017	Trieste, Italy	1st EMODnet Chemistry Coordination group meeting with session dedicated to the Board of MSFD experts	1st Plenary meeting aimed to share the work plan, with deadlines and deliverables with the whole group and the Board of MSFD experts. The need to get feedback on existing data products to tune future development was strongly underlined
23/05/2017	Brussels, Belgium	EMODnet Kick-off meeting	Organized by EASME with the coordinators from all lots, the secretariat and DG MARE
07/06/2017	Copenhagen Denmark	TG DATA	Discussion on data flow to fulfill MSFD Art 19.3 with EEA, INSPIRE, MS and EMODnet

08-09/06/2017	Gdansk, Poland	MSFD TG Marine Litter	EMODnet Chemistry approach was presented together with the data format defined for micro-litter
15/06/2017	Rome, Italy	Meeting with INFO/RAC	Informal meeting to discuss and agree on the integration of EMODnet standards into the Mediterranean platform
5-6/07/2017	Genova, Italy	EMODnet Central Portal TWG	Technical meeting for the discussion of the central portal features and new reporting requests
25/07/2017	Skype	Meeting with OSPAR and MCS	Meeting between OSPAR, OGS and MCS to set the terms of reference for beach litter data exchange
29/08/2017	Skype	Meeting with UNEP/MAP	Meeting between UNEP/MAP and OGS to clarify administrative issues linked to their subcontracting
12/09/2017	Lisbon, Portugal	JPI Ocean BASEMAN	Invitation to BASEMAN workshop to present and discuss EMODNet Chemistry format for micro-litter
13-15/09/2017	Rome, Italy	8th EMODnet Steering Committee	Presenting project progress and contributing to discussions
25-26/09/2017	Gotheborg, Sweden	EMODnet Chemistry Steering Committee	Monitoring progress and planning further activities
27/11/2017	Video-conference	MSFD board of experts for EMODnet Chemistry: Eutrophication online workshop	The first online workshop of the MSFD board of experts for EMODnet Chemistry was aimed to consolidate the cooperation with Regional Sea Conventions in order to tune EMODnet activities in support of MSFD implementation. This first workshop was focused on MSFD Descriptor 5 Eutrophication.
4-5/12/2017	Delft, Netherlands	2nd Technical Working Group Meeting	Meeting of the technical group to discuss the status of development and the next steps
11/01/2018	Video-conference	Agreement of the format and content for the INSPIRE use case	TG DATA meeting to contribute to Art 19.3 recommendations on publication of datasets
18/01/2018	Paris, France	SeaDataCloud-EMODnet Chemistry-CMEMS strategic meeting	Meeting to discuss the terms of reference for two bilateral MoU for data exchange
22-25/01/2018	Porto, Portugal	EUDAT Conference "Putting the EOSC vision into practice“	Presentation on Adopting and adapting SeaDataNet services for EMODnet Chemistry
06-08/02/2018	Roskilde, Denmark	EMODnet Chemistry Annual Plenary and SC meeting	
12-13/02/2018	Brussels, Belgium	TG DATA	INSPIRE compliance for EMODNet Chemistry data models

22-23/02/2018	Athens, Greece	MEDCIS Stekeholder Workshop on Marine Litter and Contaminants	EMODnet Chemistry activity and standards
27/02/2018	Video-conference	Regional data aggregation and validation	Consultation on results and open issues faced by the RLs

9 Outreach and communication activities

List of the relevant communications activities or products developed/executed during the period March 2017 – March 2018. Relevant scientific and/or popular articles are reported as well.

Date	Media	Title	Short description and/or link to the activity
14-15/3/2017	Presentation	EMODnet Chemistry	Introduction to EMODnet Chemistry with focus on marine litter approach for ML Baselines.
28-31/3/2017	Poster	The Italian National Oceanographic Data Center	Demonstration on how EMODnet data infrastructure supports IODE objectives as it is further building over the European network of NODCs.
24-28/4/2017	Presentation	EMODnet chemistry results in support to EU marine policies: use cases	Oral presentation to Maritime Spatial Planning, Ecosystem Approach and Supporting Information Systems (MaPSIS)
7/6/2017	Presentation	EMODnet	For all lots, with the point of view of OSFD data reporting
8-9/6/2017	Presentation	EMODnet Chemistry	EMODnet Chemistry approach and the micro-litter data format
15/6/2017	Presentation	EMODnet Chemistry platform for sharing marine monitoring data for contaminants, nutrients and marine litter in support to MSFD implementation	EMODnet chemistry data infrastructure
16-20/5/2017	interview		Interview at local and national radio broadcast and four articles in the local newspaper (se links on the portal)
25/8/2017	Presentation	EMODnet Chemistry	EMODnet Chemistry data portal presented to CMEMS-Med-MFC-Biogeochemistry group
September 2017	Paper	Spatio - temporal variability of chemical seawater parameters around the Spanish coasts	Underline the importance of homogenize and validate Data to be included in EMODnet for long-term accessibility
12/9/2017	Presentation	EMODnet Chemistry	EMODnet Chemistry approach and the micro-litter data format
6/10/2017	Presentation	Updates from EMODnet Chemistry	EMODnet Chemistry presented the last results focused to Black Sea area to the 33rd BSC Regular Meeting, Istanbul. The BSC welcomed the cooperation with EMODNet Initiative and endorsed the draft MoU with

			OGS (Italy) representing the EMODNet Chemistry II
18-19/10/2017	Presentation	SeaDataCloud annual meeting	EMODnet Chemistry was presented
23-24/10/2017	Presentation	EMODnet Chemistry platform to address the needs of WMO and UNESCO's IOC community: use cases	EMODnet Chemistry platform and its link to SeaDataNet have been presented to JCOMM-5 Marine Technical Conference, WMO headqarters
31/10/2017	Poster	Romanian Research Salon	EMODnet Chemistry was presented at the Romanian Research Salon organized by the Romanian Ministry of Research and Innovation between 25-27 October 2017, in the Palace of Parliament, Bucharest (Romania).
7/10/2017	Presentation	scientific meeting in Daugavpils University by Latvian Institute of Aquatic Ecology	EMODnet Chemistry was presented on the 6th of December, 2017 during a scientific meeting in Daugavpils University by Latvian Institute of Aquatic Ecology.
9-10/11/2017	Presentation	EMODnet Chemistry contribution to data publication	EMODnet Chemistry presented and discussed at the 5th TG DATA meeting, with action for the development of end-to-end examples on the use of INSPIRE data-models
15-17/11/2017	Openday	Open Sea Lab	A three day open data bootcamp hackathon to ideate and co-create innovative solutions to unique problems using EMODnet's marine data and ocean observations
01/12/2017	Article	EMODnet Chemistry Spatial Data Infrastructure for observations, data and information	Submitted the article to the Ocean & Coastal Management MaPSIS conference special issue
18/01/2018	Presentation	EMODnet Chemistry objectives and possible interfaces to/from CMEMS	The available data products and the interoperability solutions are presented to evaluate possible collaborations
22-25/01/2018	Presentation	Adopting and adapting SeaDataNet services for EMODnet Chemistry	EMODnet Chemistry data infrastructure and its link to SeaDataNet was presented to a wider audience, Porto, Portugal
12-13/02/2018	Presentation	Using INSPIRE for describing MSFD Criterion D5C1 "Nutrients concentrations in water"	Bruxelles, Belgium

22/02/2018	Presentation	Marine litter data management at European scale EMODnet	Athens, Greece
23/02/2018	Presentation	How EMODnet could help to collect and manage data to be used for GES assessment, which are not in national databases (e.g. from regular monitoring or research projects)	Athens, Greece
16/03/2018	Video-conference	What is EMODnet?	New contaminants maps presented to MSFD board of experts
June 2018	Publication	Seasonal and interannual trends of trophic status in northern Adriatic Sea in relation to nutrient loadings	Makes use of EMODnet Chemistry data

Publication:

Grilli F., F. Bernardi Aubry, M. Bastianini, C. Bergami, M. Cabrini, E. Camatti, A. Campanelli, B. Cataletto, S. Cozzi, P. Del Negro, M. Giani, S. Guicciardi, M. Marini, A. Penna, P. Penna, A. Pugnetti, M. Ravaioli, F. Riminucci, A. Rinaldi, F. Ricci, C. Totti, P. Viaroli, Seasonal and interannual trends of trophic status in northern Adriatic Sea in relation to nutrient loadings, to be presented at 49° Congresso della Società Italiana di Biologia Marina, Cesenatico (FC), 4-8 June 2018.

Matteo Vinci, Alessandra Giorgetti, and Marina Lipizer, The role of EMODnet Chemistry in the European challenge for Good Environmental Status, Nat. Hazards Earth Syst. Sci., 17, 197–204, 2017, www.nat-hazards-earth-syst-sci.net/17/197/2017/, doi:10.5194/nhess-17-197-2017.

A. Giorgetti, E. Partescano, A. Barth, L. Buga, J. Gatti, G. Giorgi, A. Iona, M. Lipizer, N. Holdsworth, M.M. Larsen, D. Schaap, M. Vinci, M. Wenzer, EMODnet Chemistry Spatial Data Infrastructure for marine observations and related information. Ocean and Coastal Management, in press.

E Tel, M Alvarez, A Bode, A Cabrero, I Chamarro, MC Garcia-Martinez, C. Rodriguez-Puente, P Velez, A Viloria 2017. Spatio - temporal variability of chemical seawater parameters around the Spanish coasts. IAPSO-IAMAS-IAGA. Cape Town, 27/08/2017 - 01/09/2017

10 Updates on Progress Indicators

Using the indicator as a header, the metrics collated and the time interval are listed..

Indicator 1 - Volume of data made available through the portal

The total number of CDIs for chemistry data sets has increased from **841356 to 942038.**

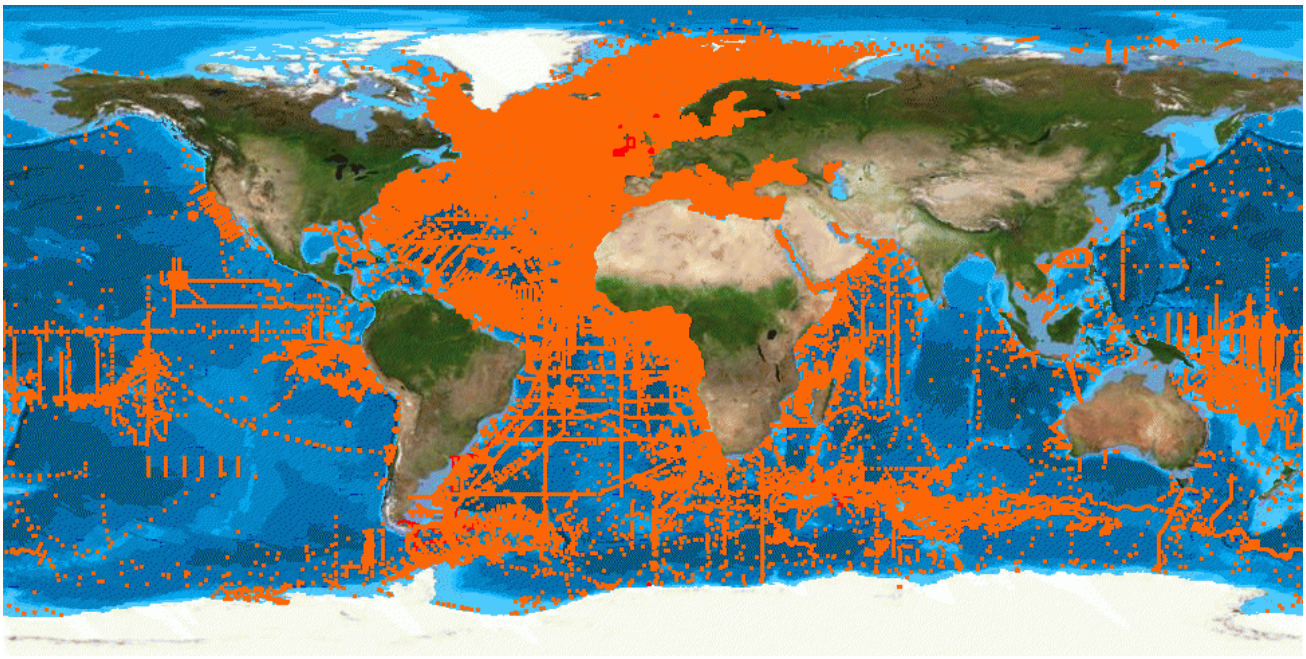


Image: Map of all entries in the CDI catalogue service

The total in production covers the whole globe. Specifically relevant for European waters (Lat Long box**: N80, W-30 ; N20, E45)** has increased from **745551 to 822108.**

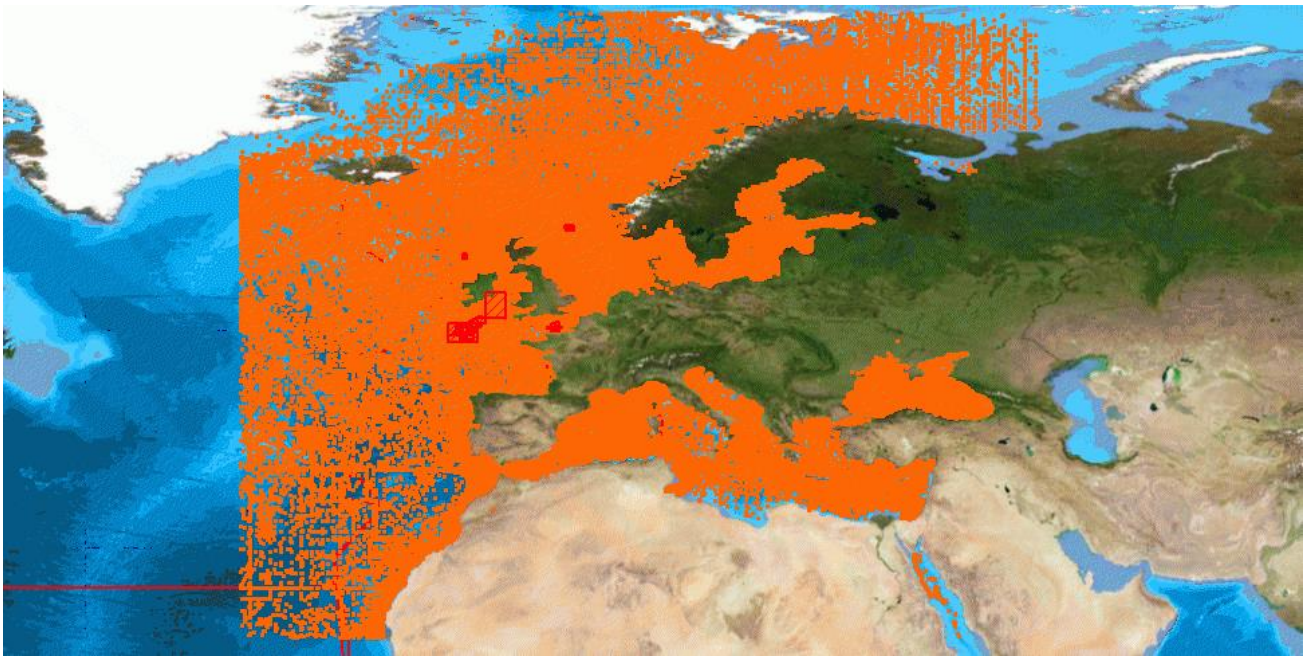


Image: Map of entries in the CDI catalogue service for European marine waters

Of these **689558** are unrestricted (unrestricted and SeaDataNet license), while others (**132550**) require (possible) negotiation due to restrictions. Users can submit requests for access by means of the shopping mechanism in the CDI Data Discovery and Access service. This way data providers are informed about the requests and will contact the users by email or telephone for further discussing their requests. Most of the time this leads to positive decisions and delivery of data sets through the CDI Data Discovery and Access service or directly by e-mail by-passing the CDI service. It can also be that no agreement can be reached and then users will not get access to the requested data sets. Anyway the negotiation is an issue between the users and the data providers whereby the CDI service and in particular its Request Status Manager (RSM) service can serve as an instrument, but it can be by-passed.

The division per **Discovery Parameter** is as follows:

Parameter	No of CDI	No restrictions	Restrictions
Dissolved oxygen parameters in the water column	524983	460639	64344
Salinity of the water column	515005	456066	58939
Temperature of the water column	505262	450539	54723
Phosphate concentration parameters in the water column	374320	320119	54201
Nitrate concentration parameters in the water column	313398	270196	43202
Silicate concentration parameters in the water column	302123	253492	48631
Vertical spatial coordinates	239697	176925	62772
Chlorophyll pigment concentrations in water bodies	235201	211101	24100
Nitrite concentration parameters in the water column	220154	180429	39725
Ammonium and ammonia concentration parameters in water bodies	217686	178204	39482
Alkalinity, acidity and pH of the water column	128834	96391	32443
Particulate total and organic nitrogen concentrations in the water column	110724	104299	6425
Particulate total and organic phosphorus concentrations in the water column	101233	97382	3851
Dissolved total or organic phosphorus concentration in the water column	94625	82241	12384
Density of the water column	76648	73196	3452
Dissolved total and organic nitrogen concentrations in the water column	73035	70395	2640
Phaeopigment concentrations in the water column	43772	37136	6636
Concentration of suspended particulate material in the water column	35224	23976	11248
Transmittance and attenuance of the water column	30274	27673	2601
Raw fluorometer output	27746	15117	12629
Particulate total and organic carbon concentrations in the water column	23791	20804	2987
Concentration of inorganic sulphur species in the water column	23518	21831	1687
Electrical conductivity of the water column	21178	19774	1404
Dissolved organic carbon concentration in the water column	20298	14714	5584
Inorganic chemical composition of sediment or rocks	18576	9669	8907
Concentration of other organic contaminants in the water column	15785	5186	10599
Pesticide concentrations in water bodies	15781	11185	4596

Parameter	No of CDI	No restrictions	Restrictions
Concentration of other hydrocarbons in the water column	15189	14048	1141
Reference numbers	14804	13354	1450
Secchi disk depth	14382	10101	4281
Visible waveband radiance and irradiance measurements in the water column	13407	11427	1980
Moored instrument depth	13283	13177	106
Concentration of polycyclic aromatic hydrocarbons (PAHs) in sediment samples	11647	5573	6074
Redox potential in sediment	10204	0	10204
Dissolved metal concentrations in the water column	9716	7481	2235
Dissolved inorganic nitrogen concentration in the water column	9437	3779	5658
Concentration of polychlorobiphenyls (PCBs) in sediment samples	8776	3953	4823
Metal concentrations in biota	8676	3095	5581
Carbon concentrations in sediment	8241	1663	6578
Pollution events	8134	8134	0
Quality control flags	7622	6846	776
Sediment grain size parameters	7150	5281	1869
Nitrogen concentrations in suspended particulate material	6515	2854	3661
Concentration of polychlorobiphenyls (PCBs) in biota	6427	1356	5071
Variable fluorescence parameters	6420	5015	1405
Carbon concentrations in suspended particulate material	5941	2037	3904
Pesticide concentrations in sediment	5516	4106	1410
Raw temperature and/or salinity instrument output	5295	1803	3492
Raw oxygen sensor output	5250	1822	3428
Sound velocity and travel time in the water column	5180	5118	62
Concentration of other organic contaminants in sediment samples	5145	4698	447
Optical backscatter	4541	1963	2578
Light extinction and diffusion coefficients	4260	0	4260
Pesticide concentrations in biota	4222	1887	2335
Date and time	4025	3706	319
Raw light meter output	3819	1155	2664
Carotenoid and flavenoid pigment concentrations in water bodies	3765	1538	2227
Temperature variation in the water column	3446	3446	0
Sea level	3330	696	2634
Nitrogen concentrations in sediment	3316	2155	1161
Metal concentrations in sediment pore waters	3239	2708	531
Unclassified pigment concentrations in the water column	3138	273	2865
Concentration of polycyclic aromatic hydrocarbons (PAHs) in the water column	3102	2359	743
Metadata parameters	3089	2305	784
Unspecified	3044	2652	392
Total metal concentrations in water bodies	2761	1350	1411
Light absorption in the water column	2658	1624	1034

Parameter	No of CDI	No restrictions	Restrictions
Concentration of polycyclic aromatic hydrocarbons (PAHs) in biota	2651	891	1760
Radioactivity in water bodies	2609	1375	1234
Organometallic and organometalloid species concentration parameters in sediments	2339	2046	293
Particulate metal concentrations in the water column	2229	1123	1106
Concentration of organic matter in sediments	2171	1126	1045
Raw suspended particulate material concentration sensor output	1979	1849	130
Concentration of other organic contaminants in biota	1797	113	1684
Organometallic species concentration parameters in biota	1673	1607	66
Horizontal spatial co-ordinates	1652	1574	78
Lithology	1619	599	1020
Concentration of carbohydrates, phenols, alkanols (alcohols), ethers, aldehydes and ketones in sediment	1616	704	912
Concentration of polychlorobiphenyls (PCBs) in the water column	1503	1139	364
Dissolved concentration parameters for other gases in the water column	1409	844	565
Concentration of polycyclic aromatic hydrocarbons (PAHs) in suspended particulate material	1051	1051	0
Primary production in the water column	1021	651	370
Urea concentration parameters in the water column	1013	704	309
Sedimentary structure	921	0	921
Biota lipid concentrations	884	577	307
SeaDataNet biological format biotic parameters	759	641	118
Concentration of organic matter in water bodies	755	711	44
Sediment water content, porosity and surface area	735	648	87
Suspended particulate material grain size parameters	669	114	555
Horizontal velocity of the water column (currents)	660	660	0
Concentration of other organic contaminants in suspended particulate material	648	648	0
Dissolved trace metalloid and inorganic selenium concentrations in water bodies	531	339	192
Geological sample radioactivity	523	459	64
Surfactant concentrations in water bodies	517	517	0
Total dissolved inorganic carbon (TCO2) concentration in the water column	514	366	148
Stable isotopes in sediment	459	0	459
Phosphorus concentrations in suspended particulate material	399	83	316
Visible waveband radiance and irradiance measurements in the atmosphere	339	205	134
Bacteria taxonomic abundance in water bodies	333	0	333
Terrestrial detritus in the water column suspended particulate material	322	322	0
Phytoplankton taxonomic abundance in water bodies	317	317	0
Concentration of alkanes in the water column	316	316	0

Parameter	No of CDI	No restrictions	Restrictions
Trace metalloid concentrations in biota	307	260	47
Bacteria generic abundance in water bodies	293	257	36
Carbonate chemistry in sediment pore waters	285	120	165
Acoustic backscatter in the water column	283	283	0
Mineralogical composition	254	0	254
Phaeopigment concentrations in sediment	244	228	16
Water body redox potential	231	231	0
Concentration of carbohydrates, phenols, alkanols (alcohols), aldehydes and ketones in water bodies	194	194	0
Concentration of proteins in the water column	194	194	0
Zooplankton and zoobenthos morphological parameters	185	185	0
Concentration of inorganic halogens in water bodies	168	168	0
Concentration of polychlorobiphenyls (PCBs) in suspended particulate material	163	163	0
Other halocarbon concentrations in water bodies	156	83	73
Nutrient concentrations in sediment pore waters	151	120	31
Shellfish morphology, age and physiology	148	82	66
Regenerated production in water bodies	144	144	0
Raw in-situ nutrient analyser output	143	143	0
New production in water bodies	142	142	0
Sediment lipid concentrations	137	121	16
Chlorophyll pigment concentrations in sediment	136	120	16
Dissolved organic carbon concentrations in sediment pore waters	136	120	16
Oxygen production and respiration in the water column	136	136	0
Concentration of aliphatic hydrocarbons in sediment samples	133	13	120
Other physical and chemical properties of suspended particulate material	132	132	0
Concentration of inorganic sulphur species in sediment	131	46	85
Colloidal organic carbon concentration in the water column	100	100	0
Geological sample density	80	0	80
Organosulphur and organoselenium species concentration parameters in water bodies	76	76	0
Radioactivity in biota	64	64	0
Bacteria non taxonomy-related biomass expressed as carbon per unit volume of the water column	63	0	63
Excretion rate parameters in the water column	58	58	0
Nitrification rate in the water column	57	57	0
Organometallic and organometalloid species concentration parameters in water bodies	55	42	13
Atmospheric humidity	51	4	47
Stable isotopes in water bodies	46	20	26
Phytoplankton generic abundance in water bodies	41	5	36
Concentration of adenlylates in the water column	38	38	0

Parameter	No of CDI	No restrictions	Restrictions
Fish morphology, age and physiology	38	38	0
Bacterial production in the water column	36	0	36
Phytoplankton generic biomass in water bodies	36	0	36
Geotechnics	32	32	0
Water body lipid concentrations	32	32	0
Air pressure	28	28	0
Air temperature	27	27	0
Plankton biomass expressed as carbon per unit volume of the water column	27	0	27
Wind strength and direction	27	27	0
Concentration of silicon species in the water column	24	9	15
Horizontal platform movement	24	24	0
Wave direction	23	23	0
Wave height and period statistics	23	23	0
Geological sample magnetic, electrical and acoustic properties	22	0	22
Sediment accumulation rate	22	0	22
Phytoplankton taxonomic biomass in water bodies	20	20	0
Chlorofluorocarbon concentrations in the water column	16	16	0
Experiment state variables	15	0	15
Vertical platform movement	11	11	0
Water body released tracers	11	11	0
Bathymetry and Elevation	10	10	0
Solar Radiation	6	6	0
Concentration of inorganic halogens in sediment pore waters	5	0	5
Concentration of inorganic sulphur species in sediment pore water	5	0	5
Platform or instrument orientation	4	4	0
Dissolved oxygen parameters for sediments	1	1	0
Engineering parameters	1	1	0
Partial pressure (pCO2) and fugacity (fCO2) of carbon dioxide in the water column	1	1	0
Sediment age	1	0	1

Table: Overview of parameter types and number of CDI entries for European marine waters

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

Data provider	Country	No of CDI	No restrictions	Restrictions
British Oceanographic Data Centre	United Kingdom	65741	39543	26198
German Oceanographic Datacentre (NODC)	Germany	18444	14637	3807
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Division of Oceanography	Italy	49969	24215	25754
Institute of Marine Science S.S. of Lerici (SP)	Italy	484	1	483
CNR, Institute of Marine Science (ISMAR) - Ancona	Italy	4368	50	4318
CNR, Institute of Atmospheric Sciences and Climate (ISAC) (Rome)	Italy	552	552	0
Institute of Fishery Resources (IFR)	Bulgaria	257	257	0
Institute of Meteorology and Water Management National Research Institute, Maritime Branch in Gdynia (IMWM MB)	Poland	2726	0	2726
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	Greece	11120	6829	4291
IEO/Spanish Oceanographic Institute	Spain	21200	6964	14236
Marine Institute	Ireland	6615	6615	0
Flanders Marine Institute	Belgium	3645	2847	798
IFREMER / IDM / SISMER - Scientific Information Systems for the SEA	France	36167	35944	223
Swedish Meteorological and Hydrological Institute	Sweden	67107	67037	70
IHPT, Hydrographic Institute	Portugal	3974	3037	937
Polish Geological Institute - National Research Institute, Branch of Marine Geology (PGI BMG)	Poland	326	0	326
Institute of Marine Research - Norwegian Marine Data Centre (NMD)	Norway	42186	42186	0
NIOZ Royal Netherlands Institute for Sea Research	Netherlands	4044	4030	14
Netherlands Institute for Ecology, Centre for Estuarine and Marine Ecology	Netherlands	12894	2145	10749
All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC) National Oceanographic Data Centre (NODC)	Russian Federation	52234	52234	0
P.P.Shirshov Institute of Oceanology, RAS	Russian Federation	876	876	0
National Institute of Fisheries Research (INRH)	Morocco	552	0	552
Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology	Bulgaria	1376	1325	51

Data provider	Country	No of CDI	No restrictions	Restrictions
Iv.Javakhishvili Tbilisi State University, Centre of Relations with UNESCO Oceanological Research Centre and GeoDNA (UNESCO)	Georgia	551	551	0
Institute of Marine Sciences, Middle East Technical University	Turkey	8492	2155	6337
National Institute for Marine Research and Development Grigore Antipa""	Romania	8210	3000	5210
Latvian Institute of Aquatic Ecology	Latvia	3867	3867	0
Institute of Oceanography and Fisheries	Croatia	2320	2320	0
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	Malta	168	168	0
Cyprus Oceanography Center	Cyprus	580	580	0
Marine Systems Institute at Tallinn University of Technology	Estonia	18264	17753	511
State Oceanographic Institute (SOI)	Russian Federation	11243	0	11243
Marine Hydrophysical Institute	Ukraine	4652	2058	2594
Aarhus University, Department of Bioscience, Marine Ecology Roskilde	Denmark	200451	200451	0
International Council for the Exploration of the Sea (ICES)	Denmark	32814	32814	0
Karadeniz Technical University, Faculty of Marine Sciences	Turkey	246	29	217
Sinop University, Fisheries Faculty	Turkey	343	343	0
Dokuz Eylul University, Institute of Marine Science and Technology	Turkey	1603	0	1603
Istanbul University, Institute of Marine Science and Management	Turkey	339	171	168
Institute of Biology of the Southern Seas, NAS of Ukraine	Ukraine	998	998	0
Ukrainian Hydrometeorological Institute - Marine Branch	Ukraine	26089	26089	0
Russian State Hydrometeorological University, St-Petersburg	Russian Federation	172	172	0
National Institute of Meteorology and Hydrology, Bulgarian Academy of Sciences	Bulgaria	839	602	237
Israel Oceanographic and Limnological Research (IOLR)	Israel	3956	3623	333
BRGM / Office of Geological and Mining Resources	France	1087	0	1087
Finnish Environment Institute	Finland	11535	11535	0
Ukrainian scientific center of Ecology of Sea (UkrSCES)	Ukraine	5512	5512	0
Odessa National I.I.Mechnikov University	Ukraine	889	25	864
National Institute of Biology - NIBMarine Biology Station	Slovenia	7837	3745	4092
Institut National des Sciences et Technologies de la Mer â€“ INSTM	Tunisia	868	21	847
Scientific - Research Firm GAMMA""	Georgia	1194	1194	0
Rijkswaterstaat Water, Traffic and Environment	Netherlands	13197	13197	0

Data provider	Country	No of CDI	No restrictions	Restrictions
Institute of Geology and Geography of Nature Research Centre	Lithuania	212	212	0
Management Unit of North Sea and Scheldt Estuary Mathematical Models, Belgian Marine Data Centre	Belgium	9760	9760	0
Geological Survey of Estonia	Estonia	542	542	0
Finnish Meteorological Institute	Finland	25064	25064	0
Ankara University	Turkey	24	24	0
Danube Hydro-meteorological Observatory	Ukraine	44	0	44
Faculty of Geography and Earth Sciences, University of Latvia (LU)	Latvia	721	0	721
National Environmental Agency of the Ministry of Environment Protection and Natural Resources	Georgia	62	62	0
Institute of Marine Biology (IMBK)	Montenegro	805	758	47
ISPRA-Institute for Environmental Protection and Research	Italy	4540	4540	0
PANGAEA - Data Publisher for Earth & Environmental Science	Germany	4242	4242	0
Portuguese Institute of Ocean and Atmosphere	Portugal	919	57	862
TOTAL		**822108**	**689558**	**132550**

Table: Overview of data centres and number of CDI entries for European marine waters

These centres are government and research institutes: no industry. The increase in the first project year is given in the next table.

Data provider	Country	No of CDIs	No restrictions	Restrictions
British Oceanographic Data Centre	United Kingdom	2818	3603	-785
German Oceanographic Datacentre (NODC)	Germany	0	0	0
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Division of Oceanography	Italy	1176	1105	71
Institute of Marine Science S.S. of Lerici (SP)	Italy	0	0	0
CNR, Institute of Marine Science (ISMAR) - Ancona	Italy	1394	49	1345
CNR, Institute of Atmospheric Sciences and Climate (ISAC) (Rome)	Italy	299	299	0
Institute of Fishery Resources (IFR)	Bulgaria	0	0	0
Institute of Meteorology and Water Management National Research Institute, Maritime Branch in Gdynia (IMWM MB)	Poland	0	0	0
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	Greece	1280	0	1280
IEO/Spanish Oceanographic Institute	Spain	5269	278	4991

Data provider	Country	No of CDIs	No restrictions	Restrictions
Marine Institute	Ireland	-1061	-1061	0
Flanders Marine Institute	Belgium	111	111	0
IFREMER / IDM / SISMER - Scientific Information Systems for the SEA	France	2784	2784	0
Swedish Meteorological and Hydrological Institute	Sweden	4748	4748	0
IHPT, Hydrographic Institute	Portugal	0	0	0
Polish Geological Institute - National Research Institute, Branch of Marine Geology (PGI BMG)	Poland	0	0	0
Institute of Marine Research - Norwegian Marine Data Centre (NMD)	Norway	7608	7608	0
NIOZ Royal Netherlands Institute for Sea Research	Netherlands	86	86	0
Netherlands Institute for Ecology, Centre for Estuarine and Marine Ecology	Netherlands	0	0	0
All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC) National Oceanographic Data Centre (NODC)	Russian Federation	760	760	0
P.P.Shirshov Institute of Oceanology, RAS	Russian Federation	30	30	0
National Institute of Fisheries Research (INRH)	Morocco	0	0	0
Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology	Bulgaria	283	283	0
Iv.Javakhishvili Tbilisi State University, Centre of Relations with UNESCO Oceanological Research Centre and GeoDNA (UNESCO)	Georgia	46	46	0
Institute of Marine Sciences, Middle East Technical University	Turkey	1151	838	313
National Institute for Marine Research and Development Grigore Antipa""	Romania	1359	0	1359
Latvian Institute of Aquatic Ecology	Latvia	466	466	0
Institute of Oceanography and Fisheries	Croatia	87	87	0
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	Malta	40	40	0
Cyprus Oceanography Center	Cyprus	0	0	0
Marine Systems Institute at Tallinn University of Technology	Estonia	900	389	511
State Oceanographic Institute (SOI)	Russian Federation	4055	0	4055
Marine Hydrophysical Institute	Ukraine	0	0	0
Aarhus University, Department of Bioscience, Marine Ecology Roskilde	Denmark	15224	15224	0
International Council for the Exploration of the Sea (ICES)	Denmark	5607	5607	0
Karadeniz Technical University, Faculty of Marine Sciences	Turkey	0	0	0
Sinop University, Fisheries Faculty	Turkey	0	0	0
Dokuz Eylul University, Institute of Marine Science and Technology	Turkey	0	0	0

Data provider	Country	No of CDIs	No restrictions	Restrictions
Istanbul University, Institute of Marine Science and Management	Turkey	0	0	0
Institute of Biology of the Southern Seas, NAS of Ukraine	Ukraine	0	0	0
Ukrainian Hydrometeorological Institute - Marine Branch	Ukraine	0	0	0
Russian State Hydrometeorological University, St-Petersburg	Russian Federation	0	0	0
National Institute of Meteorology and Hydrology, Bulgarian Academy of Sciences	Bulgaria	0	0	0
Israel Oceanographic and Limnological Research (IOLR)	Israel	0	0	0
BRGM / Office of Geological and Mining Resources	France	0	0	0
Finnish Environment Institute	Finland	657	657	0
Ukrainian scientific center of Ecology of Sea (UkrSCES)	Ukraine	445	445	0
Odessa National I.I.Mechnikov University	Ukraine	0	0	0
National Institute of Biology - NIBMarine Biology Station	Slovenia	405	333	72
Institut National des Sciences et Technologies de la Mer â€“ INSTM	Tunisia	-17	0	-17
Scientific - Research Firm GAMMA""	Georgia	0	0	0
Rijkswaterstaat Water, Traffic and Environment	Netherlands	0	0	0
Institute of Geology and Geography of Nature Research Centre	Lithuania	0	0	0
Management Unit of North Sea and Scheldt Estuary Mathematical Models, Belgian Marine Data Centre	Belgium	492	492	0
Geological Survey of Estonia	Estonia	0	0	0
Finnish Meteorological Institute	Finland	17079	17079	0
Ankara University	Turkey	0	0	0
Danube Hydro-meteorological Observatory	Ukraine	0	0	0
Faculty of Geography and Earth Sciences, University of Latvia (LU)	Latvia	0	0	0
National Environmental Agency of the Ministry of Environment Protection and Natural Resources	Georgia	36	36	0
Institute of Marine Biology (IMBK)	Montenegro	161	161	0
ISPRA-Institute for Environmental Protection and Research	Italy	779	779	0
PANGAEA - Data Publisher for Earth & Environmental Science	Germany	0	0	0
Portuguese Institute of Ocean and Atmosphere	Portugal	0	0	0
TOTALS		**76557**	**63362**	**13195**

Table: Overview of data centres and increase in number of CDI entries for European marine waters in the first project year

NOTE: Many of the data centres with 0 are not part of the EMODnet Chemistry consortium and thus had no project activities for populating new entries.

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

Nothing to report.

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

Statistics during EMODnet phase 3 (begin March 2017 – end February 2018) of all datasets downloaded

RSM => EMODnet Chemistry portal

No of CDI basket transactions: 100

No of CDIs requested: 190.347

Different users: 46

Different data centres: 51

These numbers are relatively low but should joined with the number of Chemistry datasets requested during EMODnet phase 3 (begin March 2017 – end February 2018) through the CDI service by means of other portals than the EMODnet Chemistry (filtering out the robot harvester and MARIS test users).

No of CDI basket transactions: 366

No of CDIs requested: 220.964

Different users: 125

Different data centres: 69

These results demonstrate that the work of EMODnet Chemistry (in particular the gathering and making available a large collection of marine chemistry data sets) has reached many additional users through other portals than only the EMODnet Chemistry portal, in particular through the SeaDataNet portal.

	Atlantic Sea	Baltic Sea	Black Sea	Mediterranean Sea	North Sea
water body ammonium	12204	8461	2126	7546	8309
water body chlorophyll-a	5553	3236	2765	19016	3781
water body dissolved oxygen	5423	8581	3102	6968	2501
water body nitrate	0	823	1047	19322	6800
water body nitrate plus nitrite	2492	1848	1026	491	0
water body nitrite	0	0	0	1344	0
water body ph	0	0	0	5792	0
water body phosphate	2044	1851	2660	10251	2490
water body silicate	857	364	1632	1760	204
water body total nitrogen	0	573	0	3638	484
water body total phosphorus	0	1226	0	4638	271

DIVA maps visualization via the WMS server.

	Atlantic Sea	Baltic Sea	Black Sea	Mediterranean Sea	North Sea
water body ammonium	47	16	13	72	15
water body chlorophyll-a	24	14	15	49	13
water body dissolved oxygen	22	32	22	39	26
water body nitrate	0	25	12	21	12
water body nitrate plus nitrite	20	13	12	0	0
water body nitrite	0	0	0	13	0
water body ph	0	0	0	43	0
water body phosphate	24	28122	12	19	12
water body silicate	19	12	13	14	12
water body total nitrogen	0	12	0	18	12
water body total phosphorus	0	13	0	18	15

Download of the DIVA products

Dynamic downloads using WPS via Oceanbrowser				
P35 description	**P35label**	**Month**	**Year**	**Number of requests**
Water body nitrate plus nitrite	EPC00005	Mar	2017	0
Water body ammonium	EPC00009	Mar	2017	0
Water body silicate	EPC00008	Mar	2017	72
Water body nitrite	EPC00006	Mar	2017	0
Water body total phosphorus	EPC00135	Mar	2017	0
Water body total nitrogen	EPC00134	Mar	2017	2
Water body nitrate	EPC00004	Mar	2017	147
Water body phosphate	EPC00007	Apr	2017	27
Water body nitrate plus nitrite	EPC00005	Apr	2017	0
Water body ammonium	EPC00009	Apr	2017	0
Water body silicate	EPC00008	Apr	2017	0
Water body nitrite	EPC00006	Apr	2017	0
Water body total phosphorus	EPC00135	Apr	2017	0
Water body total nitrogen	EPC00134	Apr	2017	0
Water body nitrate	EPC00004	Apr	2017	90
Water body phosphate	EPC00007	May	2017	1847
Water body nitrate plus nitrite	EPC00005	May	2017	75
Water body ammonium	EPC00009	May	2017	0
Water body silicate	EPC00008	May	2017	0
Water body nitrite	EPC00006	May	2017	0
Water body total phosphorus	EPC00135	May	2017	0
Water body total nitrogen	EPC00134	May	2017	0
Water body nitrate	EPC00004	May	2017	45
Water body phosphate	EPC00007	Jun	2017	19

Water body nitrate plus nitrite	EPC00005	Jun	2017	19
Water body ammonium	EPC00009	Jun	2017	20
Water body silicate	EPC00008	Jun	2017	0
Water body nitrite	EPC00006	Jun	2017	20
Water body total phosphorus	EPC00135	Jun	2017	25
Water body total nitrogen	EPC00134	Jun	2017	20
Water body nitrate	EPC00004	Jun	2017	33
Water body phosphate	EPC00007	Jul	2017	344
Water body nitrate plus nitrite	EPC00005	Jul	2017	0
Water body ammonium	EPC00009	Jul	2017	0
Water body silicate	EPC00008	Jul	2017	0
Water body nitrite	EPC00006	Jul	2017	74
Water body total phosphorus	EPC00135	Jul	2017	18
Water body total nitrogen	EPC00134	Jul	2017	20
Water body nitrate	EPC00004	Jul	2017	41
Water body phosphate	EPC00007	Aug	2017	249
Water body nitrate plus nitrite	EPC00005	Aug	2017	0
Water body ammonium	EPC00009	Aug	2017	0
Water body silicate	EPC00008	Aug	2017	0
Water body nitrite	EPC00006	Aug	2017	52
Water body total phosphorus	EPC00135	Aug	2017	0
Water body total nitrogen	EPC00134	Aug	2017	0
Water body nitrate	EPC00004	Aug	2017	0
Water body phosphate	EPC00007	Sep	2017	173
Water body nitrate plus nitrite	EPC00005	Sep	2017	0
Water body ammonium	EPC00009	Sep	2017	0
Water body silicate	EPC00008	Sep	2017	249
Water body nitrite	EPC00006	Sep	2017	0
Water body total phosphorus	EPC00135	Sep	2017	0
Water body total nitrogen	EPC00134	Sep	2017	0
Water body nitrate	EPC00004	Sep	2017	24
Water body phosphate	EPC00007	Oct	2017	715
Water body nitrate plus nitrite	EPC00005	Oct	2017	279
Water body ammonium	EPC00009	Oct	2017	80
Water body silicate	EPC00008	Oct	2017	0
Water body nitrite	EPC00006	Oct	2017	43
Water body total phosphorus	EPC00135	Oct	2017	0
Water body total nitrogen	EPC00134	Oct	2017	12
Water body nitrate	EPC00004	Oct	2017	762
Water body phosphate	EPC00007	Nov	2017	7
Water body nitrate plus nitrite	EPC00005	Nov	2017	56
Water body ammonium	EPC00009	Nov	2017	0

Water body silicate	EPC00008	Nov	2017	71
Water body nitrite	EPC00006	Nov	2017	8
Water body total phosphorus	EPC00135	Nov	2017	0
Water body total nitrogen	EPC00134	Nov	2017	0
Water body nitrate	EPC00004	Nov	2017	89
Water body phosphate	EPC00007	Dec	2017	161
Water body nitrate plus nitrite	EPC00005	Dec	2017	72
Water body ammonium	EPC00009	Dec	2017	0
Water body silicate	EPC00008	Dec	2017	28
Water body nitrite	EPC00006	Dec	2017	0
Water body total phosphorus	EPC00135	Dec	2017	0
Water body total nitrogen	EPC00134	Dec	2017	0
Water body nitrate	EPC00004	Dec	2017	56
Water body phosphate	EPC00007	Jan	2018	178
Water body nitrate plus nitrite	EPC00005	Jan	2018	0
Water body ammonium	EPC00009	Jan	2018	0
Water body silicate	EPC00008	Jan	2018	6
Water body nitrite	EPC00006	Jan	2018	15
Water body total phosphorus	EPC00135	Jan	2018	103
Water body total nitrogen	EPC00134	Jan	2018	0
Water body nitrate	EPC00004	Jan	2018	72
Water body phosphate	EPC00007	Feb	2018	40
Water body nitrate plus nitrite	EPC00005	Feb	2018	12
Water body ammonium	EPC00009	Feb	2018	59
Water body silicate	EPC00008	Feb	2018	39
Water body nitrite	EPC00006	Feb	2018	149
Water body total phosphorus	EPC00135	Feb	2018	0
Water body total nitrogen	EPC00134	Feb	2018	0
Water body nitrate	EPC00004	Feb	2018	55

Indicator 5 - Organisations that have downloaded each data type

From CDI service:

organisation	country
?	Greece
?	Turkey
?	Russian Federation
?	Greece
?	Philippines
?	United Kingdom
?	Slovenia
?	Finland
?	Israel
Aarhus University BIOS	Denmark
ACRI-HE	France
Aix-Marseille University	France
Alfred Wegener Institute	Germany
ALTRAN	France
Benthic Solutions	United Kingdom
BODC	United Kingdom
BSH	Germany
Cefas	United Kingdom
Centre de Recherche Océanologiques	Côte d' Ivoire
CINECA	Italy
CNR-ISMAR	Italy
CNRS	France
CNRS - LEGOS	France
CORILA	Italy
CSIC	Spain
Deltares	Netherlands
DKRZ	Germany
Eau et Rivières de Bretagne	France
ENEA	Italy
ERM Italy	Italy
Finnish Environment Institute	Finland
FMI	Finland
German Federal Armed Forces	Germany
Goa University	India
HCMR	Greece
ICES	Denmark
IEO	Spain
Ifremer	France
IMR	Norway
INIOAS	Iran, Islamic Republic of
Institute of Marine Biology	Montenegro
Institute of Marine Research	Norway

organisation	country
INSTM	Tunisia
IO/BAS	Bulgaria
JRC	Italy
KODC	Korea, Republic of
Latvian Institute of Aquatic Ecology	Latvia
Leibniz Institute for Baltic Sea Research (IOW)	Germany
Marine and Freshwater Research Institute (MFRI)	Iceland
Marine Biology Station of Slovenia	Slovenia
Marine Institute	Ireland
Marine Research Institute	Iceland
MARIS	Netherlands
MHI	Ukraine
Middle East Technical University	Turkey
MSI	Estonia
MUMM	Belgium
National Institute of Biology	Slovenia
NERI	Denmark
NERSC	Norway
NIB-MBS	Slovenia
NIMRD	Romania
NIOZ	Netherlands
NOC	United Kingdom
Norwegian Institute of Water Research	Norway
Odessa National University	Ukraine
Offshore Research	United Kingdom
OGS	Italy
P.Shirshov Institute of Oceanology	Russian Federation
Parthenope University	Italy
Perfection Learning	United States
Plymouth University	United Kingdom
RBINS	Belgium
Resercher	Slovenia
RIHMI-WDC	Russian Federation
Royal Netherlands Institute for Sea Research	Netherlands
Seamode oceanographic	United Kingdom
Seastar Survey	United Kingdom
SHOM	France
SMHI	Sweden
Talinn Technical University	Estonia
TC Vode	Slovenia
Test University	Netherlands
TOSAL	Spain
Tsinghua University	China
UABC	Mexico

organisation	country
UKRSCES	Ukraine
UNESCO	Belgium
UN-IHE Delft	Netherlands
Universidad de Valencia	Spain
Universidade do Algarve - CCMAR	Portugal
Universidade do Vale do Itajaí (univali)	Brazil
Universität Bremen	Germany
University College Cork	Ireland
University of Bologna	Italy
University of Cambridge, Dept of Earth Sciences	United Kingdom
University of Kassel	Germany
University of Liege	Belgium
University of Plymouth	United Kingdom
University of Southampton	United Kingdom
University of St Andrews	United Kingdom
University of the Aegean	Greece
University of Ulster	United Kingdom
University Paul Sabatier	France
UPMC	France
VLIZ	Belgium
VNIIOkeangeologiya named after I.S.Gramberg	Russian Federation

Table: Overview of organisations that have requested data from the CDI service in the first project year

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

Chemistry main portal: http://www.emodnet-chemistry.eu/

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Mar 2017	9	13	16	19	38.32 MB
Apr 2017	2	3	11	11	34.80 KB
May 2017	23	40	51	53	6.80 MB
Jun 2017	22	35	68	80	34.69 MB
Jul 2017	303	840	2051	6689	944.10 MB
Aug 2017	348	904	2122	7911	1177.6 GB
Sep 2017	326	867	2205	9619	2437.12 GB
Oct 2017	426	1067	2612	10336	4935.68 GB
Nov 2017	520	1176	4263	18961	4249.6 GB
Dec 2017	450	1128	6100	28178	5130.24 GB
Jan 2018	549	5666	33817	141239	15.74 GB
Feb 2018	489	3681	26586	119077	95.05 GB

Chemistry CDI data discovery and access service: http://emodnet-chemistry.maris2.nl/v_cdi_v3/search.asp

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Mar-17	228	564	6,679	18,378	204.77 MB
Apr-17	232	366	3,478	11,398	259.62 MB
May-17	294	592	9,932	21,818	377.69 MB
Jun-17	207	464	6,502	16,555	282.10 MB
Jul-17	170	342	5,444	14,577	368.66 MB
Aug-17	314	540	6,345	12,783	253.91 MB
Sep-17	196	409	7,937	17,216	304.92 MB
Oct-17	218	485	6,126	18,980	532.60 MB
Nov-17	278	586	10,768	44,617	679.74 MB
Dec-17	145	306	6,021	18,757	255.34 MB
Jan-18	152	281	6,472	15,414	376.21 MB
Feb-18	170	311	7,764	17,312	241.44 MB

Chemistry Products – Ocean Browser service: http://ec.oceanbrowser.net/emodnet/

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Mar 2017	179	347	22084	29312	11.79 GB
Apr 2017	166	340	24692	32255	5.20 GB
May 2017	268	540	63159	71949	3.79 GB
Jun 2017	186	446	59978	68033	5.13 GB
Jul 2017	127	315	23741	28885	7.93 GB
Aug 2017	90	248	31370	36583	827.22 MB
Sep 2017	158	414	31218	39446	77.69 GB
Oct 2017	202	600	54544	69967	22.69 GB
Nov 2017	213	581	66875	81865	14.55 GB
Dec 2017	225	561	37061	46754	49.45 GB
Jan 2018	248	616	32475	43543	7.24 GB
Feb 2018	272	606	40894	53933	40.85 GB

Products metadata catalogue: http://www.emodnet-chemistry.eu/products/catalogue

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Mar 2017	47	97	11738	16882	496.94 MB
Apr 2017	27	76	6584	8824	285.19 MB
May 2017	36	98	9725	12092	467.91 MB
Jun 2017	31	80	4401	5938	232.32 MB
Jul 2017	19	56	2319	2975	150.68 MB
Aug 2017	22	60	1393	1754	94.42 MB
Sep 2017	27	144	15639	18592	619.47 MB
Oct 2017	40	89	6252	7371	361.62 MB
Nov 2017	63	114	10040	12802	311.03 MB
Dec 2017	54	130	27159	34600	885.72 MB
Jan 2018	66	158	19465	23672	739.16 MB
Feb 2018	65	126	13013	15743	436.01 MB

Tables: Web statistics of EMODnet Chemistry main portal, CDI Data Discovery and Access service, Products viewing service, Products catalogue.

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

Users of the CDI Data Discovery and Access service are asked to give a reason for their data requests. The following relevant reasons for downloading Chemistry datasets were given.

REASON FOR DOWNLOADING
A posteriori QC
Academic purposes
Atmosphere ocean coupling model verification of SST over Adriatic basin.
cmems biogeochem validation
cmems validation
Comparison of in situ data with model results.
Comparison to numerical models
Copernicus BGC model validations
Data analysis for survey report.
Data extraction for a French association Eaux et RiviÃ¨res" for a study on the water quality in Brittany.
Data for use for EEA report
Data is needed to populate conditional probability tables in a Bayesian Network.
Data will be used for comparison with model outputs.
Data will be used to inform an environmental Impact Assessment study
Disseration research from Plymouth University
Doing a master thesis on Rio Grande Rise South Atlantic Ocean.
Eau et RiviÃ¨res de Bretagne is conducting a study on pesticides pollutions.
Education and science
EEA assessment; spatial data layer of nutrients
Establishing baseline current speeds for an Environmental Impact Assessment
Etude pollution pestides
Etudes pesticides
Eutrophication study.
Exercise to map nutrients data from Italy with INSPIRE data models in the context of MEDCIS project and TG DATA.
For classifying profiles, training and test dataset
For National environmental status assessment
For ocean color algorithm purposes.
I actually work on Helgoland and would just like to check the workflow for data discovery and download
I am a coastal scientist and I have started my postdoc study recently. I am going to use these datasets to evaluate the coastal sustainability level of Barcelona Province coasts and develop a tool for decision makers.
I am a PhD student focusing on marine pollution and i came across this course marine data menagement" By the context within this course i was asked to disvover the portals and try to download data. "
I am a phd student. I would like to have access to these data in order to compare them with satellite data.
I am a postdoc in UN-IHE Delft. I am developing a tool to evaluate coastal sustainability for Barcelona coast. The tool will be extended for other coasts in the world.
I am a Postdoctoral Research Fellow investigating the Southern Ocean surface freshwater fluxes. I would like to use the oxygen isotope and salinity data contained in this data set to investigate spatial and temporal variations in the surface freshwater fluxes.
I am currently doing my MSc thesis on the Dutch Wadden Sea and data pertaining to sediments are essential for my study
I am doing my master thesis on oceanography in the Mediterranean Sea and would like to use these data (specifically bottle data) to study the differences between the basins and to apply them in a neural net.

I am doing my master thesis on oceanography on the Mediterranean Sea. The goal of my master thesis (done in the Laboratoire d'OcÃ©anologie de Villefranche/Mer-UPMC in France) is to develop and ameliorate an ANN (Artificial Neural Network) to be used on oceanographic data in the Mediterranean. Its aim is to predict from parameters easily measured (T, S, O2, ...), other parameters such as the ones from the carbonate system or nutrients. The data provided will be used to train the ANN.
I am researching habitat preference of seals for my PhD and require data about the seabed composition for habitat classification
I am researching polluting shipwrecks for my PhD and the data included in these datasets relating to hydrocarbons and heavy metals pollution is of great interest, particularly with regards to locating and identifying polluting shipwrecks.
I am studying the variability of water masses around antarctica. I would like to identify how the dynamics of the southern ocean impact on the melting of the antarctic ice shelves. This work is funded by a H2020 IF Marie Curie Fellowship. I would like the data to be in netcdf format if possible please. If not possible, a simple ascii data format that allows me to use Matlab would be very helpful, please.
I am testing the download of oxygen data from Emodnet-Chemistry for Ifremer projects, such as EOSC-Hub or Copernicus in situ.
I am working on my PhD thesis focused on remote sensing applications to oceanography and need in situ data to validate satellite data.
I do a dissertation on the mixing layer on the 10W radial. And so I need these data to support my remarks.
I need them for research purposes at IEO.
I need these data to complete a time series in South Adriatic.
I need this data to perform objective analysis. I already dowloaded this data but did not selected the duration interval correctly. That is why I have to download it again
I need to have acess to these data sets because I study oceanography of the Russian Exploration Area on polymetallic sulphides.
I require in-situ dataset for remote sensing purposes and algorithm development.
I undertaking a doing water quality modelling study in Strangford Lough for a UK government project and require validation data.
I want to download this data to apply objective analysis for my phd research work
I want to have access to these data for scientific research at the Parthenope University of Naples.
I would like to request the data for comparison purposes as I would like to compare hydrocarbon concentrations measured from the Humber Estuary with hydrocarbon concentrations recorded from an offshore infrastructure.
I would like to use in my research work
I would like to validate model results for BONUS SHEBA project purposes.
I would want to use the data for setup of water quality model for the Dutch Government
I'm doing PhD in Physical Oceanography and study ocean waves, particularly mechanisms driving their interannual variability in the North Atlantic. I need buoy data for climate assessments and verification of numerical wave model simulations.
In my phD i work about integrated ecosystem assessment. I want to investigate temporal trend using multivariate analyses with Emodnet data as ecosytem indicators
Mapping Carbon in sediments
Marine Science class activity
Master Thesis Universidade do Algarve - CCMAR Topic: Design Optimization of Marine Protected Areas. Requesting all kinds of marine data that will be used to support decision-making.
Model validation data for a simple box model of chlorophyll and macroalgae in Strangford Lough

Need the data for the NMDC project.
Need to do a College thesis on oxygen distribution in the Adriatic Sea
Nutrient analisys
Our company (TC Vode d.o.o.) is ETC/ICM partner. In collaboration with EEA we are in 2017 developing human pressure layer of European seas. EMODNET nitrogen and phosphorus parameter data are foreseen to be used as as one part of the wider input data for these dataset.
posdoctoral researching for comparative data set obtained in the gulf of Mexico
Predictive analytics in combination with satellite data.
Project for a module I'm taking at University of St Andrews
Request for the year 2005 for temperature and salinity vertical profiles in order to study the vertical structure of mesoscale eddies in the Mediterranean Sea
Research in Black Sea Coastal Zone
Research on long-term changes in alkalinity
research project on the Bucharest Convention
research purposes
Satellite data validation purposes. I am using ESA CCI Ocean Colour satellite products in Irish waters and would like to use some concurrent field measurements to assess accuracy of satellite products.
Scientific purpose. To identify the environmental variables that explain part of the fisheries variability in the region.
Scientific purpose. Influence of environmental variables in fisheries variability
Scientific purpose. Validate biogeochemical models
Scientific purpose.To continue studying the oceanographic conditions in this region.
Scientific purposes
search for oxygen data in the North Sea for monitoring reasons
Study of time series of temperature/salinity
The data are necessary for my PHD research.
The data is used for the HELCOM assessment of the state of the Baltic Sea.
The data sets are necessary in frames of my Doctoral Dissertation Transfer of priority contaminants along food webs of the Baltic Sea". The data sets will be implemented as independent data for normalization of measurements obtained during lab and field work.
The data will be used for the HELCOM assessment of the state of the Baltic Sea.
The data would be used for a qualitative estimation of carbonate systems trend as part of the EU project CACHE ITN (http://www.cache-itn.eu/)
The goal of my master thesis (done in LOV, France) is to develop and ameliorate an ANN (Artificial Neural Network) to be used on oceanographic data in the Mediterranean. Its aim is to predict from parameters easily measured (T, S, O2, ...), other parameters such as the ones from the carbonate system or nutrients (see Sauzede and al., 2016). In order to do so, I need to train the ANN with sufficient data from cruises in the Mediterranean such as the data I am asking to be provided. Thank you
The study aims to identify the key factors for the Black Sea phytoplankton bloom in winter and changes in the phytoplankton seasonal cycle
These data sets may be vital for my dissertation project.
To check an evolution of the miniCTD, the fast profiler has been designed to deliver the highest quality ctd casts at rapid drop rates
To help me to set up data from Iceland
To investigate LIW

To populate a conditional probability table for a Dynamic Bayesian Network of the Dutch Wadden Sea
University research
validate copernicus biogeochem model
validate copernicus ngc model
validation of cmems models
Validations for model
view pollution data
We are preparing a research document on Flemish Cap environmental conditions.
We are working on bio-geochemical ocean reanalysis for the period from 2007 to 2016 under ARC-MFC project. The covered domain is the Arctic and the North Atlantic Oceans. The nutrient data will be used firstly for validating the current products and will be eventually assimilated to the new reanalysis system.
We need these data to inform an impact assessment study
We plan to study possible changes in sound speed profiles off Faroe-Island during an upcoming research cruise this year. The requested data might help to identify changes in the location of the oceanic fronts during summer times.
We would like to access bottom oxygen concentration data to support the EEA development of a bottom oxygen indicator for EU seas.
We would like to carry out an intercomparison of the phytoplankton functional types. That is why, we need to dispose of in situ measurements of pigments
Writing a proposal
Writing a proposal on East Med Sea (PERLE/CNRS)

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

There are a number of web services provided for the different services that can be found at the EMODnet Chemistry portal.

Data product Viewing and Downloading service:

The analysed field generated by DIVA (Data-Interpolating Variational Analysis) can be visualised using the WMS protocol which supports the following requests:

GetCapabilities

This request is used to provide all layers of the map server. To every parameter and to every region corresponds a different WMS layer. An example of such a request would be:

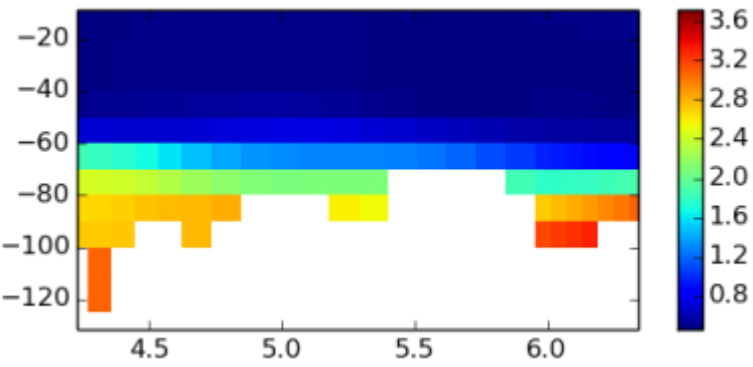
http://ec.oceanbrowser.net/emodnet/Python/web/wms?request=GetCapabilities&service=WMS&version=1.3.0

GetMap

This request allows to extract a horizontal section of the 4D NetCDF file at the specified depth and time (Example URL).

Per default, the axis are not displayed on a map. This can be activated by setting the parameter DECORATED to true (Example URL).

The GetMap can also be used to extract a vertical section (Example URL). The path of the section is encoded in the SECTION parameter: the longitude and latitude are separated by a comma and the coordinates by the pipe-symbol (|). The x-axis corresponds to the distance in arc degrees along the section (the first point is the origin) and the y-axis in the depth in meters. The parameter RATIO defines the aspect ratio of the vertical section.



Images can be returned in raster (PNG) and vector image formats (SVG, EPS, PDF). They can also be saved as a KML file so that the current layer can be visualized in programs like Google Earth and combined with other information imported in such programs. By providing multiple time instances, the web map server can also return animation in the WebM or MP4 format using this GetMap request (Example URL). As the animation are generated dynamically, it usually takes a couple of minutes to create them. The frame rate of the animation is controlled through the parameter rate.

GetFeatureInfo

This request returns a simple XML file with the underlying value of the analysed field (Example URL).

However, the WMS standards (in version 1.1.1 and 1.3.0) is not completely adequate for ocean analyses. A WMS allows to represent a data set according a list of different styles. A legend is attributed to each style which for scalar is colorbar. The legend for a given style is represented by a link to an image. A single legend is used for entire data set (for all depth layers and time instances in particular). However the ocean is strongly stratified and unique legend does not provide sufficient contrast because the ocean properties at depth are often very different from the properties near the surface. The solution is to make the legend dynamic so that it can be adjusted based on a range of value at a specified depth and time.

Dynamic Timeseries visualizations and requests for graphs

Oceanbrowser uses three different services to enable end users to select, display and evaluate time series and profiles of data of a certain kind of parameter. Oceanbrowser uses the OGC Web Services WFS and WPS for this purpose. These three services are:

- **WFS** - Get parameters request
- **WFS** - Get locations and features
- **WPS** - Get time series and plot in graph

Basic requests OGC web services WFS consists of various requests, for WFS these are:

- **GetCapabilities**
- **DescribeFeatureType**
- **GetFeature**

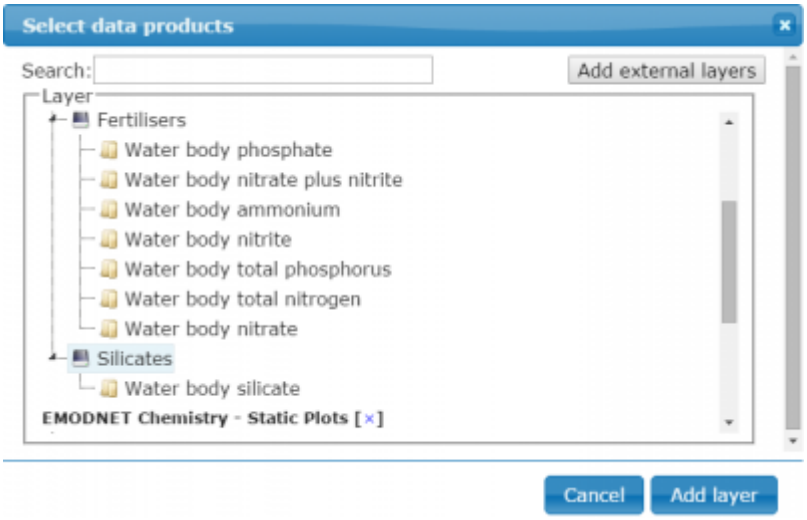
http://EMODnet02.cineca.it/geoserver/wfs?service=WFS&request=GetCapabilities yields a capabilities document from the web feature service, or in other words all functionality provided by the services.

DescribeFeatureType describes all features described. In this case 2 services are available. The result of http://EMODnet02.cineca.it/geoserver/wfs?service=WFS&request=DescribeFeatureType can be used to get a certain feature via the GetFeature statement. This GetFeature statement can be completed with a query to filter on geometry and all other available entities (columns in a database) of the type names available.

For instance http://EMODnet02.cineca.it/geoserver/EMODnet/ows?service=WFS&version=1.0.0&request=GetFeature&typeName=EMODnet:p35_used&filter=<PropertyIsEqualTo><PropertyName>EMODnet:p35_id</PropertyName><Literal>EPC00005</Literal></PropertyIsEqualTo>http://EMODnet02.cineca.it/geoserver/EMODnet/ows?service=WFS&version=1.0.0&request=GetFeature&typeName=EMODnet:p35_used&filter=<PropertyIsEqualTo><PropertyName>EMODnet:p35_id</PropertyName><Literal>EPC00005</Literal></PropertyIsEqualTo> gives the contents of P35_ID EPC00005

Getting parameters

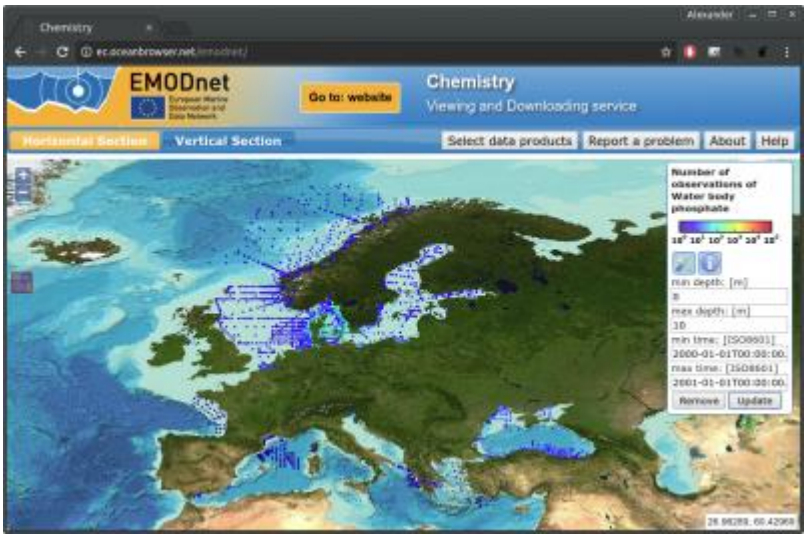
The first WFS is a very basic process that returns a table in xml with the list of available parameters. This table is used by OceanBrowser and displayed as follows:



OceanBrowser: distribution density of monitoring stations

Get locations

The Add layer button lets Oceanbrowser constructs a GetMap request on WMS layer which returns the data distribution.



Data distribution of phosphate viewed in OceanBrowser

The base URL of the WMS server for the data distribution is http://ec.oceanbrowser.net/emodnet/Python/web/wpswms

For example a full request would be:

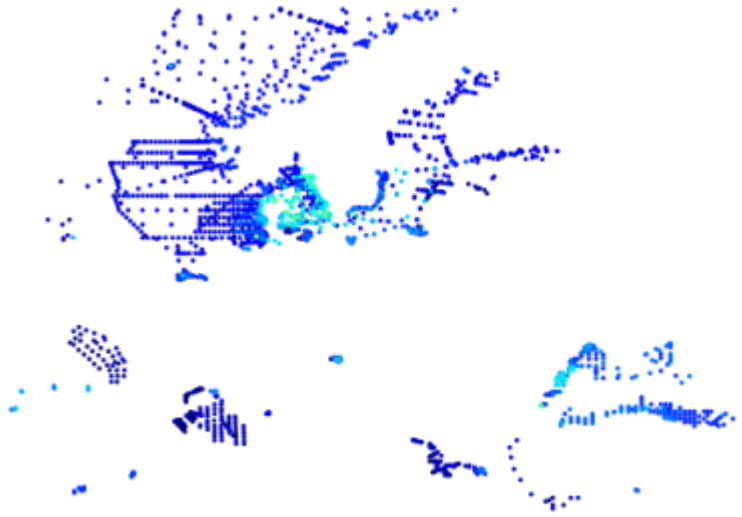
GetCapabilities:

http://ec.oceanbrowser.net/emodnet/Python/web/wpswms?request=GetCapabilities&service=WMS&version=1.3.0

GetMap:

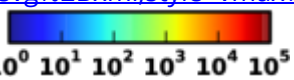
http://ec.oceanbrowser.net/emodnet/Python/web/wpswms?LAYERS=EPC00007&STYLES=vmax%3A100000.0%2Bnorm%3Alog%2Bmethod%3Apcolor%2Bvmin%3A1&TRANSPARENT=true&FORMAT=image%2Fpng&SERVICE=WMS&VERSION=1.1.1&REQUEST=GetMap&ELEVATION=0%2F10&TIME=2000-01-

01T00%3A00%3A00.000Z%2F2001-01-01T00%3A00%3A00.000Z&SRS=EPSG%3A4326&BBOX=-10,30,45,70&WIDTH=512&HEIGHT=512



GetMap request showing the distribution of phosphate within the bounding box 10,30,45,70 (East,South,West,North)

GetLegendGraphic:

http://ec.oceanbrowser.net/emodnet/Python/web/wpswms?request=GetLegendGraphic;width=150;layer=EPC00007;format=image/svg%2Bxml;style=vmax%3A100000.0%2Bnorm%3Alog%2Bmethod%3Apcolor%2Bvmin%3A1;height=50 

The legend for the data distribution is a separate request. The colour represents the number of data points at the corresponding location.

Plot time series of certain location

This is done by the OGC WPS that Deltares created to be able to extract data directly from the database. WPS stands for Web Processing Service and acts as middle ware between client side software and server side software. In this case, WPS acts between OceanBrowser and a database with all observations. The above described WFS processes are used to extract information end-users are interested in. By selecting a location, data and metadata extracted from the database can be visualised in the form of a graph. WPS also makes use of:

GetCapabilities (what can you do for me, what processes are available)

Gives the list of processes available:

http://EMODnet02.cineca.it/wps?service=wps&version=1.0.0&request=getCapabilities

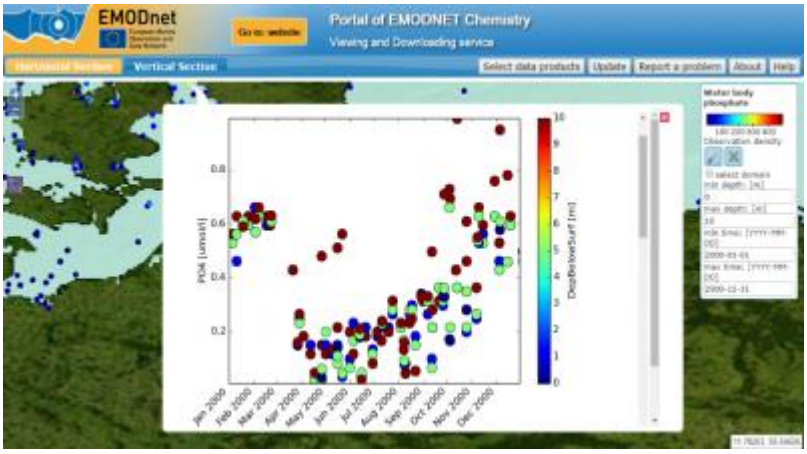
DescribeProcess (how does a process work)

This describes the available processes of the WPS, including the inputs required, their allowable formats, and the outputs that can be produced.

http://EMODnet02.cineca.it/wps?service=wps&version=1.0.0&request=describeProcess&identifier=bbox_plot_timeseries

Execute (execute a process)

The execute process is built-up on the user choice which can be found on the right hand side of the OceanBrowser portal. OceanBrowser constructs the entire HTML including the ExecuteProcess statement which triggers the WPS.



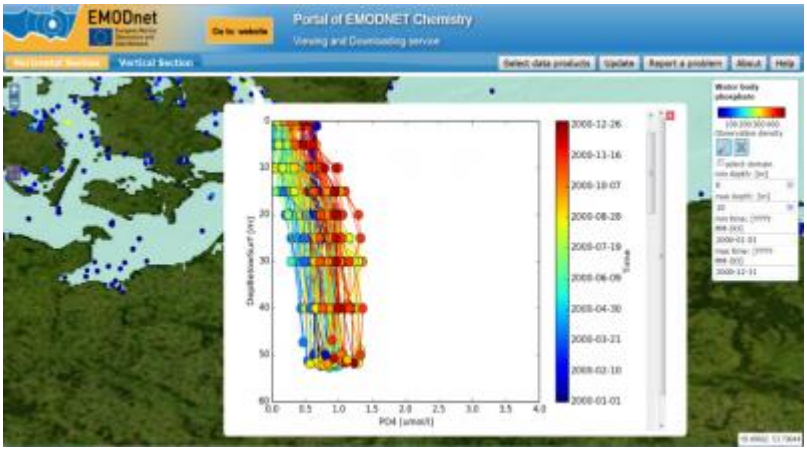
OceanBrowser: timeseries

The ExecuteProcess takes a number of input arguments specified by the user. The request looks like the following:

http://EMODnet02.cineca.it/wps?DataInputs=[z=ADEPZZ01;zlim1=10;bbox=11.8750340184,11.9848973101,57.6323448275,57.742208087;starttime=2000-01-01T00:00:00Z;endtime=2001-01-01T00:00:00Z;parameter=EPC00007;zlim0=0;log10=0;markersize=12.0;alpha=1]&service=wps&request=Execute&Identifier=bbox_plot_timeseries&version=1.0.0

It returns the graph and a list of pairs [EDMO code, Local_CDI] and links to the data shopping of the used observation is provided.

Eventually, end-users would like to gain insight in observation distribution for a certain location. OceanBrowser executes the process like the above example and retrieves a timeseries like the above picture.



OceanBrowser: profiles

For the same observation, different flavours can be given (from OceanBrowser). The following is a profile request, triggered from the OceanBrowser:

http://EMODnet02.cineca.it/wps?DataInputs=[z=ADEPZZ01;zlim1=10;bbox=11.8750340184,11.9848973101,57.6323448275,57.742208087;starttime=2000-01-01T00:00:00Z;endtime=2001-01-01T00:00:00Z;parameter=EPC00007;zlim0=0;log10=0;markersize=12.0;alpha=1]&service=wps&request=Execute&Identifier=bbox_plot_profile&]version=1.0.0

and it returns a profile as in the image above.

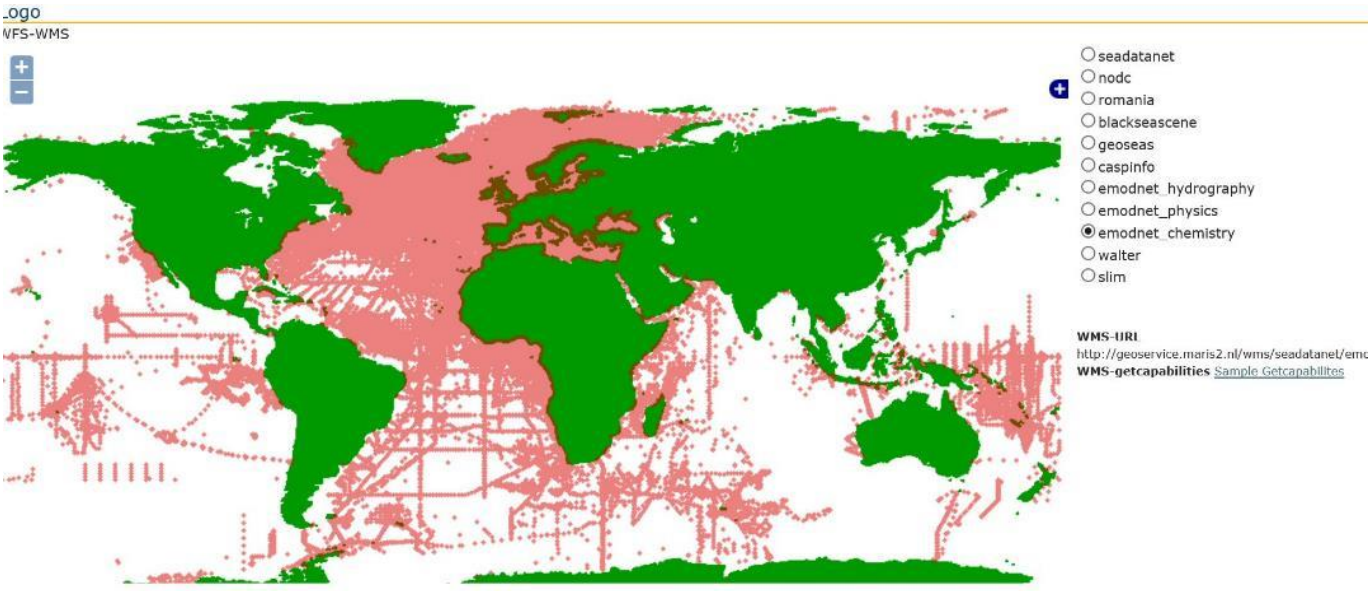
In the example above, the EDMO codes and LOCAL_CDI's generated and shown in OceanBrowser for the profile above looks like the folling:

- EDMO code: 729 - local CDI: Vand_111095
- EDMO code: 729 - local CDI: Vand_111096
- EDMO code: 729 - local CDI: Vand_111097
- EDMO code: 729 - local CDI: Vand_111121

CDI Data Discovery and Access service:

The CDI service has WMS and WFS services which are used primarily internally and by the OceanBrowser service for providing a layer of CDI entries and option for retrieving CDI metadata:

WMS and WFS service: http://geoservice.maris2.nl/wms/seadatanet/EMODnet_chemistry



Example of EMODnet Chemistry WMS layer for points

GetCapabilities:

http://geoservice.maris2.nl/wms/seadatanet/EMODnet_chemistry?service=WMS&request=GetCapabilities

Note: Getcapabilites indicates what is available. In CDI case it is both WMS and WFS. Implementing WFS is depending on the client and needs programming. We provide WFS request through WMS:

http://geoservice.maris2.nl/wms/seadatanet/EMODnet_chemistry/?LAYERS=points&QUERY_LAYERS=points&STYLES=&SERVICE=WMS&VERSION=1.1.1&REQUEST=GetFeatureInfo&BBOX=-

25.168107%2C39.506018%2C25.808455%2C64.994299&FEATURE_COUNT=10&HEIGHT=290&WIDTH=580&FORMAT=image%2Fpng&INFO_FORMAT=text%2Fhtml&SRS=EPSG%3A4326&X=296&Y=129

with BBox as LON,LAT,LON,LAT for the layer points.

11 Recommendations for follow-up actions by the EU

A list of recommendations and suggestions for the EU to consider and take action is given.

- The EMODnet Chemistry contract has a 2 year duration and it has been communicated by the EU that an extension with another 2 years without a full tender procedure is possible. However, details about the procedure and its timing are lacking while we are now halfway the existing contract. For contigency and planning purposes it is recommended that the EU provides information on short term about the intended procedure. Such a guarantee about continuation is of key importance, now that MSFD stakeholders and also Copernicus (see draft MoU with CMEMS) are intending to sign up to the EMODnet Chemistry products and services. Delay will dilute our offer and will harm considerably the position and goodwill that EMODnet Chemistry has achieved in the last year.
- Interventions of EMODnet Chemistry at the TG-DATA have contributed to the fact that TG-DATA recommendations for MS for accessing data and information according to MSFD Art. 19(3) now allow MS to make use of infrastructures such as EMODnet and SeaDataNet for publishing data underpinning their assessment reporting. Moreover EMODnet Chemistry has demonstrated to TG-DATA by a use case for D5C1 “Nutrients concentrations in water” that EMODnet metadata and data formats (SeaDataNet standards) can be mapped to INSPIRE following the INSPIRE data implementation rules. It is recommended that the EU gives support to leverage on this use case by requesting the INSPIRE team at JRC to undertake an official review of the use case results with the aim to establish official acceptance so that the mapping can be used as basis for further developing an INSPIRE transformation service for EMODnet Chemistry.
- United Nations undertakes efforts towards the International Decade of Ocean Science for Sustainable Development (2021-2030) as a unique opportunity to engage the ocean science community in archiving SDG14 – globally, regionally and locally. The Intergovernmental Oceanographic Commission of UNESCO is inviting interested parties to collaborate on the Decade concept and to help designing concerted actions with shared considerations. EU on-going policy efforts as the Marine Strategy Framework Directive, Water Framework Directive, Marine Spatial Planning, Inspire Directive together with Marine Knowledge 2020 are important pillars for future global strategies. In this landscape, EMODnet represents a crucial intermediate step contributing to the data flow from national to global level. It is recommended that the EU supports EMODnet role and contribution to achieve globally integrated observations and data sharing.

12 List of abbreviations and acronyms

BSCS is the Black Sea Commission Secretariat

CDI, Common Data Index, provides a highly detailed description of the data, answering to the questions: where, when, how and who collected the data, and how to get them. One CDI describes a data series which can be a vertical profile on a fixed location, a time series or a trajectory data set.

CMEMS, the Copernicus Marine Environment Monitoring Service (led by Mercator-Océan)

DeFishGear, Derelict Fishing Gear Management System in the Adiatic Region is the 3-year long project implemented within the framework of the IPA Adriatic Cross-border Cooperation Programme, co-funded by the European Union.

DIN is Dissolved Inorganic Nitrogen.

DIVA, Data-Interpolating Variational Analysis, is a software tool that allows to spatially interpolate (or analyse) observations on a regular grid in an optimal way.

EDMO is the European Directory fo Marine Environmental Data.

EQS, Environmental Quality Standards

EQSD, Environmental Quality Standards Directive (Legislative instrument)

GES is Good Environmental Status

HELCOM Convention = Baltic Marine Environment Protection Commission is the governing body of the Convention on the Protection of the Marine Environment of the Baltic Sea Area, known as the Helsinki Convention.

INSTAC is the In Situ Thematic Assembling Centre of CMEMS in charge of in-situ data delivery.

LOD, Limit Of Detection, means the output signal or concentration value above which it can be affirmed, with a stated level of confidence that a sample is different from a blank sample containing no determinand of interest.

LOQ, Limit Of Quantification, means a stated multiple of the limit of detection at a concentration of the determinand that can reasonably be determined with an acceptable level of accuracy and precision. The limit of quantification can be calculated using an appropriate standard or sample, and may be obtained from the lowest calibration point on the calibration curve, excluding the blank.

MEDITS is the International bottom trawl survey programme in the Mediterranean

MSFD is Marine Strategy Framework Directive.

NODC, National Oceanographic Data Centre defined within the International Oceanographic Data Exchange (IODE) System of the UNESCO Intergovernmental Oceanographic Commission (IOC).

Ocean Browser is the EMODnet Chemistry data products viewing and downloading service that allows to visualize gridded fields on-line. It is based on open standards from the Open Geospatial Consortium (OGC), in particular Web Map Service (WMS) and Web Feature Service (WFS).

ODV, Ocean Data View, is a freely available software package that provides interactive exploration, analysis and visualization of oceanographic and other geo-referenced profiles or sequence data. ODV and NetCDF data file formats are used as mandatory data exchange format in SeaDataNet/EMODnet Chemistry.

OSPAR Convention is the Convention for the Protection of the Marine Environment of the North-East Atlantic.

P01 = British Oceanographic Data Centre (BODC) Parameter Usage Vocabulary, is one of SeaDataNet Common Vocabularies based upon a semantic model that is the simple concatenation of three 'themes' (what, where/matrix and how/methods) and used to describe individual measured phenomena in ODV data transport format. P01 are narrower terms of P02. At present P01 already contains more than 30.000 concepts.

P02 = SeaDataNet Parameter Discovery Vocabulary, is one of SeaDataNet Common Vocabularies describing fine-grained related groups of measurement phenomena designed to be used in dataset discovery interfaces (namely CDI metadata records).

P35 = EMODnet chemistry lot aggregated parameter names, is one of SeaDataNet Common Vocabularies used to facilitate data aggregation and data labelling (as in products description).

QA/QC = Quality Assurance/Quality Control.

Robot Harvester is the system used for discovery and gather data from SDN infrastructure of distributed NODCs via the CDI Discovery and Shopping mechanism with an almost full automatic method. It is configured to harvest data on selected sea areas (or MSFD regions) and for specific chemical parameters.

RSC are Regional Sea Conventions.

SDN, SeaDataNet is the pan-European infrastructure for ocean & marine data management sponsored within FP7 (grant agreement 283607, 1/10/2011-30/9/2015) linking more than 100 national oceanographic data centres and marine data centres from 35 countries riparian to all European seas.

Sextant products metadata catalogue is the EMODnet Chemistry data products discovery service used for searching Chemistry data products and linking to the viewing service.

TG DATA is the MSFD Common Implementation Strategy Technical Group on Marine Data

TG ML is the MSFD Common Implementation Strategy Technical Group on Marine Litter

TN is Total Nitrogen.

UNEP/MAP is the United Nations Environment Programme, Mediterranean Action Plan for the Barcelona Convention adopted by 16 Mediterranean countries and the European Community.

VRE, Virtual Research Environment

WPS, Web Processing Services.