Project	AtlantOS – 633211
Deliverable number	D7.4
Deliverable title	Data Management Handbook
Description	Handbook for Data Management activities regarding data flow and data integration
Work Package number	7
Work Package title	Data flow and data integration
Lead beneficiary	Ifremer
Lead authors	V. Harscoat, S. Pouliquen
Contributors	WP7 partners
Submission data	22 September 2016
Due date	30 September 2016
Comments	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 633211.

Contents

1 Reference documents

Ref	Title	Version / Date
DMP	AtlantOS Data Management Plan (D11.2) https://www.atlantos-h2020.eu/download/deliverables/11.2%20Data%20Management%20Plan.pdf	V1.0 September 2015
D7.1	Data Harmonization Report https://www.atlantos-h2020.eu/download/deliverables/7.1%20Data%20Harmonization%20Report.pdf	V1.0 October 2016
D7.2	RT QC Report (Real-Time Quality Control recommendation for 7 EOVs : Temperature Salinity Current Oxygen Nitrate Chlorophyll Sea Level Carbon) https://www.atlantos-h2020.eu/download/deliverables/7.2%20QC%20Report.pdf	V1.0 November 2016
D7.3	Full Life Cycle Report https://www.atlantos-h2020.eu/download/deliverables/7.3%20Full%20Life%20Cycle%20Report.pdf	V1.0 October 2016

2 Executive summary/ Abstract

The H2020 AtlantOS project aims to optimize and enhance the Integrated Atlantic Ocean Observing System. One goal is to ensure that data from different and diverse in-situ observing Networks are readily accessible and useable to a wider community, including the international ocean science community and other stakeholders in this field. To achieve that, the strategy is to move towards an integrated data system within AtlantOS that harmonizes work flows, data processing and distribution across in-situ observing network systems, and integrates in-situ observations into existing European and international data infrastructures, termed Integrators (e.g. Copernicus INS TAC, SeaDataNet NODCs, EMODnet, EurOBIS, GEOSS).

This handbook aims to help the Networks to implement recommendations agreed upon within AtlantOS WP7 to achieve a better integration of their data, and to provide best practices guidelines for both Networks and Integrators for enhanced services to users.

First it presents the roadmap for the AtlantOS integrated system and its actors, both Networks and Integrators.

Then the elements of (1) standardization across the Networks relying on existing European and international standards and protocols, and of (2) of the data exchange backbone of the AtlantOS system, are described with the guidelines on how to set them up.

Finally this handbook describes ways to facilitate data discovery at the Network level and enhancements at the Integrator level for better fit-for-purpose services to users.

3 Introduction

3.1 Scope

The scope of this first release of the Data Management Handbook is to state the agreements achieved so far on Data Management principles in the framework of AtlantOS, and describe their implementation by the Networks and Integrators involved in WP7.
This document will be periodically updated depending upon the progress of the AtlantOS WP7 (development and enhancement of existing tools/services). It is intended to be a living document managed at EuroGOOS (European Global Ocean Observing System) by the DATAMEQ (DATA Management Exchange and Quality) working group following the completion of the AtlantOS project.

This handbook does not address the recommendations for the data submission from the observing system operators to the existing Networks' data management systems, but addresses the upgrades required at the interfaces to enhance interoperability between Networks data systems, and also among Networks' data systems and the Integrators or the users. Actions are required at different levels:

- The document gives the guidelines for the Networks' data management to (1) implement metadata recommendations [**D7.1**]; (2) to provide an integrated access to Network data so that it serves better the users and facilitate the integration in existing systems; and (3) to plan NRT QC (Near Real Time Quality Control) procedures enhancement (if needed).
- It gives guidelines for the Integrators to enable: (1) more data being integrated; (2) the enhancement of the services (viewing, downloading, traceability and monitoring) to users and providers; (3) the facilitation of discovery of AtlantOS Networks and products through a catalogue based on ISO standards; (4) provision of OGC services (WMS, WFS) to facilitate development; and (5) the visibility of existing data and the identification of gaps is facilitated.

3.2 Ocean Data Management: the European context

Several initiatives exist within Europe for ocean data management, which are now coordinated under the umbrella of EuroGOOS. EuroGOOS is committed to developing operational oceanography capacity for Europe, within the context of the intergovernmental Global Ocean Observing System (GOOS). The scope of EuroGOOS is wide and its needs are only partially addressed by the on-going development within Copernicus, SeaDataNet and other EU initiatives. Therefore to improve the quantity, quality and accessibility of marine information, to support decision making and to open up new economic opportunities in the marine and maritime sectors of Europe for the benefit of European citizens and the global community, it was agreed at the annual EuroGOOS meeting in 2010 that it is essential to meet the following needs:

- Provision of easy access to data through standard generic tools, easy means of using the data without having to be concerned about data processing and who processes them, and that adequate metadata are available to describe how the data were processed.
- To combine in situ-observation data with other information (e.g. satellite images or model outputs) in order to derive new products, build new services or enable better-informed decision-making.

The ocean data management and exchange process within EuroGOOS are intended to reduce duplication of effort among agencies, improve quality and reduce costs related to geographic information, thus making oceanographic data more accessible to the public and helping to establish key partnerships to increase data availability. In addition, a EuroGOOS data management system will deliver a system that will meet European needs, in terms of standards and respecting the structures of the contributing organizations. The structure will include:

- Observation data providers, which can be operational agencies, marine research centres, universities, national oceanographic data centres and satellite data centres.

- Integrators of marine data, such as the Copernicus in-situ data thematic centre (for access to near real-time data acquired by continuous, automatic and permanent observation networks) or the SeaDataNet infrastructure (for quality controlled, long-term time series acquired by all ocean observation initiatives, missions, or experiments), ICES and EurOBIS for biodiversity observations, and the new European Marine Observation and Data Network (EMODnet) portals.
- The integrators that will support both data providers willing to share their observation data, and users who want to access oceanographic data from a range of providers encompassing multiple types of data from multiple regions. They also develop new services to facilitate data access and increase the use of both existing and new observational data.
- Links with international and cross-disciplinary initiatives such as GEOSS (Global Earth Observation System of Systems), both for technical solutions to improve harmonization as well as for dissemination of AtlantOS data in an interdisciplinary global context.

For data management activities, the AtlantOS project takes advantage of these existing and now cooperating systems.

4 Towards an integrated EU data system

The AtlantOS project aims to optimize and enhance the Integrated Atlantic Ocean Observing Systems. One goal is to ensure that data from different and diverse in-situ observing networks are readily accessible and useable by the wider community, including the international ocean science community and other stakeholders in this field. To achieve this, the strategy is to move towards an integrated data system within AtlantOS that harmonizes work flows, data processing and distribution across the in-situ observing network systems, and integrates in-situ observations into existing European and international data infrastructures (the so called "Integrators". These include Copernicus INS TAC, SeaDataNet NODCs, EMODnet, EurOBIS, and GEOSS).

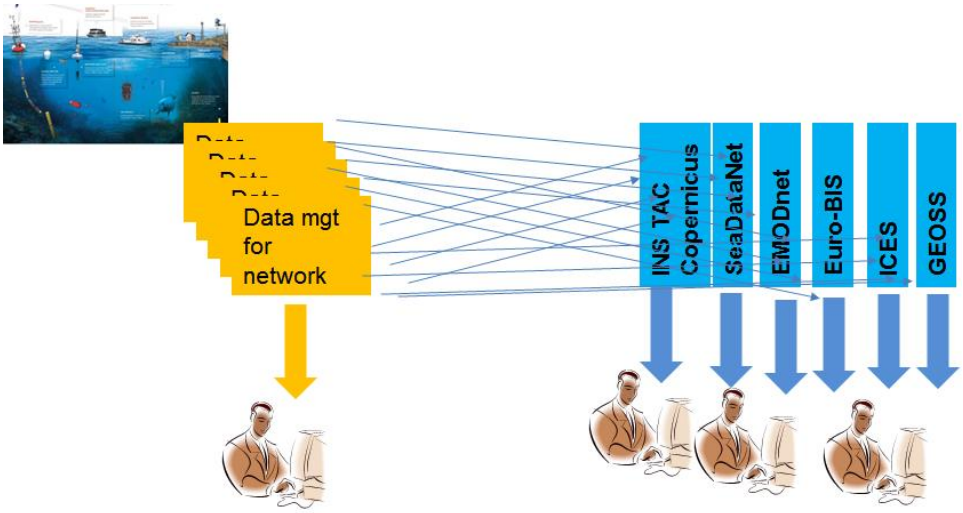
The targeted integrated system deals with data management challenges that must be met to provide efficient and reliable data service to users. These include:

- Common quality control for heterogeneous and near real time data
- Standardization of mandatory metadata for efficient data exchange
- Interoperability of Network and Integrator data management systems

4.1 The roadmap

4.1.1 The starting point

To summarize the situation at the beginning of AtlantOS project, the data acquired by the different in situ observing networks contributing to the AtlantOS project were processed and distributed using different methodologies and means. Depending on the network, the data were either processed following recommendations elaborated by the network and made accessible through a unique portal (FTP or Web), or were processed by individual scientific researchers and made available through National Data Centres or at the Institution level. Some datasets were available through Integrators by ad-hoc links that were developed in past years within projects such as Copernicus, EMODNet, SeaDataNet, etc.



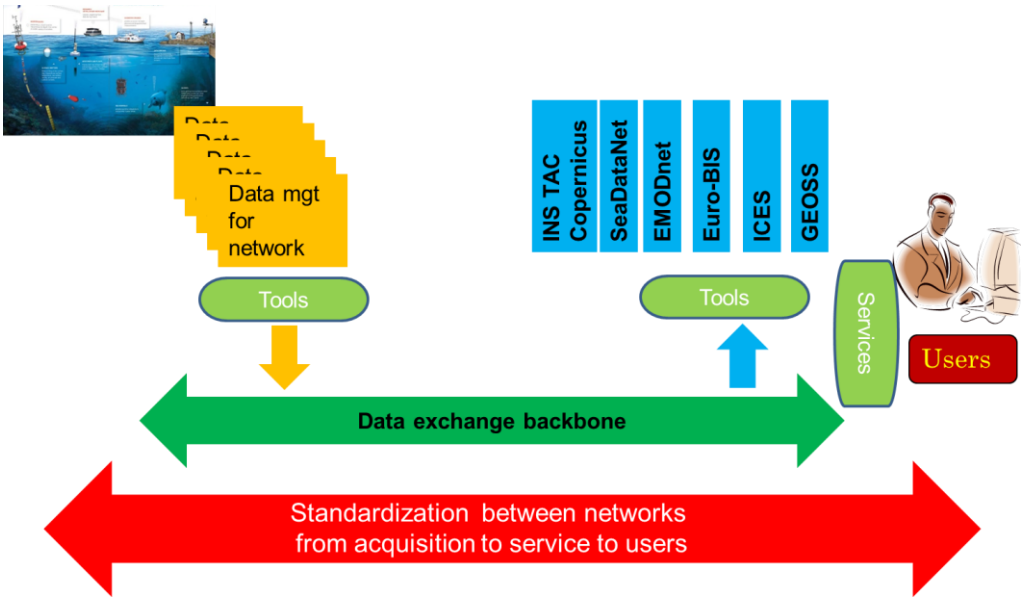
Map of the data management situation at the beginning of AtlantOS project

4.1.2 The target

To facilitate access to the broad array of Atlantic observations and avoid "mixing apples and oranges", we first agreed on common standards for metadata and data description. That was the goal of **data harmonization** task (WP7.1).

A **data exchange backbone** has been defined to facilitate discovery, viewing and downloading by the users. At the Network level, **tools** can be set up to: (1) plug the data on the backbone, and (2) to facilitate

integration into the Integrators. And finally **services to the users** shall be enhanced to ease access to existing observations.



Map of the integrated system to be developed within the AtlantOS project

The roadmap towards such an integrated EU data system is for the Networks to:

- Implement the AtlantOS recommendations for standardization among Networks
- Plan NRT QC procedures enhancement, if needed
- Facilitate access to Network data
-

As part of the roadmap the Integrators have to:

- Update their ingestion procedure to integrate new Network data
- Enhance viewing and downloading services on Network data
- Perform cross Network assessments and provide feedback to Networks
- Develop traceability and monitoring facilities for providers and users
- Facilitate discovery through Network and product catalogues based on ISO standards
- Provide OGC services (WMS,WFS) to facilitate development of customised user interfaces, either through Integrators or directly from Networks
- Provide enhanced download facilities either through Integrators or directly from Networks
- Facilitate visibility of existing data and provide gap identification

4.2 The actors

4.2.1 The Networks

The Networks involved in WP7 for AtlantOS are:

- **Ship-based observation Networks (WP2)** : GO-SHIP (Global Ocean Ship-based Hydrographic Investigations Program), VOS (Voluntary Observing Ship)/SOOP (Ship of Opportunity Program), CPR (Continuous Plankton Recorder), fish and plankton surveys, seafloor mapping
- **Autonomous observing Networks (WP3)**: Argo, Gliders, Drifters, OceanSITES, EATN (European Animal Tracking Network)
- **Coastal observing systems (WP4)**: Ferrybox, FOS (Fishery Observing System), coastal profilers, fixed moorings

The data management and services for all those Networks are described in Appendix 8.1.

Some networks are organized with DACs and GDACs components. A DAC is a **Data Assembly Centre** typically operating at either the national or regional scale. A DAC manages data and metadata for its area with a direct link to scientists and operators. The DAC pushes observations to the network GDAC. A GDAC is a **Global Data Assembly Centre**. It is designed for a global observation network such as Argo, OceanSITES, EGO for Gliders, etc. The GDAC aggregates data and metadata provided by Network DACs, in RT (Real Time) and DM (Delayed Mode).
A way to enhance integration is to set up a central point from where the data can be uploaded. This central point can be either a GDAC for the Network, or a portal with files on FTP and/or web services, allowing machine-to-machine downloading and sub-setting services.

The table below summarizes the needs to be set up at the Network GDAC level in order to enhance the services for users based on the AtlantOS minimum set of standards. These standards have been agreed on and are presented in section 5 and 6 of this handbook.

<table>
<tr><th>The user needs for discovery</th><th>At Network GDAC level</th><th>AtlantOS minimum set of standards</th></tr>
<tr><td>Discovery of datasets at GDAC level</td><td>Data files including metadata
Platform catalogue, referencing
• Provider code
• Platform id
Format :
(1) simple ASCII files
(2) SensorML files</td><td>• Organizations
• Platforms and stations
• Updates of EDMO catalogue and bringing in simple hierarchy
• Expansion of C17 catalogue; stations in ICES directory
SeaDataNet and ICES catalogues
(1) INS TAC Copernicus catalogue format
(2) AtlantOS SensorML marine profile</td></tr>
<tr><td>Discovery/use of Network data collections and Products</td><td>• DOI strategy for Data Citation
• Descriptions of data collections</td><td>• AtlantOS catalogue to present Networks data collections and products
• Link with GEOSS</td></tr>
<tr><td>Across platform, networks and products harmonized discovery</td><td>• Harmonized AtlantOS set of variables : Networks can keep the metadata unchanged in data formats but have to provide the mapping with the AtlantOS standards
• Products processed from NRT data : harmonized QC is necessary</td><td>• Vocabularies for the AtlantOS set of variables and mapping with existing standard vocabularies / BODC server
• Recommendations for NRT QC data for selected EOVs in AtlantOS</td></tr>
</table>

4.2.2 The integrators

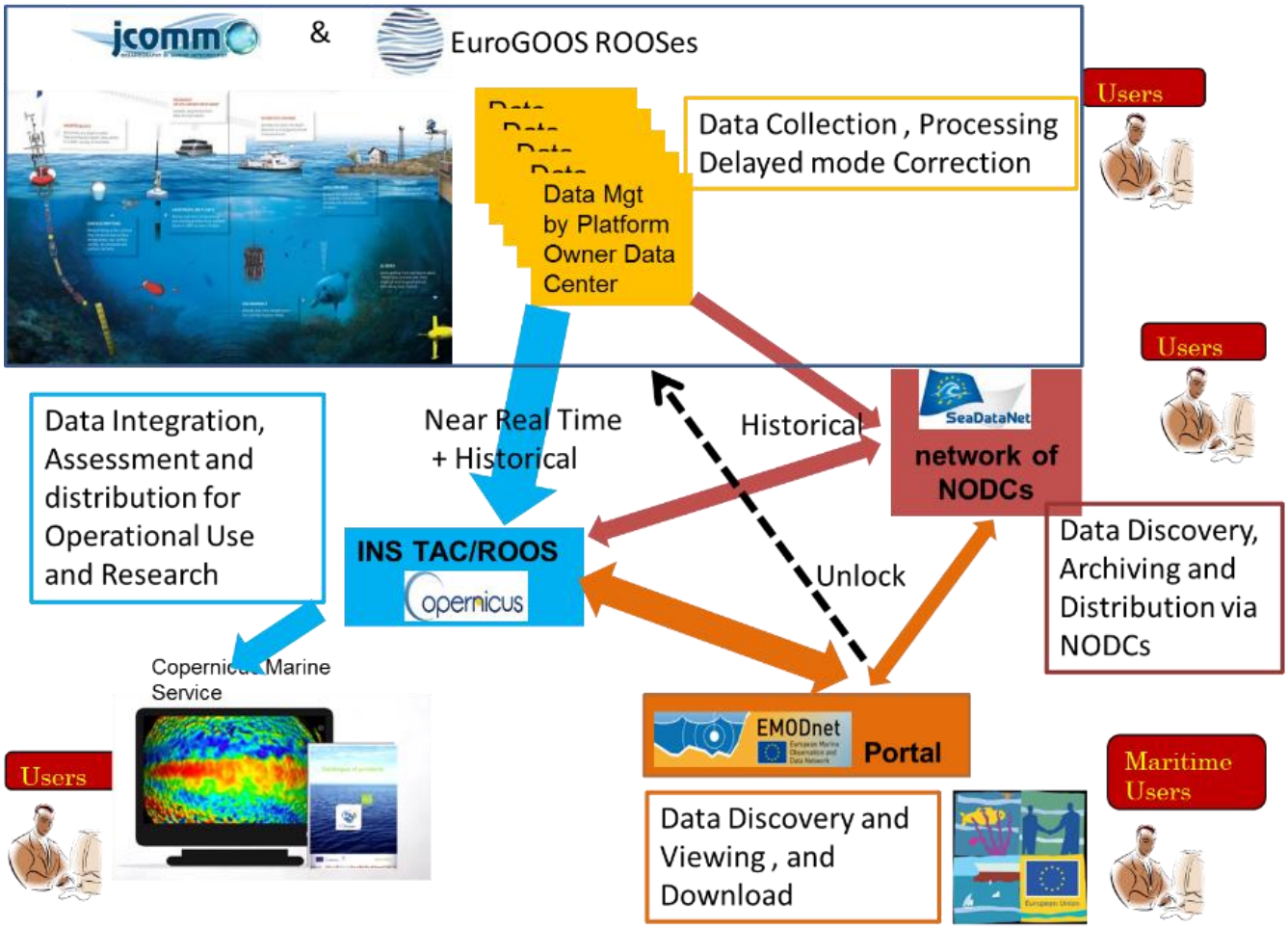
The European infrastructures or global assembly centres involved as Integrators in AtlantOS are:

- For marine environmental data: SeaDataNet for validated and archived data; and the In-Situ Thematic Assembling Centre (INS TAC) component of Copernicus Marine Environment Monitoring Service (CMEMS) for NRT data and for the past 60 years of historical data assembled for reanalysis needs
- for marine biodiversity data: the ICES system, and EurOBIS

The Portals involved as integrators in AtlantOS are:

- EMODnet lots (physics, chemistry, bathymetry, biology) fed by Copernicus INS TAC, SeaDataNet and EurOBIS
- GEOSS

The table in Appendix 8.2 presents the services provided by the Integrators. Below is the example of data integration and services for SeaDataNet/Copernicus INS TAC/EMODnet physics.



The Example of SeaDataNet/Copernicus INS TAC/EMODnet physics data integration and services

4.2.2.1 SeaDataNet

SeaDataNet has a focus on marine environmental data which has been validated and archived for long term stewardship and availability. Its infrastructure and standards have been adopted for developing EMODnet portals for physics, chemistry and bathymetry.

SeaDataNet as an Integrator offers to AtlantOS observation Networks to capability to harmonize data discovery and efficient access to validated and archived AtlantOS observation data.

This can be implemented by:

- connecting established AtlantOS Network data centres to the SeaDataNet infrastructure, and populating their Common Data Index (CDI) entries; a number of AtlantOS data centres are already connected in which case the current focus is on further populating CDI entries.
- Arranging if possible with an appropriate NODC to provide data support in cases where AtlantOS observing Networks have no data centres yet in place for validation and long term stewardship of their data.

AtlantOS observing Networks currently receive full support and guidance by the SeaDataNet CDI support desk (MARIS cdi-support@maris.nl together with IFREMER sismer@ifremer.fr).

Once included in the SeaDataNet CDI service, SeaDataNet as an Integrator arranges and guarantees that the AtlantOS data are also included in the EMODnet portals for physics, chemistry and bathymetry, as appropriate, and also as collections within the overarching GEOSS portal.

SeaDataNet also provides AtlantOS **standards** such as catalogues and controlled vocabularies for supporting harmonization and integration of metadata and data.

4.2.2.2 Copernicus INS TAC

CMEMS (http://marine.copernicus.eu) has been designed to respond to issues emerging in the environmental, business and scientific sectors. Using information from both satellite and in situ observations, it provides state-of-the-art analyses and forecasts on a daily basis, which offer an unprecedented capability to observe, understand and anticipate events in the marine environment.
Within this programme, the Copernicus INS TAC is a distributed service integrating data from different sources for operational needs in oceanography. The Copernicus INS TAC integrates and quality controls in a homogeneous manner in situ data from outside CMEMS data providers in order to fit the needs of internal and external users. It provides access to integrated datasets of core parameters for initialization, forcing assimilation and validation of ocean numerical models, which are used for forecasting, analysis and re-analysis of ocean physical and biogeochemical conditions. Since the primary objective of CMEMS is to forecast ocean state, the initial focus has been on observations from autonomous observatories at sea (e.g. floats, buoys, gliders, ferryboxes, drifters, and ships of opportunity). The second objective is to set up a system for re-analysis purposes that requires products integrated over the past 25 to 60 years. The Copernicus INS TAC comprises a global in-situ centre and 6 regional in-situ centres, one for each EuroGOOS Regional Ocean Observing System (ROOS). The INS TAC has been designed to fulfil the Copernicus Marine Core Service needs and the EuroGOOS ROOS needs. The focus is on parameters that are presently necessary for Copernicus Monitoring and Forecasting Centres, namely temperature, salinity, sea level, current, waves, chlorophyll / fluorescence, oxygen and nutrients. Additional atmospheric parameters (such as wind, air temperature, air pressure, etc.) are added by some ROOSes to these regional in-situ portals to fulfil additional downstream applications needs.

For NRT and DM products, the Copernicus INS TAC is connected to JCOMM Networks and to each ROOS of EuroGOOS. For DM products, it is also connected to the SeaDataNet Network of NODCs. From AtlantOS observations, it presently integrates the Argo, EGO, DBCP, OceanSITES and ship data via NODCs. It relies on standards developed within SeaDataNet whenever possible.

4.2.2.3 EMODnet

EMODnet is an initiative from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE) as part of the Marine Knowledge 2020 Strategy, a consortium of organizations within Europe that assembles marine data, data products and metadata from diverse sources in a uniform way. Currently it is made up of 6 portals: bathymetry, geology, physics, chemistry, biology, and seabed habitats. An additional portal on Human Activities is under construction.

EMODnet Physics
This portal is built upon two main data streams, namely archived data from monitoring stations and other in-situ physical observations, provided through SeaDataNet, and the stream of NRT and historical data from operational monitoring stations through the Copernicus INS TAC. EMODNET-Physics therefore clearly benefits from any improvement in data integrated in the Copernicus INS TAC and SeaDataNet NODCs.
EMODnet Physics provides free and open access to all available near real time data over the latest 60 days to any user without the need for registration, while for older data, EMODnet Physics and Copernicus Marine are requesting registration and use of user credentials (password is encrypted and invisible to the service, other information with regards to the organization of the registrants etc. are for internal statistics purpose and for providing to data originators information on their data's usage).
EMODnet Physics is now providing data discovery, pre-view, access and downloading services for more than 5000 operational platforms (including fixed stations, ferryboxes, Argo floats, etc.). Validated delayed data series and metadata are organized according to the network of NODCs.

EMODnet Biology
Data providers are connected with the EMODnet biology portal through operational services (IPT (DiGIR), Custom services, OGC web services and File harvesting (CDI)). At this level, the data is standardized and integrated before it is brought to the user. Standardization is done for different aspects of the data: at the level of metadata (ISO 19115), for taxonomy through linking up to World Register of Marine Species, and for localities through linking up to the Marine Regions. Also OGC standards are applied for redistribution of the data.
For AtlantOS data relevant to EMODnet biology, two data flows are already in place:

- The CPR network is well connected to the EMODnet Biology. Over 2.5 million plankton observations are transferred and redistributed through the EMODnet biology portal. In addition a series of data products is available: gridded abundance maps, ratio maps, maps of anomalies, seasonal maps, etc.
- Data collected by the ICES fish and plankton surveys are provided from the ICES Database of trawl surveys (DATRAS) to the Biology portal. In addition a number of national plankton monitoring surveys provide data to the portal (Sweden, France, others)

As part of AtlantOS, a European Aquatic Animal Tracking Network (EATN) will be developed (task led by IMAR). This network should serve as a European node of the Ocean Tracking Network (OTN). There is already a close connection between OTN and OBIS. As agreed with IMAR and OTN, EDMODnet-Biology team has taken on the task of setting up the database system for the EATN.

EMODnet central portal
EMODnet central portal provides the user with access to the data products and services of the different thematic portals. The Central portal can be seen as an integration of Integrators, with the EMODnet thematic portals being the Integrators. This Central portal does not hold any data and connects to EMODnet thematic portals through webservices. Data is exchanged with the Central portal using OGC compliant web services. Developments of the EMODnet Central portal are driven by needs (shipping activities, aquaculture, offshore construction, etc.). The query tool allows the user to extract data from the data products that are served.

4.2.2.4 ICES
ICES datacentre manages one of the world largest marine databases and holds datasets related to the marine environment. Some datasets contain more than 100 years of data. The **fish trawl survey dataset** contains information about how samples are taken, sample sizes, collection methods and about age and maturity status of individuals in the collections. The **Eggs and larvae dataset** contains information about stages of development and quantity. The **Zooplankton dataset** contains information about abundance and biomass.

ICES is part of the SeaDataNet network of NODCs; it is a Thematic integrator, and it is linked to EurOBIS and EMODnet-Biology.

4.2.2.5 EurOBIS

EurOBIS, the European node for the Ocean Biogeographic Information System (OBIS), is used as data infrastructure for **EMODNet Biology** and has been used as a biodiversity data depository in several FP6, FP7 and ESFRI projects. EurOBIS currently counts over 159 data suppliers providing research datasets and datasets from national monitoring programmes.

The **OBIS network** is a global initiative stemming from the Census of Marine Life (2000-2010). It is now part of the IOC/IODE programme. OBIS currently integrates marine biodiversity data from over 450 data providers in 56 countries. OBIS deals with observation data on zooplankton, phytoplankton, benthos, fish, sea birds, marine mammals, reptiles, etc. and holds biodiversity information that aligns with several of the variables discussed within GEO BON as potential EBVs (Essential Biodiversity Variables). These include Species distribution, Population abundance, Population structure by age/size class, Body mass, Migratory behaviour, Physiological traits, Taxonomic diversity, Species interactions, Primary productivity, and Aecondary productivity.
Integration in OBIS adds value to the data through **standardization** into common formats based on the OBIS and Darwin Core standards. Taxonomy is standardized based on the World Register of Marine Species (WoRMS http://www.marinespecies.org/). Localities and area boundaries are standardized to Marine Regions (http://www.marineregions.org/). Furthermore, a procedure of OBIS **QC** (steps & outlier checks) allows upgrading the data by providing feedback to the individual data providers.
At the global level OBIS provides information for Ecologically or Biologically Significant Areas (ESBA) identification in the framework of the Convention of Biological Diversity (CDB), the UN World Ocean Assessment and other international biodiversity related processes. The OBIS network provides data to GBIF (Global Biodiversity Information Facility). On a European level, OBIS data is used within the Operational Oceanographic Products and Services (OOPS) that support the ICES advisory process for Integrated Ecosystem Assessments.

4.2.2.6 GEOSS

GEOSS (Global Earth Observation System of Systems) links together existing and planned earth observing systems around the world and supports the development of new systems. It promotes common technical standards so that data from different instruments can be aggregated into coherent data sets.
The GEOSS portal offers a single Internet access point for users seeking data, imagery and analytical software packages relevant to earth observations. Data providers can make their resources and services available in a global context through the GEOSS Components and Services Registry, which provides a formal listing and description of all the Earth observation systems, data sets, models and other services and tools that together constitute the Global Earth Observation System of Systems.
At the moment the main upstream providers are operators of remote sensing platforms like EOMAP, DigitalGlobe, RapidEye and others. An upstream provider of specific interest to AtlantOS is Copernicus, which is designated as Europe's main contribution to the global ten-year implementation plan of GEOSS. The Global Ocean Observing System GOOS led by the IOC is another upstream provider of data and information for GEOSS relevant for AtlantOS.
AtlantOS will promote integration of ocean information into GEOSS Common Infrastructure specifically targeting EOVs.
In collaboration with the GEF Transboundary Waters Assessment Programme (TWAP), GOOS and OBIS, GEOWOW (GEOSS interoperability for Weather, Ocean and Water) is bringing together new marine ecosystem information in the form of ecosystem EOVs; that is key marine 'variables' considered essential to monitor the ocean changes, especially induced by anthropogenic climate change and other human impacts. These are being analysed to create 'indicators' of marine change.

The GEOSS Common Infrastructure holds a number of registries like the component and service registry or the standards (from OGC, W3C, others) that are relevant for the data registration process. With the advent of the data and access broker this process has been significantly accelerated. AtlantOS can support further improvements in this process by asking all its data providers to register their data in the GEOSS Common Infrastructure.

As GEOSS integrates resources and services throughout the many scientific disciplines covered in earth observations, it has a broad crowd of target users. Hence, the GEOSS portal provides a window to the broader Earth observing community.

5 Standardization across Networks

Within AtlantOS, the set of agreed recommendations aims to better serve data to users by facilitating data discovery, usage of data and products, and to facilitate the integration by Integrators. The recommendations have been developed around four axes, which are:

- Common mandatory metadata
- Mapping on EOVs of the observations acquired by the different networks
- Common NRT automatic QC procedure for a set of parameters available rapidly after acquisition
- Best practices in terms of data delivery

5.1 Across Network mandatory metadata

For guaranteeing a continuum between **data-platform-institution** in an unambiguous way across the Networks, the following data harmonization recommendations must be fulfilled:

- The minimum metadata are the **platform or station identifier** and the **data provider code**.
- These are mandatory in the data files and the associated platform catalogue (described in §6.1)

5.1.1 Unique platform or station identifier

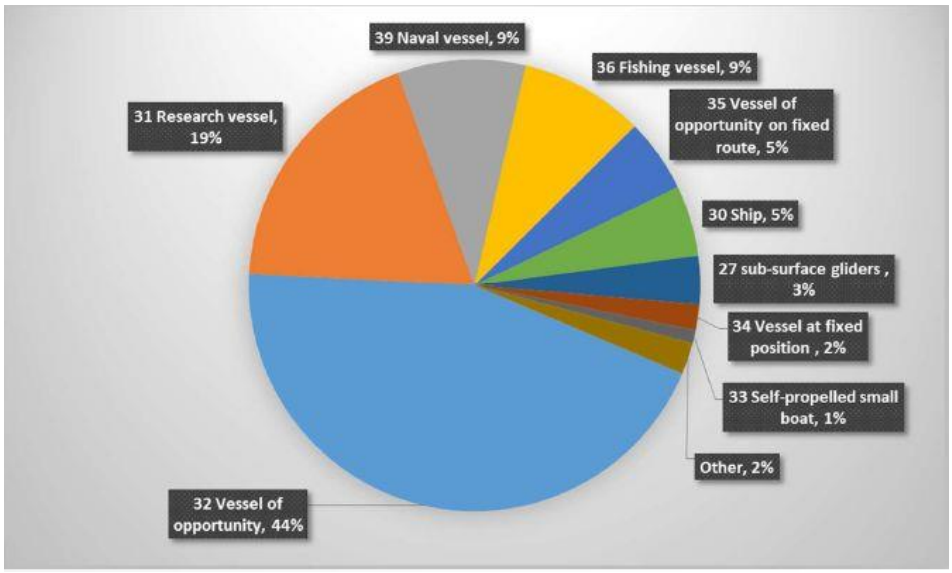
The goal is to identify, without ambiguity, the platform and/or station that has acquired data by including the unique ID of each platform and station in the dataset metadata. These unique IDs will help in the traceability of datasets, identifying which platform carried out the measurements and/or at which station. This will enable better comparisons of/combining of NRT and DM validated data from the same platform/station that are supplied by different routes.

A platform is considered as a combination of a name and physical entity such as hulls or airframes. A station differs from a platform in that there is a fixed geospatial component, which can be considered as having different attributes to a platform. A platform could be deployed for the duration of its working life to collect data at only one station or a platform could transit among many stations collecting data from other locations as part of its lifetime operation.

For Networks involved in AtlantOS, the two catalogues agreed for unique IDs management are: **(1) C17 controlled vocabulary of SeaDataNet** listing the codes **for all platforms except stations,** and **(2) ICES station directory** for stations**.** The second catalogue has a geospatial component not present in the C17 SeaDataNet catalogue and thus is more suitable as a station can be relocated and then spatial metadata are needed. The EuroGOOS Task Team on Sea Level will provide recommendations by the end of November 2016.

The guidelines to request a unique ID, via the ICES platform procedure for both catalogues, are provided in Appendix 8.3. The set of recommendations will be managed and made available at EuroGOOS, together with the definition of the procedure to warn the networks when it is evolving.

An action to expand the code list in C17 is on-going and involves JCOMMOPS, ICES, EMODnet and SeaDataNet. This action has first been focusing on vessels (more 4000 registered up to June 2016, see the figure below) and is also taking into account the WMO number for Argo, Drifter data and most of data that are sent on GTS.



Vessels in the C17 catalogue, current to the end of 2015

5.1.2 Unique institution code for data providers

It is very important to give visibility to the Institutions that provide data (the originator of the data, not the funder or the operator). Thus, the mandatory and minimal information for data providers to put in a data file and in the platform catalogue is the Institution code from EDMO (data harmonization recommendation, see **D7.1**).

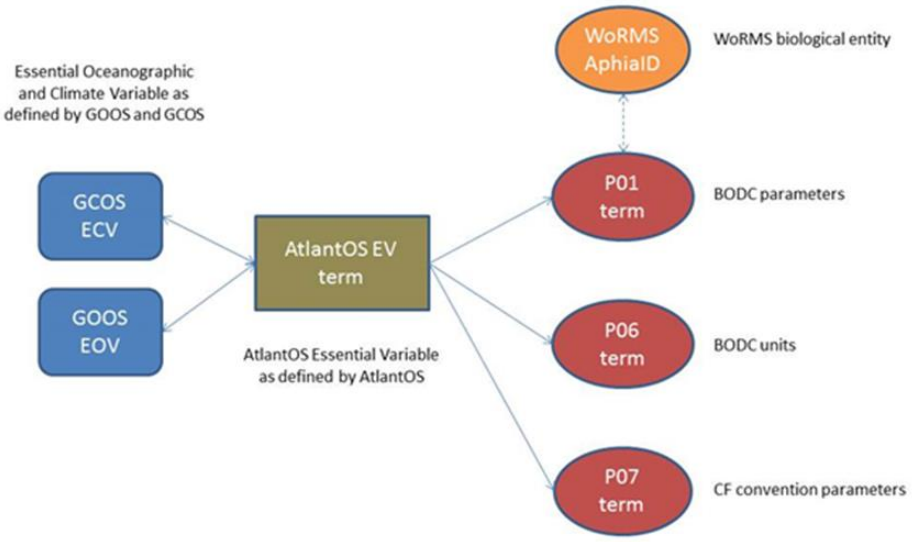
EDMO is the European Directory of Marine Organizations developed under SeaDataNet, and it can be used to register any marine organization involved in the collection of datasets (operators, funders, data holders etc.). It delivers a code for the organization to be included in the data or metadata to harmonize the information (compared to free text) and optimize the discovery of datasets. EDMO is coordinated by MARIS.

For EU Countries new entries are added by the National Data Centres (NODCs). Through ODIP cooperation, there is also a point of contact for USA, Australia and some other non-EU countries. The rest of the world is managed by MARIS, which also moderates the first entrance in EDMO of new entries.

The request for a new entry in EDMO is sent to MARIS (current contact: Peter Thijsse (peter@maris.nl), who verifies if the institution is already registered. If a new entry is needed the basic entry is made by MARIS, after which the appropriate NODC is responsible for updating further details and managing changes.

5.2 AtlantOS set of Essential Variables

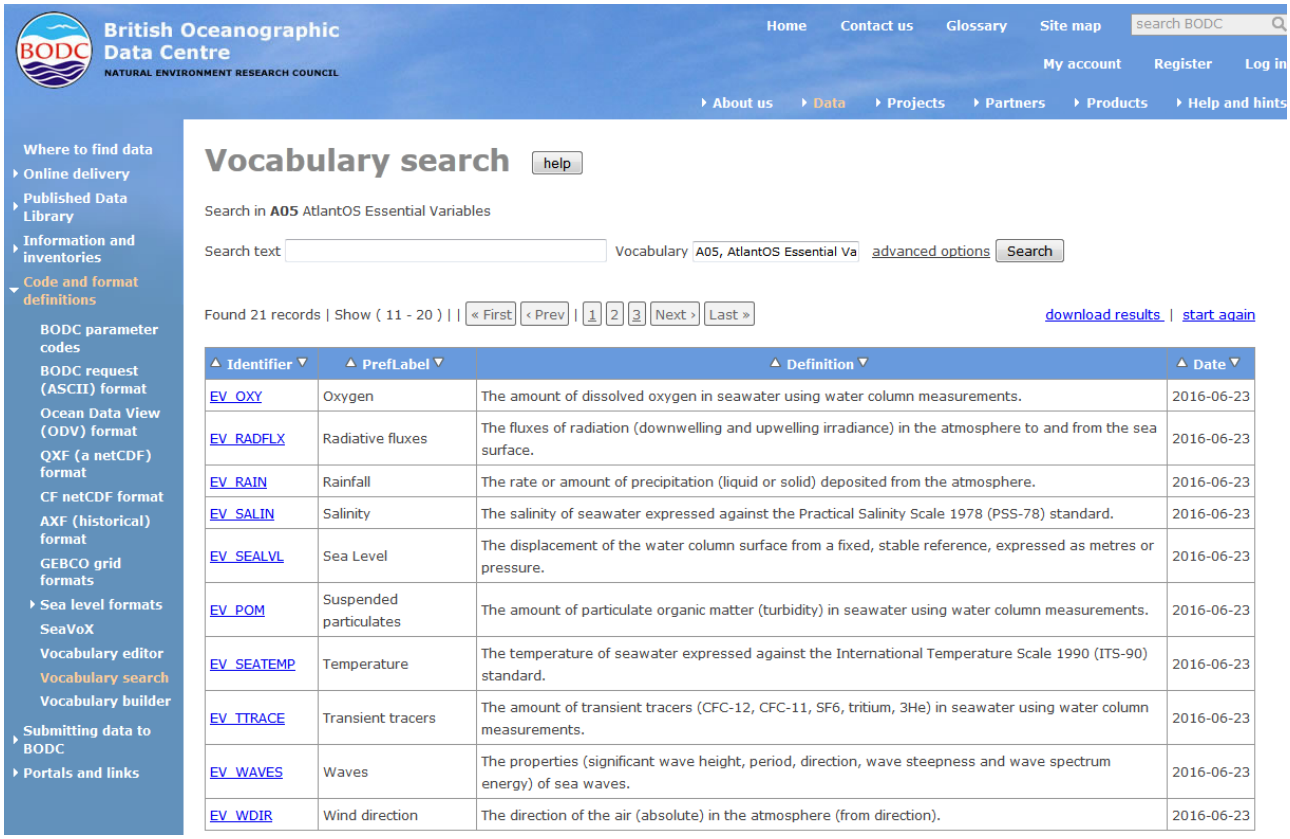
An AtlantOS Essential Variables list of terms (aggregated level), related to ECV –EOV or other, has been defined and was published in June 2016 on the NERC/BODC Vocabulary Server (version 2.0) as A05 vocabulary (https://www.bodc.ac.uk/data/codes_and_formats/vocabulary_search/A05/). This new vocabulary is mapped to the standards recommended for AtlantOS parameter metadata (see **D7.1**): P01 (parameter), P07 (CF variable), P06 (units) from SeaDataNet controlled vocabularies managed by NERC/BODC and the internationally assured AphiaID from the WOrld Register of Marine Species (WoRMS), http://www.marinespecies.org/aphia.php?p=webservice.



Map of AtlantOS recommended vocabularies

The A05 vocabulary and associated mapping is updated and adjusted when EOVs (especially biological EOVs) and network measurements are confirmed.

Each Network has to define the mapping between the metadata for the parameters in their data and the standards recommended. By doing this, a **Network allows mapping on the fly without having to change its datasets**.
To find the mapping corresponding to a measured parameter, it starts from A05 list at https://www.bodc.ac.uk/data/codes_and_formats/vocabulary_search/A05/



British Oceanographic Data Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

Home | Contact us | Glossary | Site map | search BODC | My account | Register | Log in
About us | Data | Projects | Partners | Products | Help and hints

- Where to find data
- Online delivery
- Published Data Library
- Information and inventories
- Code and format definitions
  - BODC parameter codes
  - BODC request (ASCII) format
  - Ocean Data View (ODV) format
  - QXF (a netCDF) format
  - CF netCDF format
  - AXF (historical) format
  - GEBCO grid formats
  - Sea level formats
  - SeaVoX
  - Vocabulary editor
  - Vocabulary search
  - Vocabulary builder
- Submitting data to BODC
- Portals and links

Vocabulary search

help

Search in **A05** AtlantOS Essential Variables

Search text | Vocabulary A05, AtlantOS Essential Va | advanced options | Search

Found 21 records | Show (11 - 20) | | « First | ‹ Prev | 1 | 2 | 3 | Next › | Last » | download results | start again

Identifier	PrefLabel	Definition	Date
EV_OXY	Oxygen	The amount of dissolved oxygen in seawater using water column measurements.	2016-06-23
EV_RADFLX	Radiative fluxes	The fluxes of radiation (downwelling and upwelling irradiance) in the atmosphere to and from the sea surface.	2016-06-23
EV_RAIN	Rainfall	The rate or amount of precipitation (liquid or solid) deposited from the atmosphere.	2016-06-23
EV_SALIN	Salinity	The salinity of seawater expressed against the Practical Salinity Scale 1978 (PSS-78) standard.	2016-06-23
EV_SEALVL	Sea Level	The displacement of the water column surface from a fixed, stable reference, expressed as metres or pressure.	2016-06-23
EV_POM	Suspended particulates	The amount of particulate organic matter (turbidity) in seawater using water column measurements.	2016-06-23
EV_SEATEMP	Temperature	The temperature of seawater expressed against the International Temperature Scale 1990 (ITS-90) standard.	2016-06-23
EV_TTRACE	Transient tracers	The amount of transient tracers (CFC-12, CFC-11, SF6, tritium, 3He) in seawater using water column measurements.	2016-06-23
EV_WAVES	Waves	The properties (significant wave height, period, direction, wave steepness and wave spectrum energy) of sea waves.	2016-06-23
EV_WDIR	Wind direction	The direction of the air (absolute) in the atmosphere (from direction).	2016-06-23

A05 vocabulary for AtlantOS set of variables

By way of example, by searching the A05 vocabulary as illustrated above, one can click in the list displayed on EV_SEATEMP for Temperature and reach the mapping for this variable with the terms in P01 and P06 vocabularies. Then, by browsing through the list of terms displayed (see below) a user can identify the one corresponding to the parameter sought.

⇑ -- Temperature --

URI	http://vocab.nerc.ac.uk/collection/A05/current/EV_SEATEMP/
Identifier ()	SDN:A05::EV_SEATEMP
Preferred label (en)	**Temperature**
Alternative label (en)	Sea temperature
Definition (en)	The temperature of seawater expressed against the International Temperature Scale 1990 (ITS-90) standard.
Version Info ()	1
Deprecated()	false
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPPR01/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPST01/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPST02/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC01/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC02/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC03/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC04/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC05/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC06/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC07/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC08/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC09/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC10/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC11/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC12/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC13/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC14/
Narrower	http://vocab.nerc.ac.uk/collection/P01/current/TEMPTC15/
Narrower	http://vocab.nerc.ac.uk/collection/P07/current/CFSN0335/
Related	http://vocab.nerc.ac.uk/collection/P06/current/UPAA/
Related	http://vocab.nerc.ac.uk/collection/P06/current/UPKA/
Date ()	2016-06-23 15:58:53.0

Access to associated P01 and P06 vocabularies for Temperature variable (EV_SEATEMP in A05)

For example, in INS TAC Corpernicus data files SDN::P01::TEMPST01 corresponds to the TEMP parameter as illustrated below.

⇑ -- Temperature of the water body by CTD or STD --

URI	http://vocab.nerc.ac.uk/collection/P01/current/TEMPST01/
Identifier ()	SDN:P01::TEMPST01
Preferred label (en)	**Temperature of the water body by CTD or STD**
Alternative label (en)	WC_temp_CTD
Definition (en)	This is the preferred term for this definition. Alternative term TEMPST02 is inclu data set and referential integrity considerations prevent a usage of a single co
Version Info ()	1
Deprecated()	false
Broader	http://vocab.nerc.ac.uk/collection/P25/current/WTEMP/
Broader	http://vocab.nerc.ac.uk/collection/P02/current/TEMP/
Broader	http://vocab.nerc.ac.uk/collection/P35/current/WATERTEMP/
Broader	http://vocab.nerc.ac.uk/collection/S26/current/MAT00640/
Broader	http://vocab.nerc.ac.uk/collection/A05/current/EV_SEATEMP/
Related	http://vocab.nerc.ac.uk/collection/P06/current/UPAA/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0001/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0002/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0005/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0009/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0035/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0040/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0042/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0144/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0149/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0173/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0232/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0364/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0371/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0451/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0032/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0041/
Related	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0058/
Related	http://vocab.nerc.ac.uk/collection/S02/current/S032/
Date ()	2009-11-03 16:19:38.0

Access to TEMPST01 in P01 mapping to TEMP parameter in Copernicus data files

Below is an example of an extract of the mapping defined for Copernicus INS TAC between parameters in the data format and (P01 parameters + P06 units) in BODC controlled vocabularies.

param	long_name	cf_standard_name	unit	sdn_parameter_urn	sdn_parameter_uri	sdn_uom_urn	sdn_uom_uri
PRES	Sea water pressure, equals 0 at sea-level	sea_water_pressure	decibar	SDN:P01::PRESPR01	http://vocab.nerc.ac.uk/collection/P01/current/PRESPR01/	SDN:P061::UPDB	http://vocab.nerc.ac.uk/collection/P06/current/UPDB/
PSAL	Practical salinity	sea_water_salinity	psu	SDN:P01::PSALST01	http://vocab.nerc.ac.uk/collection/P01/current/PSALST01/	SDN:P061::UUUU	http://vocab.nerc.ac.uk/collection/P06/current/UUUU/
TEMP	Sea temperature in-situ ITS-90 scale	sea_water_temperature	degree_Celsius	SDN:P01::TEMPST01	http://vocab.nerc.ac.uk/collection/P01/current/TEMPST01/	SDN:P061::UPAA	http://vocab.nerc.ac.uk/collection/P06/current/UPAA/

5.3 NRT QC for selected EOVs

A core of seven EOVs are selected for implementation of common QC procedures because they are acquired and controlled in NRT (24h to several days) by more than one Network among the Networks involved in AtlantOS integration activity.
The selected EOVs are:

- Physics : temperature (T), Salinity (T), Current for surface and subsurface and Sea level
- Biogeochemistry : Oxygen (O2), Chlorophyll-A, Nitrate (NO3) and Carbon (pCO2) for surface and subsurface

The recommendations available in [**D7.2** QC Report] have been compiled by experts on those EOVs and validated by the Networks acquiring those EOVs and performing NRT QC.

Also the harmonization recommendations across Networks include **QC information** to be attached to the data. These include both Quality flags that can be mapped to the SeaDataNet flag scale (see Appendix 8.4) and when known processing level information ("qualified in NRT using automated procedures" or "processed in DM by Scientist").

Below is the list of Networks affected by these recommendations:

- Argo, Gliders and OceanSITES for T&S, Current, Oxygen(O2), Chla, NO3
- Drifters for T&S, Current
- Ferrybox, FOS, fixed moorings, coastal profilers for T&S, Current, Chla
- VOS/SOOP, GO-SHIP for T&S, Chla, Carbon (pCO2), NO3
- Tide gauges for Sea level

5.4 Distribution means

The recommendation for implementation is that participants at least to provide an FTP service at the level of Network data management as the minimum delivery service. Additional services such as Web services can also be provided but are not mandatory.

6 Data exchange backbone

The purpose of the "Data Exchange Backbone" is to set up mechanisms that will ease discovery, viewing and downloading of AtlantOS observations by users. It relies on the following:

- Platform catalogues at Network GDAC or Portal level
- Detailed Network and platform descriptions (SensorML marine profile)
- AtlantOS Network and product catalogue
- Controlled vocabularies (NERC/BODC) for parameters (described in §5.2)
- Citation strategy (DOI)

6.1 Platform catalogue at the GDAC or portal level

This catalogue, located at the root on an FTP portal, aims to describe the available datasets and platforms of the Network. This facility enables (1) the users to discover more easily and rapidly the data from a Network, and (2) set up monitoring services. Such catalogues are populated (built and updated) from the metadata in the data files on Network FTP sites (minimum data access mean recommended).

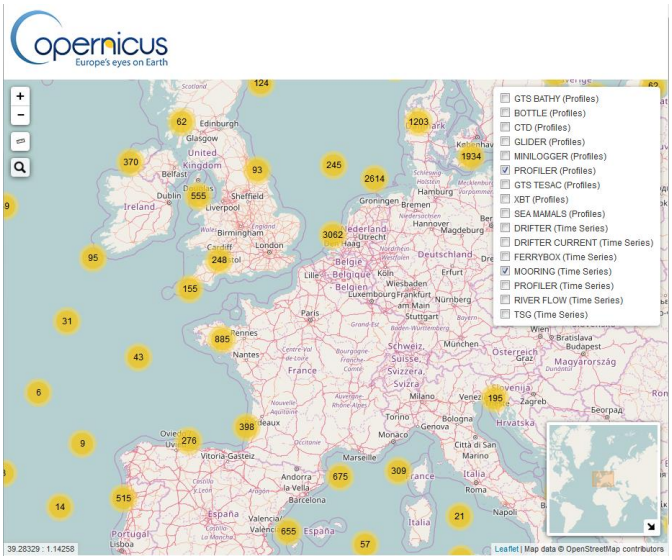
To facilitate the discovery of platforms and data files at Network GDAC level, a simple catalogue technique consists of populating, continuously (creation and update) on file arrival/update, two types of indexes as simple ASCII files besides the data files made available on FTP:

1. **An index of data files** (one line per file described), that contains all the **relevant metadata** to describe each individual data file, in particular the "provider" with **at least the unique institution code defined for AtlantOS** (and not an alphanumeric string)
2. **An index of platforms** (one line per platform described) aggregated from the metadata in the data file, that contains all the relevant metadata to describe each platform

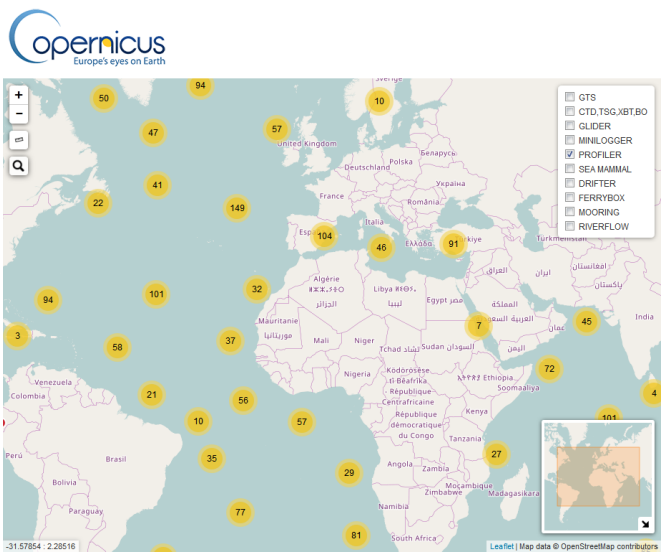
This kind of catalogue exists in the Integrator Copernicus INS TAC (content at the end of 2015: 100 000 data files and 30000 platforms). The precise ASCII format for the two types of indexes is described in the "Catalogue of data and platforms at Network GDAC level, including the example of Copernicus In Situ TAC" (http://dx.doi.org/10.13155/45063).

Such index files are useful for setting up synchronization between the GDAC and the user space. This is desired by operational users that retrieve data automatically from the portals. They can also be used to create KPIs (Key Performance Indicators) for monitoring purposes on the networks availability, statistics on institutions or countries providing data, maps of the latest data available parameters provided, delays, etc.

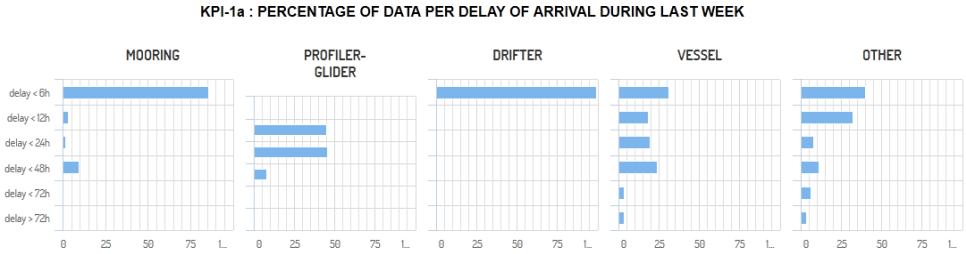
Statistics and maps on Copernicus INS TAC index files are continuously updated. They provide indicators (see http://www.ifremer.fr/co/co05010507 and http://www.ifremer.fr/co/co05010507/KPI), to monitor the content of the data and metadata. Below are presented some examples of the Copernicus INS TAC indicators.



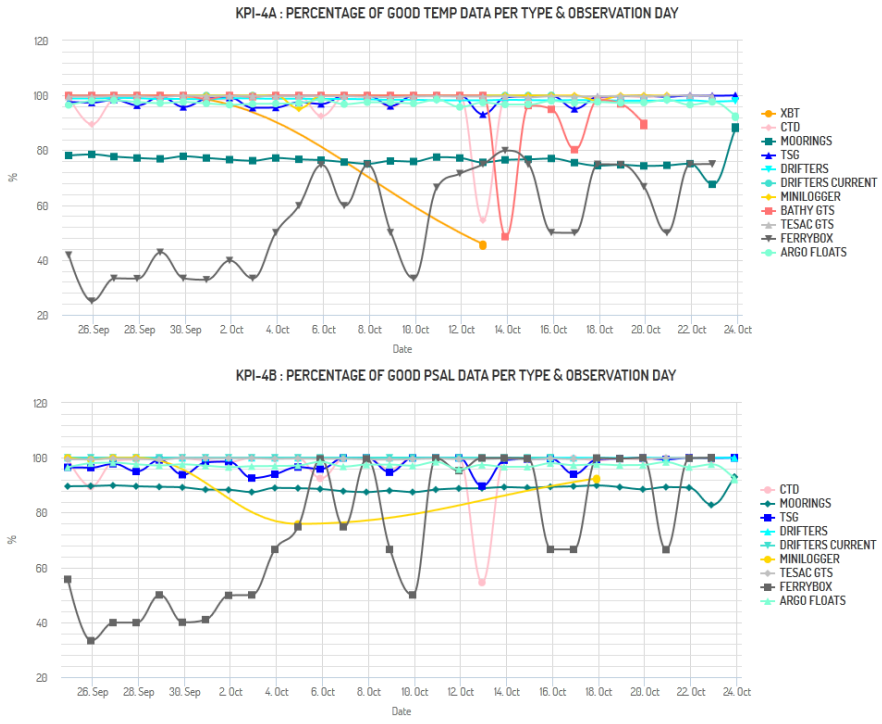
The last 30 days of observations hit map for Copernicus INS TAC



The last position of the 30 000 Copernicus INS TAC platforms



Copernicus INS TAC KPIs - delay of arrival per platform type (date of availability minus date of observation)



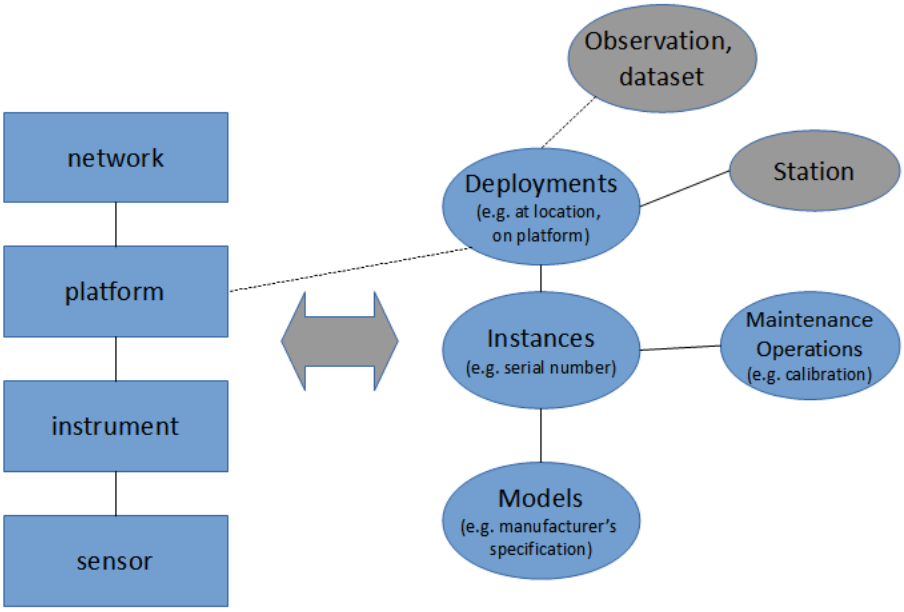
Copernicus INS TAC KPIs : percentage of good temperature and salinity data per platform type

Taking the example of the Copernicus INS TAC, Networks in AtlantOS for which data are managed at the GDAC level can setup such a catalogue. **GO-SHIP, VOS, Glider and Ferry Box Networks** are candidates to set up such facilities (catalogue and services) to enhance access to their Network data and also their monitoring.

6.2 Detailed network and platform metadata

A harmonized way of describing platforms helps to trace the provenance of the data and how it was acquired. A trigger to go to the SWE (Sensor Web Enablement) standard from OGC occurs when a Network needs to register a significant amount of metadata to describe a platform or a deployment. In this context, SensorML, one of several implementation standards produced under OGC's SWE activity, is useful to describe the sensor, instance of sensor on a platform or deployment of a platform. Networks that want to exchange such data should have the capability to describe their metadata using a SensorML profile.

SensorML standard is very flexible and hierarchical; as illustrated below it can describe network, platform, instrument, sensor, process, etc.



Hierarchical modelling with SensorML standard

Examples of existing catalogues are:

- ESONET yellowpages (http://www.esonetyellowpages.com/) for hundreds of models of sensors that can be mounted on fixed moorings or seafloor laboratories
- EuroFleets for research vessel description (http://www.eurofleets.eu/rvs/)
- SensorNanny interface that allows users to browse a SensorML description.

The following Networks in AtlantOS are candidates to test or set up SensorML catalogues: Argo, OceanSITES for FixO3 PAP moorings, GO-SHIP, VOS/SOOP, Gliders and Ferrybox.

The proposed SensorML marine profile is elaborated in partnership with funded works in Europe:

- The group 52°North is steadily working on standardization of marine SWE profile
- Ocean of Tomorrow's projects (senseOCEAN, FixO3, NexOS, BRIDGES …), ODIP2 (US-Australia-Europe collaboration on E-Infrastructure), SeaDataCloud and AtlantOS are involved.
- ENVRIplus sensor registry activity
- Development on-board platform are on-going at CSIC (Nexo)
- Tools for edition and access are made compliant with standards by: 52°North, UTM-CSIC + CNR (Research Vessel), IFREMER (Research data, deep sea observatory and mooring …), BODC, ETT, MARUM ...
- Vocabularies are being standardized at BODC (e.g. event types)

Use of SensorML profiles to describe platforms is likely to develop rapidly in the coming years with the development of "intelligent" sensors or platforms that will be able to provide information on their configuration directly in SensorML instead of through manufacturer formats.

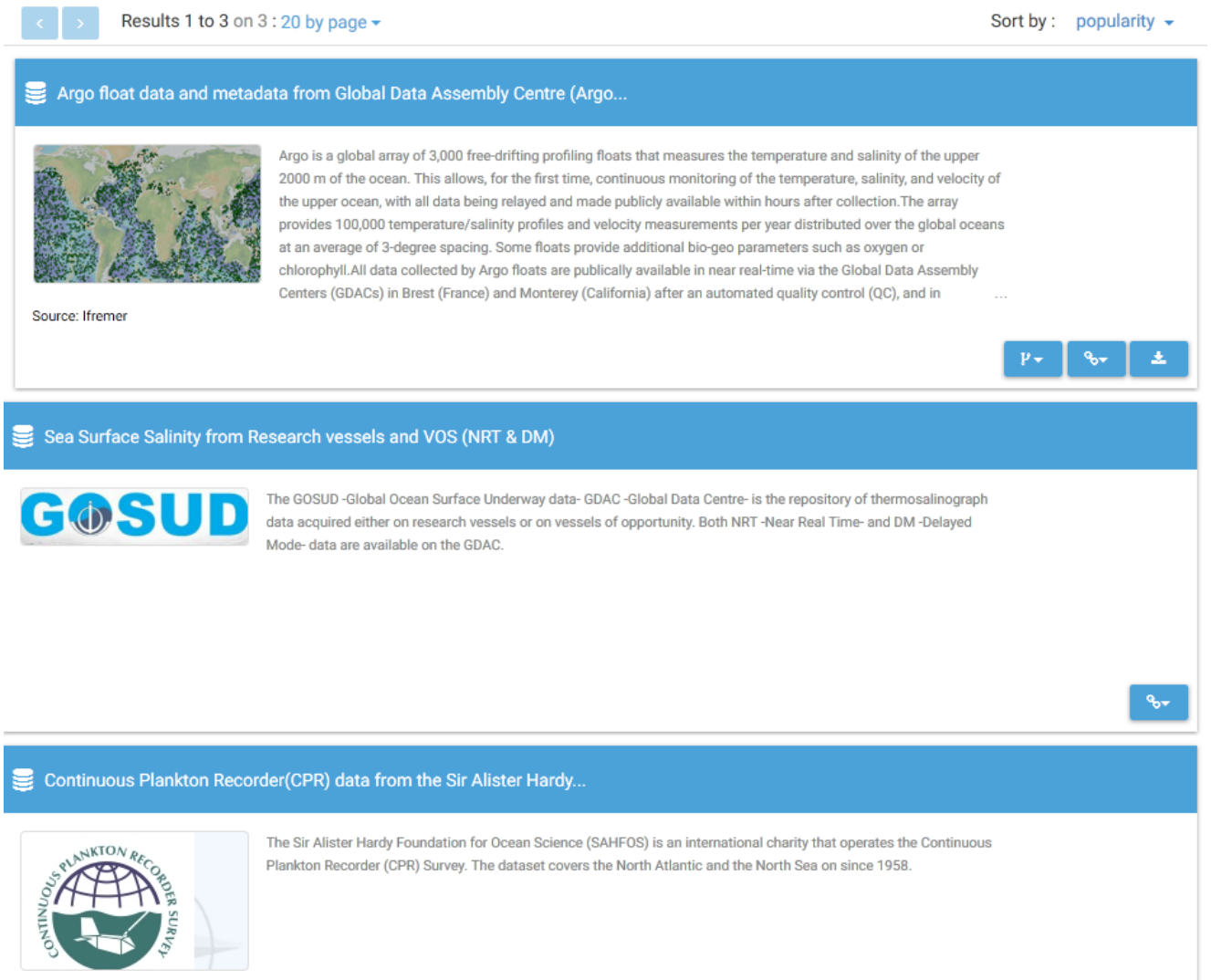
6.3 AtlantOS Network and product catalogue

As a front window for the WP7 AtlantOS efforts to aggregate and federate observations, it is proposed to build a catalogue of data products and present it in searchable web pages. The catalogue is implemented with the GeoNetwork component of the **Sextant** Spatial Data Infrastructure. This catalogue will also feed GEOSS common infrastructure.

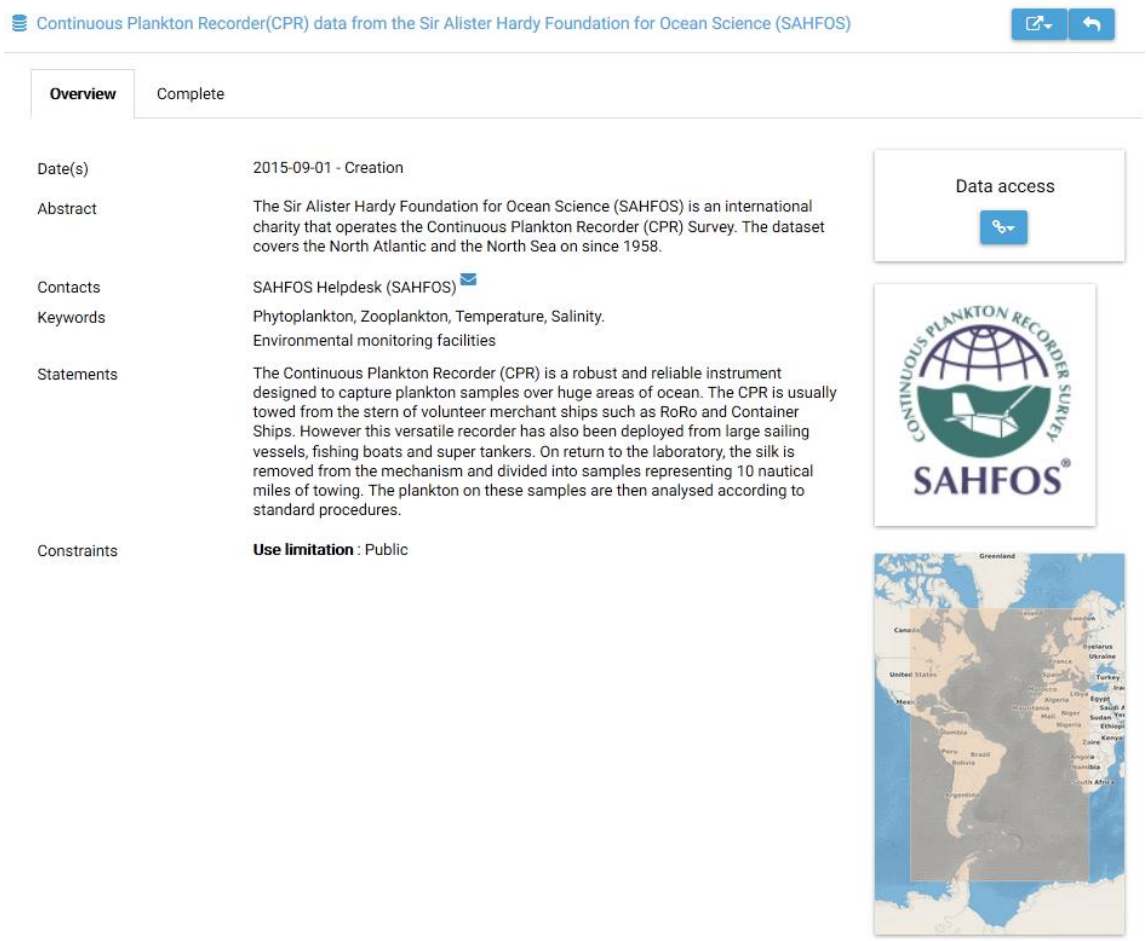
A **template** for the AtlantOS data product descriptions to be filed in by the Network representatives and the Integrators in AtlantOS is presented in Appendix 8.5.

The output documents elaborated from this template for each Network shall be sent to the contact point (codac@ifremer.fr attn: Loic Petit de la Villeon, Subject: Network metadata for AtlantOS catalogue) and will be used as input to populate the AtlantOS catalogue.

The initial version of this catalogue shows descriptions (as illustrated below) of the networks collections of observation data and links to the data resources where they are originally curated and published (e.g. GDACs).



Snapshot of Networks in AtlantOS catalogue



CPR Network description in AtlantOS catalogue

Such catalogue will be available from EuroGOOS website and aims at being maintained in the future.

6.4 Implementation of Data Citation

To be able to operate observing systems on a long-term basis, operators are often asked to provide evidence that their platform data are essential not only for their study but also for multiple uses. Sharing data with other communities contributes to foster multiple uses of observations but makes it more difficult to trace its effective use.

A DOI (Digital Object Identifier) is a unique identifier for an electronic document or a dataset. Networks can assign DOIs to documents and datasets for two main objectives:

- Citation (in a publication the DOI is efficiently tracked by bibliographic surveys)
- Traceability (the DOI is a direct and permanent link to the document or data set used in a publication).

In the past years, a lot of progress has been made on data citation, and it is now possible to assign a DOI to the network and link to DOIs assigned to frozen fragments that are archived forever. The proposed way to cite dynamic data (continuously updated in time), is to have a unique DOI plus an additional date stamp (#date) for frozen fragments (like http://dx.doi.org/10.12770/128...cfc9#date).
That is the way DOIs are implemented for Argo Network (http://www.argodatamgt.org/Access-to-data/Argo-DOI-Digital-Object-Identifier).

Assigning DOI is underway for French cruises linked to a Cruise Summary Report (suggestion to add the EXPOCODE = ICES code + date of the Cruise). A “master” DOI is assigned to each French oceanographic

cruise (past and future). Each data set from the cruise is assigned a DOI, linked to the cruise DOI. The cruise landing page is an efficient and dynamic support to give access to all data sets (with their own DOIs) produced by the cruise and the bibliography of publications using these DOIs.

A reference guide name “DOIs for ocean data, general principles and selected examples (Argo, French cruises)” has been issued and is available at http://dx.doi.org/10.13155/44515

Each network must define the appropriate granularity to assign DOIs. Preliminary thoughts for consideration include:

- For Moorings have a DOI per site and fragments periodically
- For Cruise data there are activities in ODIP and it should be discussed at GO-SHIP level to make the best use of DOIs
- For Gliders there are needs for DOIs at the network, site and deployment levels, and a strategy needs to be elaborated
- If the DOI master (without the fragment) could be added to the file, this will facilitate link to DOI landing pages.

7 Data integration and services to users

To facilitate access to AtlantOS data it has been decided to work at two levels:

- **At Networks level** to provide integrated access to all available data. The importance of enhancing services at the Network level is that data managers are close to platform operators and can design the system to fit the platform specificities.
- **At Integrators level** that build thematic services for additional targeted users and will be able to enhance their services with the help of the Networks (integration, update process, archive, etc.).

7.1 Facilitate access to Network data

As already mentioned, the way to facilitate access to Network data for users is to set up a central point from where the data can be uploaded, or rely on existing Integrators to distribute more widely their data.

The table below summarizes the situation at the **beginning of AtlantOS project** for the Networks involved in WP7. More details are presented in Appendix 8.6

			WP2 - ship based observing networks					WP3 - autonomous observing networks					WP4 - coastal observing systems			
			GO-SHIP	VOS/SOOP	CPR	Fish + plankton survey	Seafloor mapping	Argo	Glider	Drifter	OceanSITES	EATN	Ferrybox	FOS (RECOPESCA)	Coastal profilers	Fixed moorings
Integrator	Portal	GEOSS	X	Partially	Partially	Partially	X	Partially	Partially	X	Partially		Partially			
		Emodnet-physics	Partially	X				X	X	X	X		X	Partially	Partially	Partially
		Emodnet-chemistry	Partially	Partially				not yet	not yet		not yet		Partially			
		Emodnet-biology			X	X			not yet			*target*				
		Emodnet-bathymetry					X									
	Infrastructure	Copernicus INS TAC	Partially	Partially				X	X	X	X		Partially	Partially	Partially	Partially
		Seadatanet	Partially	Partially		Underway	Allmost all	Partially	not yet		Partially		Partially			
		Eur-OBIS			X	X						*target*				
	Data center	Global assembling	CCHDO, CDIAC	Sea surface: CDIAC/USA ; PANGAEA for atlas Subsurface :NOAA	SAHFOS database	ICES		GDAC	GDAC	GDAC	GDAC	*to be set up in Task3.7*	GDAC			
		national level	NODC		BODC, OBIS	IMR, IFREMER, DTU,...	NGDC	DAC	DAC	DAC	DAC		DAC	DAC	DAC	DAC

Summary table of data integration at the beginning of AtlantOS project

In this context, set up or enhancement of Global Data Assembly Centres or portals are planned for:

- VOS/SOOP and GO-SHIP (European collaboration with USA)
- Ferrybox for European data
- Gliders (enhance the Global portal with more European data but also extend to USA and Canadian gliders)
- OceanSITES (enhance the Global portal with more European data)
- Drifters (set up of 2 GDAC,Europe and Canada, under Marine Climate Data System (MCDS) framework to access the best version of drifter data)

Furthermore, it also planned to push more data to existing international initiatives:

- CPR and EU Ferrybox to GOSUD IOC program

7.2 Enhance integration into Integrators and services to users

To summarize the enhancements:

- All infrastructures are planning to connect to new GDACs that are setting up to achieve:
  - A more complete data coverage in time and space
  - Better quality of the integrated data as update processes will be easier
  - Extension to more biogeochemistry data essential for Ecosystem modelling
  - Facilitate also links between Integrators (Copernicus INS TAC <-> SeaDataNet, Copernicus INS TAC <-> EMODnet)
- All Integrators are updating their data system to implement the AtlantOS recommendations on metadata and vocabularies for parameters
- Surveys were performed to identify the AtlantOS data that were not integrated yet, and activities are going on with Networks to improve the situation for Copernicus INS TAC, SeaDataNet and consequently EMODnet
- Implement traceability of AtlantOS observations and use methods, and develop monitoring tools and dashboards in association with WP9.1 (ETT, VLIZ, JCOMMOPS)
- AtlantOS is contributing to GEOSS through different channels including teaming up with ODIP and in addition is promoting its use as the central hub to discover environmental data and information. However, as the GEOSS Common Infrastructure is going through a transitional phase, AtlantOS will explore the best strategy for taking new initiatives like the GEOSS European Data Hub into account.

7.2.1 SeaDataNet for long term archive

To enhance access to network data archives, it is important to know the current status of existing systems. MARIS has developed and completed **a survey of the SeaDataNet Data centres** to assess how much of the network DM data were available in the **SeaDataNet CDI infrastructure**, compared to what was available at Network level.

To solve the problem of identified gaps, two options are proposed to the Networks: either (1) become a node themselves in SeaDataNet infrastructure or (2) push their data through an NODC that feeds SeaDataNet. This depends also largely on the way data is organized: centrally or nationally. Overview of the feedback so far is:

Network	Central / national	Preferred connection
VOS/SOOP, GO-SHIP	Central	Own node (in progress at SOCAT)*
Ferrybox	Central (HZG)	Own node
Drifters	Central (2 GDAC)	Own node (but not under AtlantOS)
Argo	Central (GDAC) and partly national	Via GDAC for some countries (France already), other via NODC*
OceanSITES	Central (at IFREMER and USNDBC) and some national	Own node? (tbd)*
Gliders	Central (GDAC at Ifremer)	Own node*
Seafloor mapping	National	Via NODC and other datacentres (already)

Network	Central / national	Preferred connection
Fish and plankton survey, EATN	Via EurOBIS/EMODnet biology	
CPR	Central	Own node for Physical and chemical data

** Some of the Argo-GOSUD-OceanSITES-EGO data are managed both at national NODC and at GDAC level. The SeaDataNet CDI catalogue could in some cases be more easily and efficiently fed from the GDACs, which has not been the recommendation in SeaDataNet up to now. This is due to the fact that NODC's often apply specific Delayed QC and have national obligations to handle certain data. This will need to be decided country by country which is the preferred way to distribute DM data. Maris will also raise the issue at the SeaDataNet steering team level.*

7.2.2 Copernicus INS TAC for operational need

Copernicus INS TAC focuses on some physical (T&S, Current, Sea level, Wave (wind)) and biogeochemical (O2, Chl) parameters, and is well connected to the following networks:

- Argo, OceanSITES ,GOSUD, Drifters, SOOP (XBT though GTS) and some European Gliders
- Connection to regional and coastal networks started in JERICO and EuroGOOS-ROOS
- Connection to GO-SHIP data is presently done via the SeaDataNet network of NODCs like for all the scientific cruises

The first improvement carried on is related to the use of the recommendations set up at the AtlantOS level: the EDMO code of platform is added in the files and the missing EDMO codes will be requested through appropriate NODCs. The aggregation of WAVE and O2 and Chl data will be improved with a better usage of SeaDataNet vocabularies. The mapping with SeaDataNet attributes will be added in the documentation and in tools that will be provided to users.

The second axis of improvement is to switch to the GDACs when they will be set up as a main source of observation, and includes:

- SAHFOS data via GOSUD in particular environment data
- GO-SHIP data in NRT and earlier for DM through the GO-SHIP portal when set up
- harvesting from the Ferrybox portal to synchronize with the best version available and keep transect information in the files
- integrate more Glider data to take into account the new platforms that will be made available on the EGO portal
- Idem for OceanSITES data

Copernicus INS TAC is preparing the link with ICOS-Ocean for Ocean Carbon and environmental data for ecosystem model validation in association with the GDAC set up by UiB.

A third axis is to improve the availability of historical data to enhance the products for reanalysis. CMEMS plans to do it using the aggregated collections provided by the SeaDataCloud project when available.

In link with ENVRIplus, the use of the EUDAT Cloud system for providing subscription mechanisms, viewing and subsetting facilities on Copernicus products using Virtual Machine on the Cloud will be tested.

7.2.3 EMODnet portals

7.2.3.1 EMODnet-Physics

For each connected platform, the EMODnet Physics portal is showing both the latest data and metadata, and in particular it is citing all the relevant actors in the data acquisition, validation and distribution pipeline chain when available in the data files. Some of the networks are transmitting only a limited number of metadata while the full metadata is hosted and managed by international organizations. The most important is JCOMMOPS. The first axis of improvement was to set up collaboration between EMODnet Physics and JCOMMOPS in order to support each other in avoiding duplicating efforts, and in the end, to better track metadata and information.

The second axis of improvements for data discovery includes: (1) to give more visibility to the AtlantOS Data Networks, the EMODnet Physics landing page now presents links to Data Networks; (2) to interact with the Networks to enhance the viewing pages for the platforms they manage, this work has started; and (3) to link to the Network description in the AtlantOS catalogue.

The third axis of improvements will be to enhance the downloading and viewing services taking into account Network feedbacks on the usage of the services that already exists.

7.2.3.2 EMODnet-Biology

EMODnet-Biology covers all the EU regional seas and connects data from 159 institutes from all EU countries. It is based on EurOBIS, which is connected the regional node of the International OBIS under IOC-IODE and uses WoRMS (AtlantOS recommendation) and OBIS Darwin core standards for biology metadata. A large part of the data flow is based on operational web services and data from Atlantic (sub)regions can be retrieved. A new download portal has been launched allowing regional subsetting of the data and providing access to the original data mapped on a standardised format.

Concerning the integration of data from the Networks involved in AtlantOS, EMODnet-biology already integrates the biology data from the CPR network, and the Fish and Plankton surveys from the ICES database. Integration of European Animal Tracking Network has started in link with WP3.

EMODnet-biology will focus on implementing the set of recommendations for standardization agreed at the AtlantOS level:

- Include EDMO codes for institutions
- Include additional data flows based on the AtlantOS set of EOVs
- Propose an EOV selection when the concept is better developed at IOC/GOOS level and within MBON GEOSS initiative.

7.2.3.3 EMODnet central portal

The EMODnet Central portal is an integration of integrators that doesn't hold any data and connects to the EMODnet lots portals through webservices. The EMODnet Central portal focuses on the high quality products, part of them being managed by the same tool as the one proposed for AtlantOS (described in §6.3) which may facilitate the link with AtlantOS.

7.2.4 GEOSS

The GEOSS Common Infrastructure (GCI) provides a set of core services facilitating the integration of Earth Observation resources making GEOSS an operational System-of-Systems. The GCI allows data providers to make data, information, tools, and services available to GEOSS users, and it facilitates the users of Earth observations with tools to access, search and use these resources. It is a goal for AtlantOS to integrate the GEOSS GCI as part of the AtlantOS interoperability framework, and WP7 is closely following the evolution of the GCI and interacts with GEOSS in order to explore how AtlantOS as a community can contribute to and make best use of GEOSS services. This includes technical solutions to improved harmonization as well as dissemination of AtlantOS data.

GEOSS takes a brokering approach to facilitate interdisciplinary interoperability and GCI builds on a broker for each main functionality: discovery, access, semantic interoperability, which are unified in a common brokering framework called the GEO Discovery and Access Broker (DAB) (Nativi et al. 2015). AtlantOS will explore the best practice for making use of GEOSS brokering services to improve harmonization and interoperability of resources. Some of the AtlantOS data integrators, like SeaDataNet, are already making use of GEOSS brokering services to facilitate concordance of their standards with the EU INSPIRE Directive Implementing Rules. AtlantOS shall explore the experience derived from these activities, and investigate if they can be used in a broader perspective for other AtlantOS Integrators. Furthermore, already existing links to GEOSS shall be explored, for instance our links to GEOSS via ODIP, which has generated significant progress on GEOSS interoperability, which also involves AtlantOS partners, such as SeaDataNet.

The GEOSS GCI is continuously evolving and new initiatives emerge, like the GEOSS European hub, which is under development in order to strengthen the access to Earth Observation at regional level and accommodate the requests from European users willing to discover, access, combine and process multiple Earth observation data and information streams. This will include an innovative web-based IT platform to provide users with a unique access point (gateway) to the diverse European range of Earth observation data. As the GEOSS Common Infrastructure is going through this kind of transitional phase, AtlantOS will explore the best strategy for taking new initiatives like the GEOSS European Data Hub into account.

GEOSS works globally and covers all scientific disciplines concerned earth observation. AtlantOS collaboration with GEOSS shall assure that AtlantOS resources gets the widest possible prevalence; geographically as well as interdisciplinary. A workshop planned for the spring 2017 shall explore the imminent possibilities for usage of the GEOSS GCI as overarching integrator of AtlantOS data resources. Recommendations on improved AtlantOS/GEOSS integration are planned in report D7.8 (mo36).

8 Appendices

8.1 Network data management and services

8.1.1 WP2-Ship based observing networks

8.1.1.1 Data management

	GO-SHIP		VOS/SOOP		CPR		Fish + plankton survey		Seafloor mapping	
EOVs measured summary										
Physics	yes	M	yes	A	yes	A	yes	A	yes	A
Biogeochemistry	yes	M	yes	M	yes	A	yes	A	no	
Biology/ecosystems	no	A	no		yes	M	yes	M	no	
Quality control										
NRT (24h to several days)	yes	no common QC routines, different accuracy/precision goals. CTD available daily.	yes	for XBT	yes	internal QC procedure - ISO standards	no		yes	variable levels of quality control, SVP variably corrected
DM	yes	All data available 6 months after cruise, or 6 months after shore based analysis.	yes	P,T,S only range limit, PCO2 planned,	yes	internal QC procedure - ISO standards	yes	DATSU utility of ICES, , report provided to PI	no	
flags, with standard scale	yes	WOCE standard			no		no		no	
Metadata										
Platform identification	yes	ICES platforms codes, some Seadatanet approved codes	yes ?	ICES platforms codes, some Seadatanet approved codes	yes	internal code system	yes	ICES platforms codes, some Seadatanet approved codes	yes	Ship, sensor, SVP, date variably recorded and supplied
data provider available	yes	EDMO when in NODC	yes	EDMO when in NODC	yes		yes	but not exposed yet	no	metadata provided by uploader
make use of standard vocabularies	yes	Defined in the WOCE manuals		BODC vocabs are currently being implemented	yes	Worms for taxa	yes	ICES vocabs (reference codes), Worms and Rubin for taxa, EDMO and EDMERP codes	yes	
Data formats										
netCDF					no		-		yes	
ASCII (CSV,...)	yes	exchange csv format	yes	SOCAT	no		yes	DATRAS and CSV for Acoustic database	yes	both ungridded and gridded
Other			yes	BUFR for XBT	yes	Darwin core (for use with OBIS, EMODnet and GBIF)	yes	XML for Acoustic database	many	mix of native sonar, exported sounding and gridded formats currently available

8.1.1.2 Services

	GO-SHIP		VOS/SOOP		CPR		Fish + plankton survey		Seafloor mapping	
Data distribution										
GTS (real time)	yes	CTD data to Coriolis	yes	for XBT, BUFR format	-		-		no	
Publically available	yes		yes	yes - partly under IPR	yes	for presence data	yes		yes	6 months - 3 years after cruise
Authentication			no	but yes for no public data	no		no		no	
FTP			yes	for download	no		no		yes	for download
Web	yes	http://cchdo.ucsd.edu/ http://cdiac.ornl.gov/oceans/	yes	SOCAT - data or product viewer, PANGAEA	no	Presence data from OBIS. Some processed data via EMODNET portal	yes	ICES portals, Web Service APIs with WSDL	yes	Pangea, Geomapapp, BODC, NOAA and others
Standard Services										
OGC (SWE,WMS,WSC,...)					no	only via OBIS			no	
DOIs	yes		yes		no	only via OBIS			yes	not consistently

8.1.2 WP3-Autonomous observing networks

8.1.2.1 Data management

	Argo		Glider		Drifter		OceanSITES		EATN	
EOVs measured summary										
Physics	yes	M	yes	M	yes	M	yes	M	yes	A
Biogeochemistry	yes	M	yes	M	no		yes	M	yes	A
Biology/ecosystems	no		no		no		no		yes	M
Quality control										
NRT (24h to several days)	yes	P, T, S, oxygen, ChlA	yes	P, T, S, oxygen, ChlA	yes	T S Current	yes	When available	no	A small fraction of our receiver report in RT(cabled or satellite systems)
DM	yes	T,S	yes	to be defined	yes		yes		Yes	
flags, with standard scale	yes		yes		yes		yes	defined in format	No	
Metadata										
Platform identification	yes	WMO, unique	yes	WMO, unique	yes	WMO, unique from now on (past has duplicates)	yes	WMO code if allocated and Oceansites platform	Yes	Unique
data provider available	yes		yes		yes	JCOMMOPS	yes		Yes	VLIZ
make use of standard vocabularies	yes	SDN Vocab for parameters Argo for other variables	yes	EGO based on SDN vocab for parameters	no	BUFR sequences not all in CF	yes	BODC vocabs and ACDD (Attribute Convention for Dadaset discovery)	Yes	Darwin Core, CF
Data formats										
netCDF	yes	Argo NetCDF V3.1 CF1.6, Oceansites CF v1.2	yes	EGO format with QC flag for NRT	yes	Oceansites CF v1.2 for trajectories	yes	OceanSites v1.3	Yes	Animal Acoustic Telemetry Standard delivered via ERDDAP
ASCII (CSV,...)	-		-		-		-		Yes	As above
Other	-	TESAC and BUFR for profiles	yes	TESAC for profiles	yes	BUFR template TM315009, excludes current	-	TESAC converted to BUFR	Yes	Includes many formats as per ERDDAP

8.1.2.2 Services

	Argo		Glider		Drifter		OceanSITES		EATN	
Data distribution										
GTS (real time)	yes	TESAC and BUFR for profiles	yes	TESAC for profiles	yes	BUFR format	yes	not all sites	-	
Publically available	yes		yes		yes		yes		Yes	As per data policies
Authentication	no		no		no		no		Yes	
FTP	yes	GDAC ftp, Copernicus ftp	yes	GDAC ftp, Copernicus ftp	yes	Copernicus ftp for RT	yes	GDAC ftp, Copernicus ftp	No	
Web	yes	Copernicus thredds servers with subsetting facility	yes	Copernicus thredds servers with subsetting facility	yes	Copernicus thredds servers with subsetting facility	yes	Copernicus thredds servers with subsetting facility	Yes	ERDDAP, Geoserver
Standard Services										
OGC (SWE,WMS,WSC,...)	yes	Copernicus in-situ services (Oceanotron=OpenDAP, OGC-WMS)	yes	Copernicus in-situ services (Oceanotron=OpenDAP, OGC-WMS)	yes	Copernicus in-situ services (Oceanotron=OpenDAP, OGC-WMS)	yes	Copernicus in-situ services (Oceanotron=OpenDAP, OGC-WMS)	Yes	Geoserver
DOIs	yes	GDAC DOIs	no	to be defined	no		no		Yes	CISTI (through OTN)

8.1.3 WP4-Coastal observing systems

8.1.3.1 Data management

	Ferrybox		FOS (RECOPESCA)		Coastal profilers		Fixed moorings	
EOVs measured summary								
Physics	yes	M	yes	M	yes	M	yes	M
Biogeochemistry	yes	M	yes	A	yes	A	yes	M
Biology/ecosystems	no		no		no		no	
Quality control								
NRT (24h to several days)	yes		yes		yes		yes	
DM	yes		yes		no		yes	
flags, with standard scale	yes							
Metadata								
Platform identification	yes	partly	yes		yes		yes	
data provider available	yes	partly	yes		yes		yes	
make use of standard vocabularies	yes	partly	yes		yes		yes	
Data formats								
netCDF	yes	from ROOSs	yes		yes		yes	
ASCII (CSV,...)	Yes		yes		yes		yes	
Other								

8.1.3.2 Services

	Ferrybox		FOS (RECOPESCA)		Coastal profilers		Fixed moorings	
Data distribution								
GTS (real time)	yes	RT (satellite communication) or NRT (after each cruise)						
Publically available	yes	not always the case	yes		yes		yes	
Authentication	no		no		no		yes	
FTP	yes	partly	yes		yes		yes	
Web	yes	partly	yes		yes		yes	
Standard Services								
OGC (SWE,WMS,WSC,...)	yes	partly						
DOIs	no	planned in near future	no	planned in near future	no	planned in near future	no	planned in near future

8.2 Services provided by Integrators

		Infrastructure			
		ICES	**EurOBIS**	**Seadatanet**	**Copernicus INS TAC**
Services	**Discovery**	**ICES metadata catalogue** (ISO 19115) based on GeoNetwork v3.1.0	**IMIS** discovery metadata catalogue (ISO 19115 and GCMD)	**CDI** data discovery Products in **SEXTANT tool** **SWE** metadata extension	aggregated products documented in the **CMEMS catalogue (ISO 19139**) in **SEXTANT tool**
	Viewing	**OGC WMS and WFS** services; ICES data portal based on OpenMap layers and additional thematic portals acoustic.ices.dk and datras.ices.dk	**OGC WMS and WFS** services	**OGC WMS and WFS** to exchange maps and metadata including URLs to further metadata and data. **Oceanbrowser** combined with **OCEANOTRON** (via **CDI Buffer**) for data products such as climatologies. **SOS** viewing services for NRT data	**OGC WMS (soon WFS)** services through the **OCEANOTRON tool** (OPENDAP for in situ data)
	Downloading	Open access data policy, web GUI data and data product downloads and **web services (various protocols)**	Open access, **web services**	Authenticated **Web** (**Marine ID**), distributed **Download Manager(DM)** in data centers, via **CDI**	Authenticated **FTP** (CAS-FTP)- **Planned Subsetting using OCEANOTRON**
	Traceability	**Implementing DOI's** from November 2016; datasets have associated factsheets and clear citation guidance. The disclaimer in the download states all sources of data in the dataset. As a matter of policy ICES does not require users to register or document their request for data unless it is data of a restricted nature	All user downloads are logged, user downloads are registered.	**Request Status Manager(RSM)** tracking and tracing all requests. Each product is described with metadata and has traceable links to the used data	All user downloads are logged and monitoring is done by Mercator. Planned to provide feedback to platform providers on access made through CMEMS
	Outreach and training	**ICES has 200 expert groups** regularly working with the data and interacting with the Data Centre; the ICES training programme focusses on application (the end use of data)	regular OBIS/EurOBIS training courses; OceanTeacher, …	Training and guidance of new data centres for getting connected, using software tools, and populating their data sets	coordinated within the CMEMS User workshops and participation to training session as in situ experts
	Others	Additional **concept mapping and code management** provided via the request management system (Platforms and Monitoring Stations) and all utilised vocabularies in **vocab.ices.dk** including web services	**Data publishing services . OGC/Open GIS web** map/feature/coverage services (GeoServer/GeoNetwork) . Datasets are being published as citable **DOI** labelled data publications based on a collaboration with **DATACITE**		

		Portal			
		EMODnet-physics	**EMODnet-biology**	**EMODnet central**	**GEOSS**
Services	**Discovery**	interactive dynamic map + filter (platform type, EOV, upstream provider among ROOSs (INSTAC – Copernicus.Marine), ARGO, EGO, DBCP, OceanSites , SHIP, SDN for data, and JCOMM for missing metadata …)	IMIS discovery metadata catalogue (ISO 19115, GCMD) + search functionality (per species, species group, dataset) on data portal	Products catalogue based on Geonetwork	Data and services discovery available via the GEOSS portal
	Viewing	data plots (selectable time window), WMS and WFS (geoserver), web services	Portal with data maps + data products visualised, OGC WMS and WFS services (geoserver), web services	Viewer visualising data products	Imagery can be viewed directly e.g. Remote sensing
	Downloading	open – ensuring traceability	Download toolbox provides efficient downloading	Refers to lots for entire product download.	GEOSS portal will guide to the resources
	Traceability	user downloads are tracked (IP, type of request, user name …)	Citable DOI labelled datasets. User downloads are registered (email, purpose, user group)	Metadata describes lineage and data product providers.	GEOSS provides a reference to data providers
	Outreach and training		Outreach: Website, Blog, Twitter,	Outreach: by Emodnet secretariat, website,	GEOSS is a marked focus on outreach and training
	Others	**Dashboard, monitoring tools** (manual and automatic), **KPIs**	Manual reporting of tracked downloads and web hits in EMODNET reports		

8.3 Guidelines to manage platform id

8.3.1 Procedure to request C17 codes (via ICES platform procedure)

To request a new code or update the metadata for an existing code, one has to log in to the ICES Platform and Station Code Management application => http://vocab.ices.dk/Request/Login.aspx?ReturnUrl=%2frequest.

To get a userid and password, an email has to be sent to accessions@ices.dk and request to set you up.
Alternatively: If asking BODC to set a code up, email to pamcg@bodc.ac.uk (Paul mcGarrigle).

ICES' CMS only allows users to submit one ship at a time - there's no bulk upload facility.
The minimum, in terms of attributes, you'll need are:

- Name
- Flag country
- Platform class (from the L06 vocabulary)
- Plus either radio call sign or IMO number.

Optional attributes are:

- Native language name (if different)
- Maritime Mobile Service Identity (MMSI)
- Pennant number
- NODC World Ocean Database (WOD) number
- Title (e.g. RRS, HMS)
- Date commissioned
- Data decommissioned (if applicable)
- Date built
- Length (metres)
- Previous name (if applicable)

NB: as a code refers to a name, flag & hull combination, a new code is needed if a ship is renamed, or a new vessel goes into service with the same name as the one it replaced.

BODC manages a Mailman mailing list "[platforms]", where new code submissions are circulated by ICES. All requests for new codes or updates to existing records are circulated via the list email (platforms@mailman.nerc-liv.ac.uk). More people can be added to this group if required.

New code requests need approval by NOAA (they synchronise with their own ship code list), at which point they are marked as approved in ICES database (vocab.ices.dk). NOAA is sometimes described by ICES as 'US-NODC' - in the context of platform codes they are the same.

BODC only updates C17 once a new code or change of details has been approved by NOAA. This process may take a while depending on available NOAA and ICES staff resources.

8.3.2 Procedure to request monitoring station codes (via ICES station directory procedure)

The monitoring station codes are distinct from the platforms, but now handled through the same request system (http://vocab.ices.dk/Request/Login.aspx?ReturnUrl=%2frequest - Choose “Station”).
Platforms and stations can be queried through the ICES Vocabulary service using POX or SKOS representation (http://gis.ices.dk/geonetwork/srv/eng/catalog.search#/metadata/FE02B766-B83C-4A14-AE2B-E7545CFFFA12)
ICES is planning to release an update that will allow for bulk inserts of stations, and when this is running along with the appropriate documentation, some further guidance for the networks will follow.

8.4 SeaDataNet QC Flag Scale

A harmonized scheme of **QC Flags** to be used to label individual data values has been defined and adopted in SeaDataNet. This **QC Flag scale** presented below is available in the SeaDataNet Common Vocabularies (http://seadatanet.maris2.nl/v_bodc_vocab/welcome.aspx/) as list **L201**.

Key	Term	Term abbr	Term def
0	no quality control	none	No quality control procedures have been applied to the data value. This is the initial status for all data values entering the working archive.
1	good value	good	Good quality data value that is not part of any identified malfunction and has been verified as consistent with real phenomena during the quality control process.
2	probably good value	probably good	Data value that is probably consistent with real phenomena but this is unconfirmed or data value forming part of a malfunction that is considered too small to affect the overall quality of the data object of which it is a part.
3	probably bad value	probably bad	Data value recognised as unusual during quality control that forms part of a feature that is probably inconsistent with real phenomena.
4	bad value	bad	An obviously erroneous data value.
5	changed value	changed	Data value adjusted during quality control. Best practice strongly recommends that the value before the change be preserved in the data or its accompanying metadata.
6	value below detection	BD	The level of the measured phenomenon was too small to be quantified by the technique employed to measure it. The accompanying value is the detection limit for the technique or zero if that value is unknown.
7	value in excess	excess	The level of the measured phenomenon was too large to be quantified by the technique employed to measure it. The accompanying value is the measurement limit for the technique.
8	interpolated value	interpolated	This value has been derived by interpolation from other values in the data object.
9	missing value	missing	The data value is missing. Any accompanying value will be a magic number representing absent data.
A	value phenomenon uncertain	ID_uncertain	There is uncertainty in the description of the measured phenomenon associated with the value such as chemical species or biological entity.

8.5 Template for AtlantOS Network description

In the following template:

- each section/sub-section identifies a field or sub-field of the template for the Sextant catalogue
- *what is written in italic between [] is a comment or an explanation on the field or sub-field of the template*
- what is written in normal font correspond to the example for GOSUD-Sea Surface Salinity

1) Identification

a) Title

[Name by which the cited resource is known]
Sea Surface Salinity from Research vessels and VOS (NRT & DM)

b) Abstract

[Brief narrative summary of the content of the resource(s)]
The GOSUD -Global Ocean Surface Underway data- GDAC -Global Data Centre- is the repository of thermosalinograph data acquired either by research vessels or by vessels of opportunity. Both NRT -Near Real Time- and DM -Delayed Mode- data are available on the GDAC.

c) Identifier

[Alphanumeric value identifying an instance in the namespace. ***This field will be filled up by the Sextant administration team. Don't use it, but keep it in the document****]*

d)Language

English

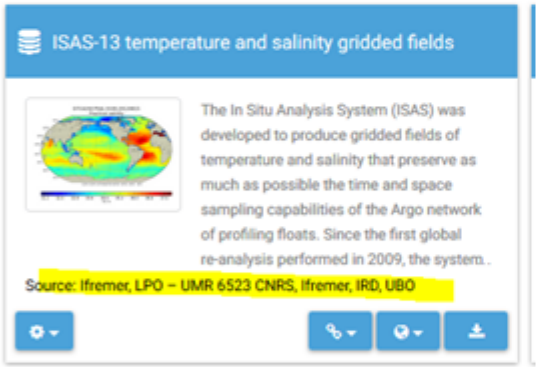
e)Credit

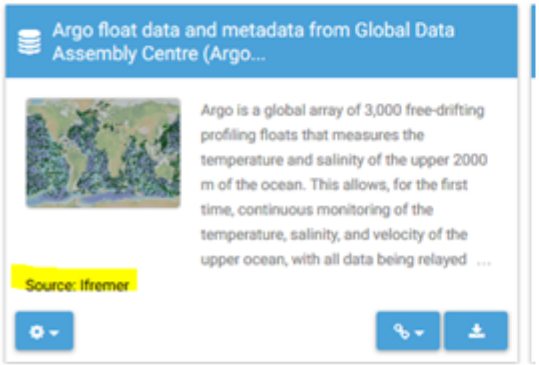
[Recognition of those who contributed to the resource(s)

Either indicate the Name of the Institute that maintains the Data service + names of the contributors if it can fit in the field or "& all" if it's too long, or the Credit sentence agreed in your program

This information is very important and will appear in the source field of the catalog. See images below]

SAHFOS (for CPR data) or Ifremer (for Argo) or GOSHIP (for RV data)





f) Date

[date of creation of this document or date of the last main update]

2) Inspire theme and keywords

a)Topic category

*[this is fixed by ISO. **Do not change this field**]*

Oceans

b) Sextant theme

*[this is fixed by Sextant. **Do not change this field**]*

Ocean Observation Network

c) INSPIRE themes

*[This is a fixed INSPIRE theme; **Do not change this field**]*

Environmental monitoring facilities

d) Descriptive keywords

[Free text for these keywords, or P02 thesaurus or CF parameter names]

Salinity of the water column, Temperature of the water column

3) Contact for the resource

a) Organism

[Either Name of the Network or Name of the Integrator Program]

GOSUD

b) Individual name

[We propose here the contact point of a Helpdesk. By default the Coriolis HelpDesk]

codac@ifremer.fr

4) Responsible organisation

[Name of the institution that runs the Network or Integrator Portal. [OceanSites, Argo, GOSUD, SOT...]]

GOSUD

a) individual name

[Generic Name or contact]

codac@ifremer.fr

5) Geographic bounding box

[by default the geographical area will be the whole Atlantic Ocean. Please provide the boundaries, if you want to display a more restricted area, as a bounding box: northernmost and southernmost latitude, westernmost and easternmost longitude]

6) Temporal reference

a)Date for the content of the dataset
[not necessary to fill up the end date if the network is providing new data]

Begin *2016-05-13*
End

7) Usage

a) Use limitation
[this field is fixed:the AtlantOS data policy is open. ***Do not change this field****]*
Public

b) Access constraints
[this field is fixed : the AtlantOS data policy is open. ***Do not change this field****]*

c) Other restrictions
[Access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions on obtaining the resource. This field is free. You have the possibility to put how to acknowledge the contribution of the network]

8) Quality and validity

a) Origin
[General explanation of the data producer knowledge about the lineage of a dataset]

The GOSUD data are T & S surface data acquired using thermosalinograph instruments on board R/V and Ships of opportunity. The data are transmitted in Near real time whenever it is possible. The data are then quality controlled and adjusted using water sample analysis.

9) Metadata

Contact for the metadata

-Individual name (not mandatory)

-Organisation name: GOSUD

-Email: codac@ifremer.fr

-Role: point of contact

10) Associated resources

a) Title of document or website
[provide here one or more web site and / or ftp addresses or documents url or doi (quality reports, user's manual, any web services are also welcome: OGC/WMS, opendap, ...]

URL: ftp://ftp.ifremer.fr/ifremer/gosudv3/latest

b)Thumbnail

[provide here any image, map that represent you network]

8.6 Networks-Integrators maps

		WP2 - ship based observing networks									
		GO-SHIP		VOS/SOOP		CPR		Fish + plankton survey		Seafloor mapping	
Portal	GEOSS	**X**	Through CLIVAR, CDIAC, SDN etc.	**Partially**	Through CDIAC and PANGAEA	**Partially**	Through PANGAEA	**Partially**	Through PANGAEA	**X**	National Hydrography Offices
	Emodnet-physics	**Partially**	Through CMEMS and SDN	**X**							
	Emodnet-chemistry	**Partially**	Through SDN	**Partially**	CO2						
	Emodnet-biology					**X**	Discovery, Viewing, Download + Data Products. (for CPR, presence only)	**X**	Discovery, Viewing, Download + Data Products		
	Emodnet-bathymetry									**X**	DTM products
Infrastructure	Copernicus INS TAC	**Partially**	Some data are transmitted directly to CMEMS	**Partially**	Physics, Not CO2						
	Seadatanet	**Partially**	**BODC**: delayed-mode qc'd from BODC; **IEO**: Delayed mode expected in near future; **IFREMER**: French cruises for CTD, Bottles (but not all cruises and not all parameters); **MI**: once data collected; **AU-DCE/NERI**: all	**Partially**	**PANGAEA:** SOCAT will be entered; **IFREMER:** Not yet (to be decided)			**Underway**	**SMHI**:Not yet; **IFREMER**: Not yet; **AU-DCE/NERI**: underway.	**Almost All**	**UKHO-OceanWise + BODC**: as part of EMODnet Bathymetry; **PANGAEA**: MARUM working on popualtion as part of EMODnet Bathymetry; **IFREMER**: bathymetry of IFREMER research Vessels; **SHOM**: all SHOM surveys globally; GSI and **MI**: most Irish surveys; **BSH**: all BSH surveys; **OGS**: surveys of polar
	Eur-OBIS					**X**	biology	**X**	biology		
Data center	Global assembling	**CCHDO, CDIAC**	data submission by Pis	**Sea surface:** CDIAC/USA ; PANGAEA for atlas **Subsurface:** NOAA	Data submission by Pis; SOCAT Atlas	**SAHFOS database**	no RT, no QC flags	**ICES**	processed data submission by Pis, no RT, no QC flags. QC manual and survey protocols, metadata standard for acoustic data, using WorMS and other controlled vocabs		
	National level	**NODC**	SISMER, BODC, PANGEA, BSH, SMHI, IMR		managed by PIs	**BODC, OBIS**	managed by PIs	**IMR, IFREMER, DTU,...**	Primary acoustic data and primary biological trawl data **managed by Pis in national/institute systems**	**NGDC**	NOAA, partners of GEO-Seas

		WP3 - autonomous observing networks									
		Argo		Glider		Drifter		OceanSITES		EATN	
Portal	GEOSS	**Partially**	via SDN (only EU)	**Partially**	via SDN (only EU)	**X**	via GTS and WIS	**Partially**	via SDN (only EU)		*to be discussed*
	Emodnet-physics	**X**	European	**X**	European	**X**		**X**	European		
	Emodnet-chemistry	**not yet**	European	**not yet**	European (Oxygen, Nitrate,…)			**not yet**			
	Emodnet-biology			**not yet**	European (Chl-A, CDOM, Turbidity)					**X**	*is the target*
	Emodnet-bathymetry										
Infrastructure	Copernicus INS TAC	**X**		**X**		**X**		**X**			
	Seadatanet	**Partially**	**BODC**: no, because data not currently included in BODC's National Oceanographic Database; **IFREMER**: French and German Argo floats only; rest	**not yet**	**BODC**: no, because data not currently included in BODC's National Oceanographic Database; **IFREMER**: Not yet (to be decided)			**Partially**	**BODC**: provides data from PAP mooring; **IEO**: Delayed mode expected in near future; **IFREMER**: Not yet (to be decided)..		
	Eur-OBIS									**X**	*is the target*
Data center	Global assembling	**GDAC**	Coriolis	**GDAC**	Coriolis + GROOM architecture (RT data)	**GDAC**	AOML/GDC, DFO/OS and Coriolis (RT data only)	**GDAC**	Coriolis, SOCAT Atlas		*to be developped in Task3.7*
	National level	**DAC**	BODC,Coriolis	**DAC**	BODC,Coriolis, UiB, SOCIB, HZG, OC-UCY, CMRE (RT +DM data)	**DAC**	Also serves European community on request	**DAC**	NERC-NOC advisory role for EU platform in Fix03. Observatories use local DACs, some but not all output in OceanSITES format to OceanSITES, or to MyOcean		

			WP4 - coastal observing systems							
			Ferrybox		FOS (RECOPESCA)		Coastal profilers		Fixed moorings	
Integrator	Portal	GEOSS	**Partially**	though SDN that interacts with GEOSS portal						
		Emodnet-physics	**X**	European	**Partially**	European	**Partially**	European	**Partially**	European
		Emodnet-chemistry	**Partially**	European						
		Emodnet-biology								
		Emodnet-bathymetry								
	Infrastructure	Copernicus INS TAC	**Partially**	European	**Partially**	European	**Partially**	European	**Partially**	European
		Seadatanet	**Partially**	**SMHI**: data from one ship with ferry box (1992-2005); **BODC**: historical data (as described under "national") will soon be available						
		Eur-OBIS								
	Data center	Global assembling	**GDAC**	EuroGOOS ROOS portals, GDAC under discussion within EuroGOOS Ferrybox Task Team and development in EU-project JERICO-Next						
		National level	**DAC**	HZG, Coriolis, NIVA, SYKE, HCMR	**DAC**	Coriolis	**DAC**	Coriolis	**DAC**	Coriolis

9 List of acronyms

ASCII	American Standard Code for Information Interchange
CDB	Convention of Biological Diversity
CDI	Common Data Index
CMEMS	Copernicus Marine Environment Monitoring Service
CPR	Continuous Plankton Recorder
CSIC	Spanish National Research Council
DAC	Data Assembly Centre
DATAMEQ	DATA Management Exchange and Quality
DATRAS	DATabase of TRAwl Surveys
DBCP	Data Buoy Cooperation Panel
DG MARE	European Commission Directorate-General for Maritime Affairs and Fisheries
DiGIR	Distributed Generic Information Retrieval
DM	Delayed Mode
DOI	Digital Object Identifier
EATN	European Animal Tracking Network
EBSA	Biologically Significant Areas
EBV	Essential Biodiversity Variable
ECV	Essential Climate Variable
EDMO	European Directory of Marine Organizations
EGO	Everyone's Gliding Observatories
EMODnet	European Marine Observation and Data Network
EOV	Essential Ocean Variable
ESONET	European Sea Observatory NETwork
EurOBIS	European Ocean Biogeographic Information System
EuroGOOS	European Global Ocean Observing System
FixO3	Fixed-point Open-Ocean Observatories
FOS	Fishery Observing System
GBIF	Global Biodiversity Information Facility
GDAC	Global Data Assembly Centre
GEF	Global Environment Facility
GEO BON	Group on Earth Observations Biodiversity Observation Network
GEOSS	Global Earth Observation System of Systems
GEOWOW	GEOSS interoperability for Weather, Ocean and Water
GOOS	Global Ocean Observing System
GO-SHIP	Global Ocean Ship-based Hydrographic Investigations Program
GOSUD	Global Ocean Surface Underway Data
GTS	Global Telecommunication System
HZG	Helmholtz-Zentrum Geesthacht
ICES	International Council for the Exploration of the Sea
INS TAC	In-Situ Thematic Assembly Centre
IOC	Intergovernmental Oceanographic Commission
IPT	Integrated Publishing Toolkit
ISO	International Organization for Standardization
JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology

JCOMMOPS	JCOMM in-situ Observing Programmes Support Centre
JERICO	Joint European Research Infrastructure for Coastal Observatories
KPI	Key Performance Indicator
MCDS	Marine Climate Data System
NODC	National Oceanographic Data Centre
NRT	Near Real Time
OBIS	Ocean Biogeographic Information System
ODIP	Ocean Data Interoperability Platform
OGC	Open Geospatial Consortium
OOPS	Operational Oceanographic Products and Services
OTN	Ocean Tracking Network
QC	Quality Control
ROOS	Regional Ocean Observing System
RT	Real Time
SensorML	Sensor Modeling Language
SOOP	Ship of Opportunity Program
SWE	Sensor Web Enablement
TWAP	Transboundary Waters Assessment Programme
VOS	Voluntary Observing Ship
W3C	World Wide Web Consortium
WFS	Web Feature Service
WMO	World Meteorological Organization
WMS	Web Map Service
WoRMS	WOrld Register of Marine Species