



# SeaDataNet

**Pan-European infrastructure for marine and ocean data management**

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**Optimising FAIRness of federated Blue Data Infrastructures  
webinar  
6 Dec 2023**

 **eosc**

**Blue-Cloud2026**

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# What is SeaDataNet?



A pan-European infrastructure, initiated and set up by the NODCs and marine data focal points of 34 countries bordering the European seas

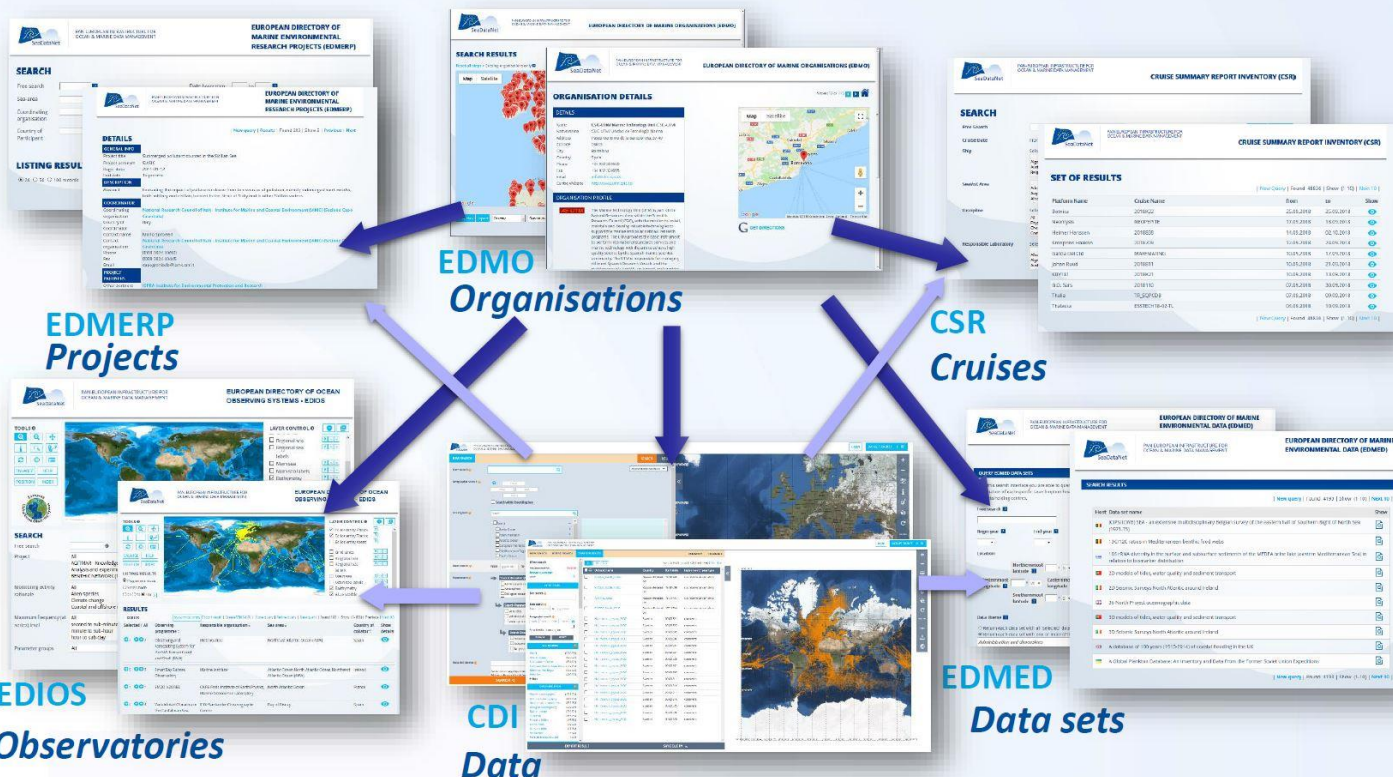
90s	Metadata directories Medar/MedAtlas
1998–2001	EuroNODIM (FP3)
2002–2005	Sea-Search (FP5)
2006–2011	SeaDataNet (FP6)
2011–2015	SeaDataNet II (FP7)
2016–2021	SeaDataCloud (H2020)



# SeaDataNet AISBL since 2019

- Developing and maintaining of standards and associated tools, services, and guidance for metadata and data formats, and controlled vocabularies for handling many data types and disciplines, deploying FAIR and INSPIRE principles
- Providing training and support to data centres for uptake of standards, tools, and services in their operation
- Developing skills for uptake of emerging technologies and principles
- Developing and publishing integrated data products such as T&S climatologies
- Being a major player in the European ocean and marine data management landscape supporting EU initiatives like EMODnet, CMEMS, Blue-Cloud, and DTO and working together with several Research Infrastructures (RIs)

# European Directory services



- **User Interfaces**
- **Machine-to-Machine services:**
  - *SparQL*
  - *SOAP web services*
  - *API's*
  - *Linked Data Principle*

Maintaining and publishing a series of Pan-European directories

# SeaDataNet standards

- **Common standards for the marine domain**, adapting ISO and OGC standards and achieving INSPIRE compliance:
  - **Metadata formats for data sets, research cruises, monitoring networks, organisations, and research projects**
  - **Standard data exchange formats : ODV ASCII and NetCDF (CF)**, fully supported by controlled vocabularies
  - **Controlled Vocabularies** for the marine domain (>90.000 terms in 110+ lists), with international governance and web services

Maintenance and dissemination of standard QA-QC procedures, together with IOC/IODE and ICES

*“Making Data and Services:*

- **Findable**
- **Accessible**
- **Interoperable**
- **Re-usable**

*for machines and people.”*



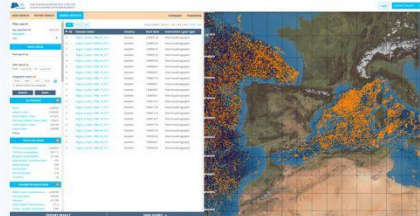
Cooperation with EUDAT,  
European e-  
infrastructure of  
academic computing  
centres



As part of:



SeaDataNet portal



Search  
and  
Shop



Data  
download

Cloud Data Cache

Already 110 data centres connected and more underway



European data sources

data centres holding data of  $\approx$  850 data originators

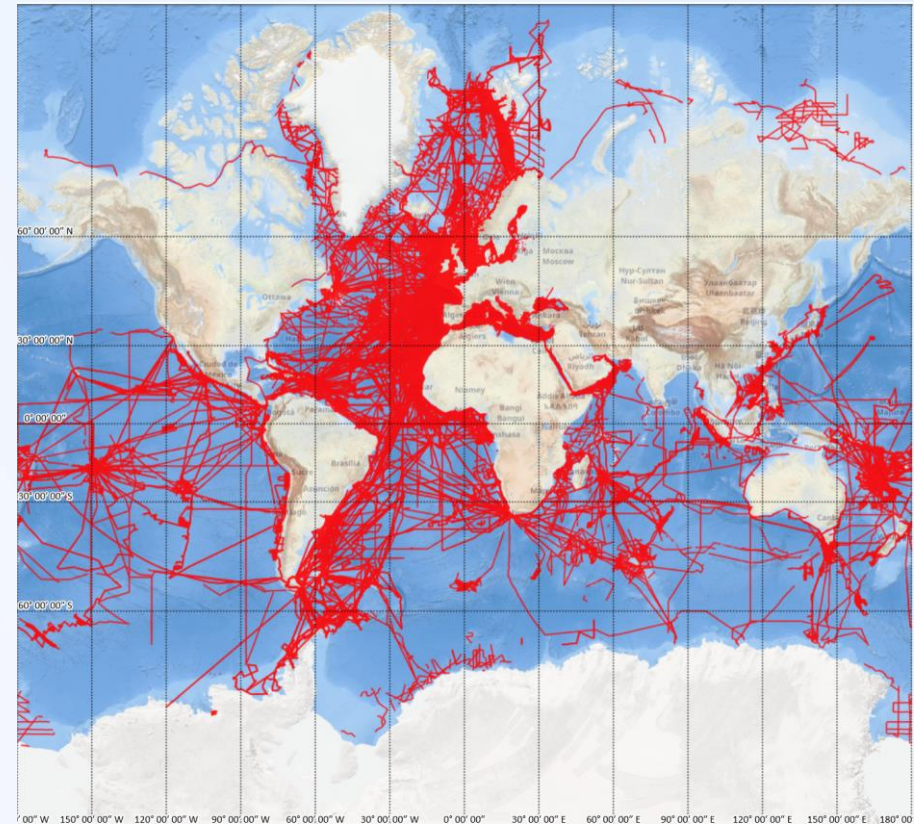
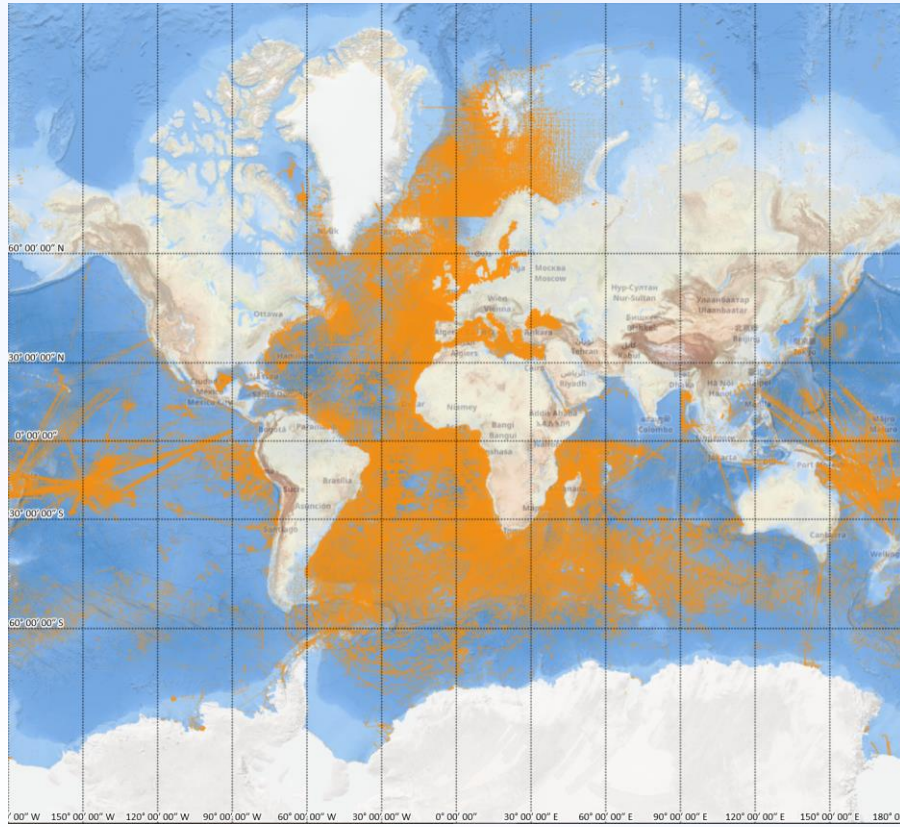


data number	name	university	description	date	download
32457				06-03-2020	
32456	Edin Battery core			06-03-2020	
32106	meteoan	meteoan		20-10-2019	


Metadata  
+ transaction data

<https://cdi.seadatanet.org/search>

Providing harmonized discovery and access to marine and ocean data sets for physics, chemistry, geology, bathymetry, biology, and geophysics



**December 2023: more than 2.9 million CDI entries for physics, chemistry, biology, geology, bathymetry, and geophysics, from 117 data centres, located around the European seas, and 970 data originators.**



PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN & MARINE DATA MANAGEMENT

FEEDBACK
SURVEY

Login
DATASET BASKET 0

**NEW SEARCH** **REFINE SEARCH** **SEARCH RESULTS** **SUMMARY** **TIMESERIES**

Filter search

You searched for: Reset all

Instrument Type: CTD

**EXPORT RESULT** **SAVE QUERY**

**INPUT FIELDS**

Free search ?

Date search ?

From  To

Geographic search ?

North West East South

Search within bounding box

**SEARCH** **RESET**

**SEA REGIONS** ?

Atlantic Ocean (295552)

North Atlantic Ocean (284862)

Northeast Atlantic Ocean (40... (271726)

Baltic Sea (210188)

Mediterranean Region (156882)

Mediterranean Sea (121244)

**+** More

**DISCIPLINE (P08)** ?

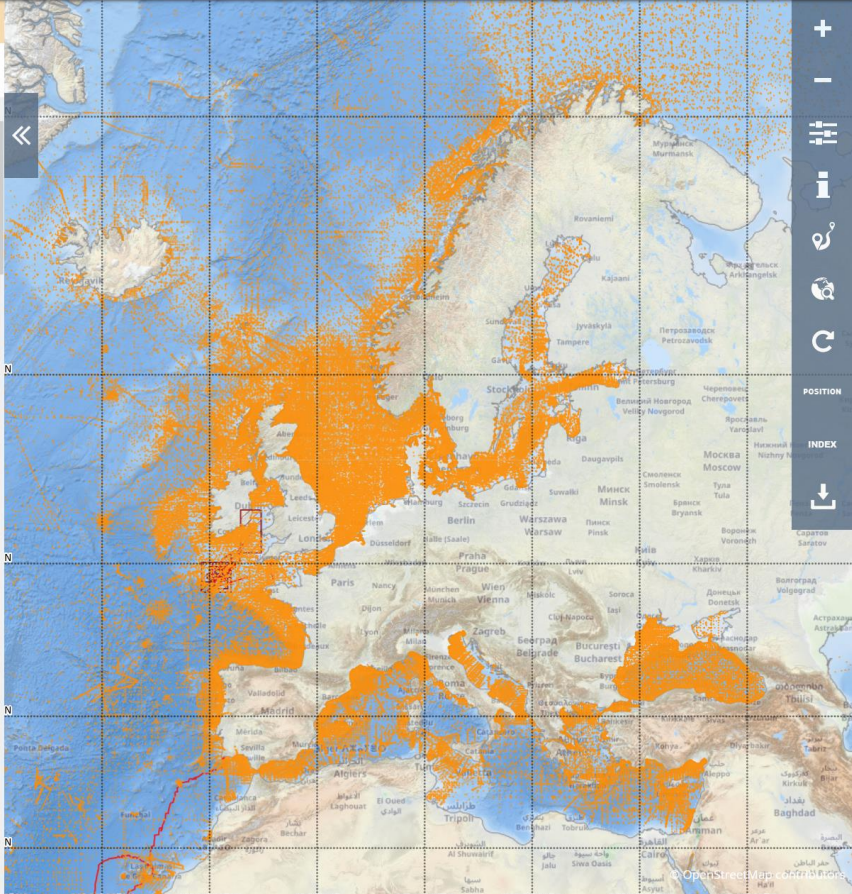
Physical oceanography (751057)

Administration and dimensi... (320780)

Chemical oceanography (315854)

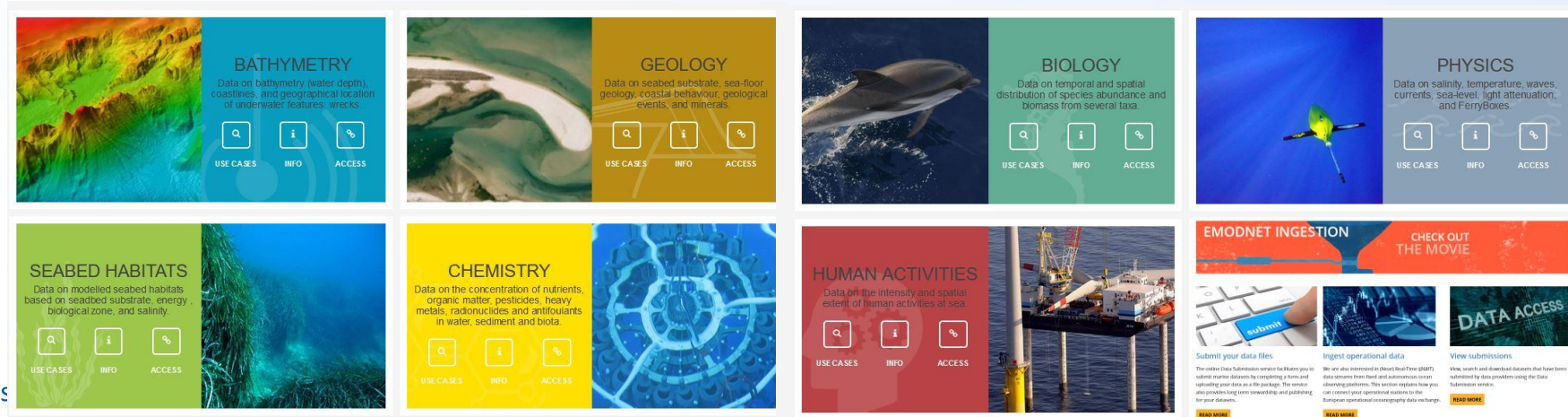
Found 763627 | Show (1 - 100) | First | Prev | Next | Last

<input type="checkbox"/>	Dataset name	Country originator	Start date	Instrument / gear type
<input type="checkbox"/>	08V1_LT1B_CTD	Lithuania	20080212	CTD
<input type="checkbox"/>	08V1_LT1_CTD	Lithuania	20080211	CTD
<input type="checkbox"/>	08V1_LT2C_CTD	Lithuania	20080212	CTD
<input type="checkbox"/>	08V1_LT2_CTD	Lithuania	20080211	CTD
<input type="checkbox"/>	08V1_LT3_CTD	Lithuania	20080211	CTD
<input type="checkbox"/>	08V1_LT46_CTD	Lithuania	20080212	CTD
<input type="checkbox"/>	08V1_LT4C_CTD	Lithuania	20080212	CTD
<input type="checkbox"/>	08V1_LT4_CTD	Lithuania	20080212	CTD
<input type="checkbox"/>	08V1_LT5_CTD	Lithuania	20080213	CTD
<input type="checkbox"/>	08V1_LT64A_CTD	Lithuania	20080212	CTD
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<input type="checkbox"/>	08V1_LTB-1_CTD	Lithuania	20080211	CTD
<input type="checkbox"/>	08V1_LTB-4_CTD	Lithuania	20080212	CTD
<input type="checkbox"/>	08V1_LTN-6_CTD	Lithuania	20080213	CTD
<input type="checkbox"/>	08V2_LT1_CTD	Lithuania	20080507	CTD





- The overarching **European Marine Observation and Data Network (EMODnet)** was **initiated in 2008** by EU DG MARE
- SeaDataNet qualified as a leading infrastructure for the EMODnet data management component and is driving several thematic portals from the start
- This synergy has resulted in many more data centres adopting SeaDataNet standards and connecting to the CDI Data Discovery and Access service, while it gave a flying start to EMODnet
- EMODnet has a focus on **European data products and services** in support of Blue Economy, Blue Environment and Marine Knowledge 2020 agendas
- The data sets as gathered, harmonised and delivered by SeaDataNet provide essential input for generating and regularly updating EMODnet data products



**BATHYMETRY**  
Data on bathymetry (water depth), coastlines, and geographical location of underwater features, wrecks.

**GEOLOGY**  
Data on seabed substrate, sea-floor geology, coastal behaviour, geological events, and minerals.

**BIOLOGY**  
Data on temporal and spatial distribution of species abundance and biomass from general taxa.

**PHYSICS**  
Data on salinity, temperature, waves, currents, sea-level, light attenuation, and FerryBoxes.

**SEABED HABITATS**  
Data on modelled seabed habitats based on seabed substrate, energy, biological zone, and salinity.

**CHEMISTRY**  
Data on the concentration of nutrients, organic matter, pesticides, heavy metals, radionuclides and anti-foulants in water, sediment and biota.

**HUMAN ACTIVITIES**  
Data on the intensity and spatial extent of human activities at sea.

**EMODNET INGESTION**  
CHECK OUT THE MOVIE

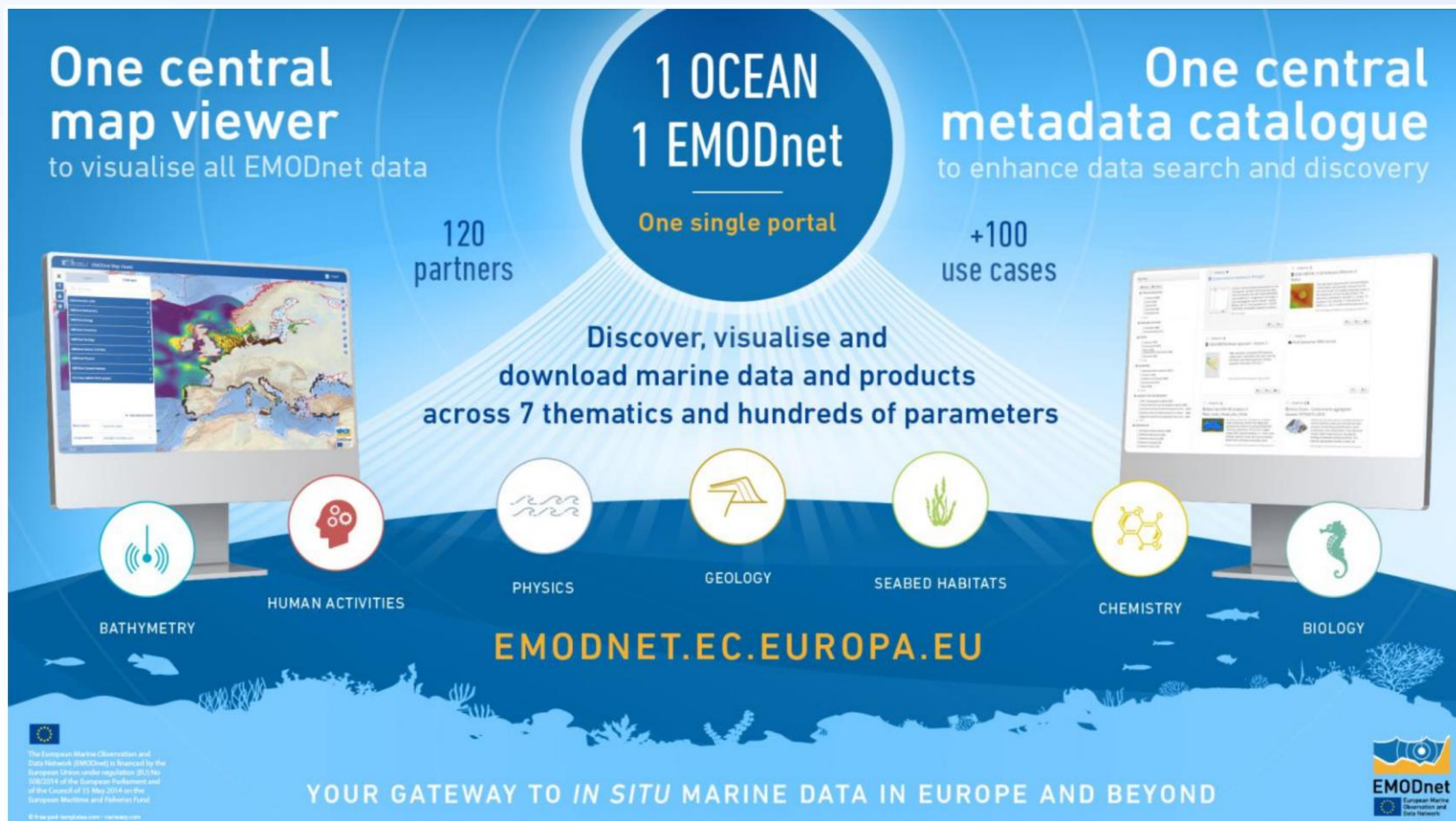
Submit your data files  
Ingest open archival data  
View submissions

Submit your data files  
We are also interested in OpenSeaView (OSV) data streams from land and autonomous ocean observing platforms. This section explains how you can connect your operational systems to the European operational oceanography data exchange.

Ingest open archival data  
We are also interested in OpenSeaView (OSV) data streams from land and autonomous ocean observing platforms. This section explains how you can connect your operational systems to the European operational oceanography data exchange.

View submissions  
View, search and download datasets that have been submitted by data providers using the Data Submission service.

**READ MORE**



**One central map viewer**  
to visualise all EMODnet data

**1 OCEAN  
1 EMODnet**  
One single portal

**One central metadata catalogue**  
to enhance data search and discovery

120 partners

+100 use cases

Discover, visualise and download marine data and products across 7 thematics and hundreds of parameters

BATHYMETRY HUMAN ACTIVITIES PHYSICS GEOLOGY SEABED HABITATS CHEMISTRY BIOLOGY

**EMODNET.EC.EUROPA.EU**

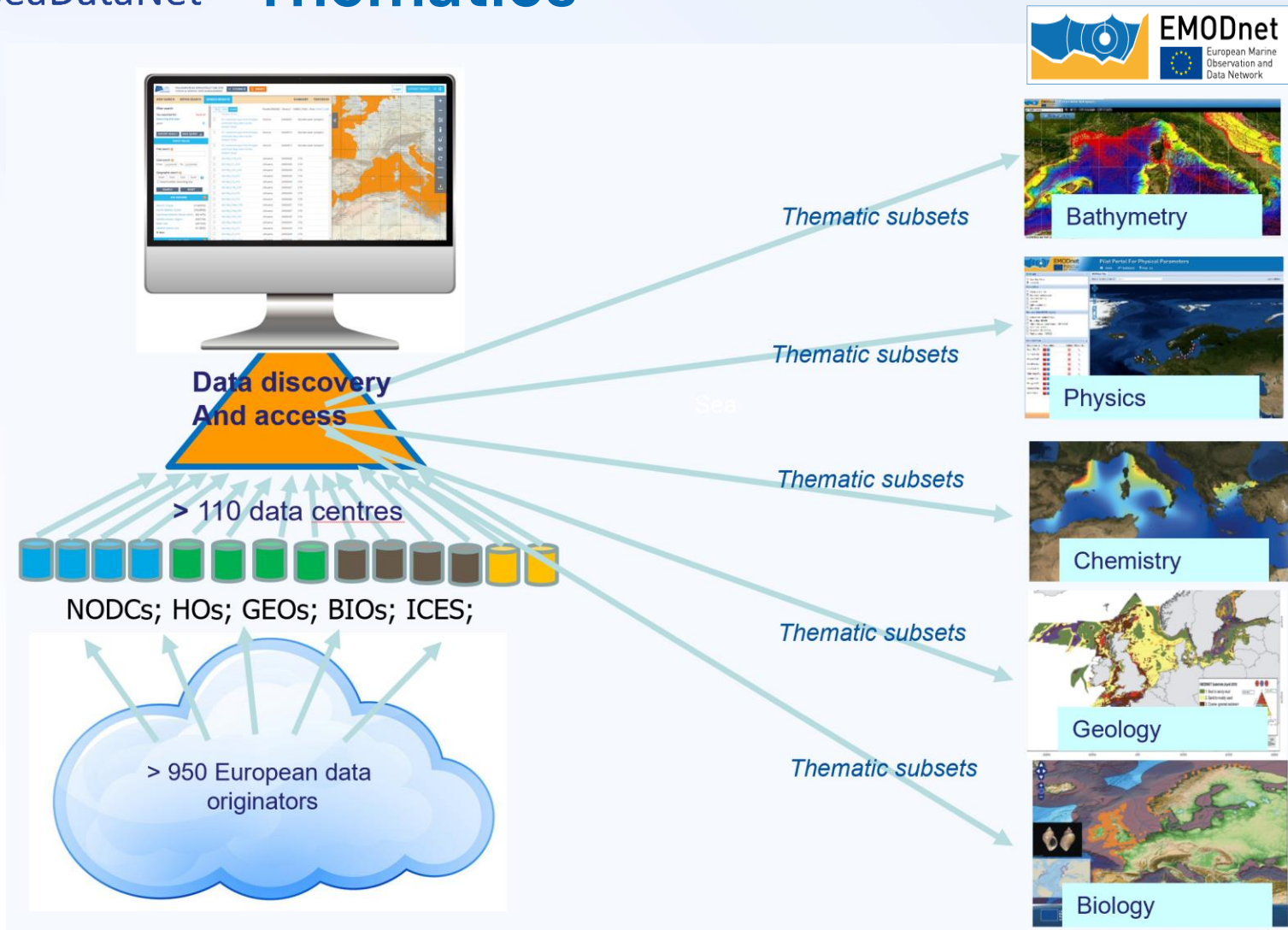
YOUR GATEWAY TO *IN SITU* MARINE DATA IN EUROPE AND BEYOND

The European Marine Observation and Data Network (EMODnet) is financed by the European Union under regulation (EU) No 508/2014 of the European Parliament and of the Council of 11 May 2014 on the European Maritime and Fisheries Fund

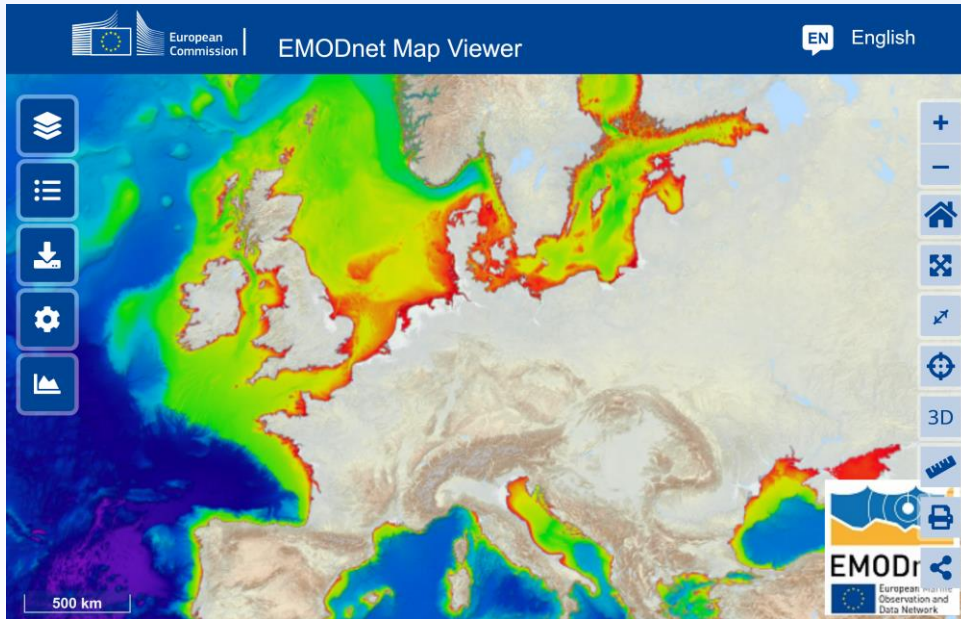
© 2016 gisportal.ec.europa.eu - 11/2016/03/2016

<https://emodnet.ec.europa.eu/en>

# Feeding data to several EMODnet Thematics

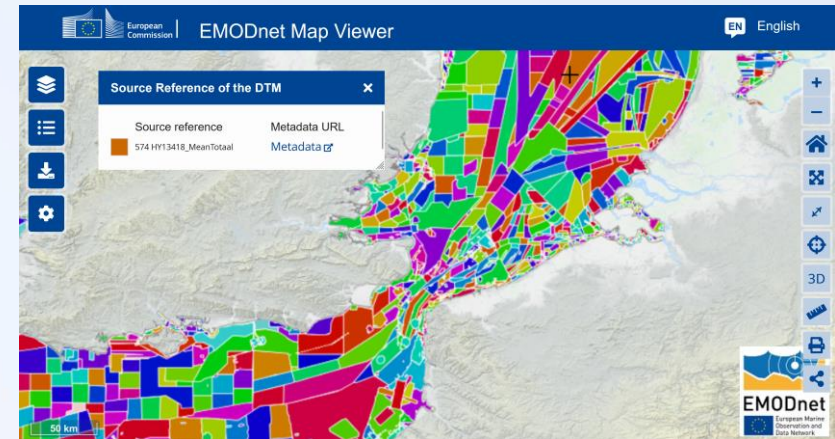


# Example: EMODnet Bathymetry

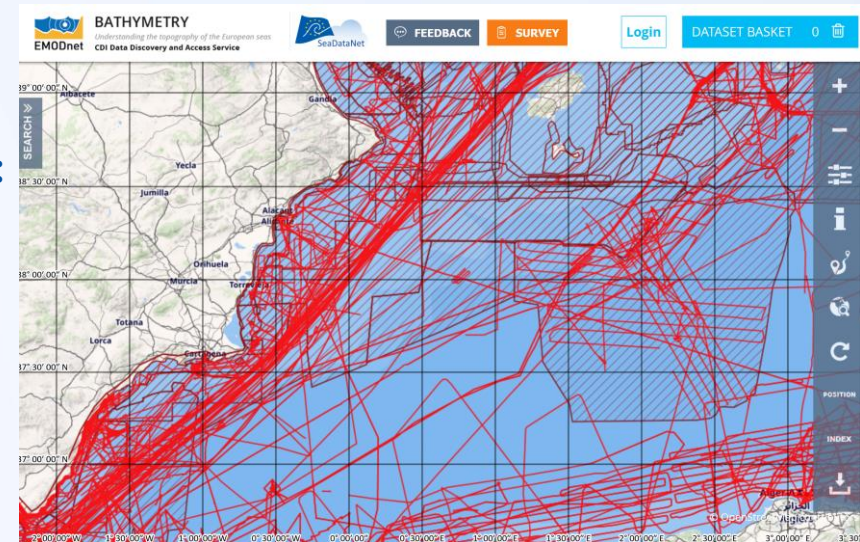


**The best Digital Terrain Model for European seas:**

- \* Resolution 115 \* 115 meters
- \* Based upon > 17.000 survey and SDB data sets



**Source reference layer with direct links to CDI service for metadata about used data**



# SeaDataNet CDI metadata format



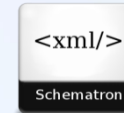
Abstract metadata model specification

- ✓ SeaDataNet metadata profile of ISO 19115 documentation



XML encoding implementation:

- ✓ Schema definition
- ✓ Schematron rules
- ✓ Sample metadata
- ✓ XML implementation documentation



- **SeaDataNet Controlled Vocabularies for marking up metadata:**
  - Currently, 115 lists with > 90000 terms
  - Available as Web Services, SparQL endpoint, User Interfaces, and with PO1 Vocabulary builder and decomposer
- **SeaDataNet European Directories** for marking up metadata and following 'linked data' principles
  - EDMO, EDMED, CSR, EDMERP

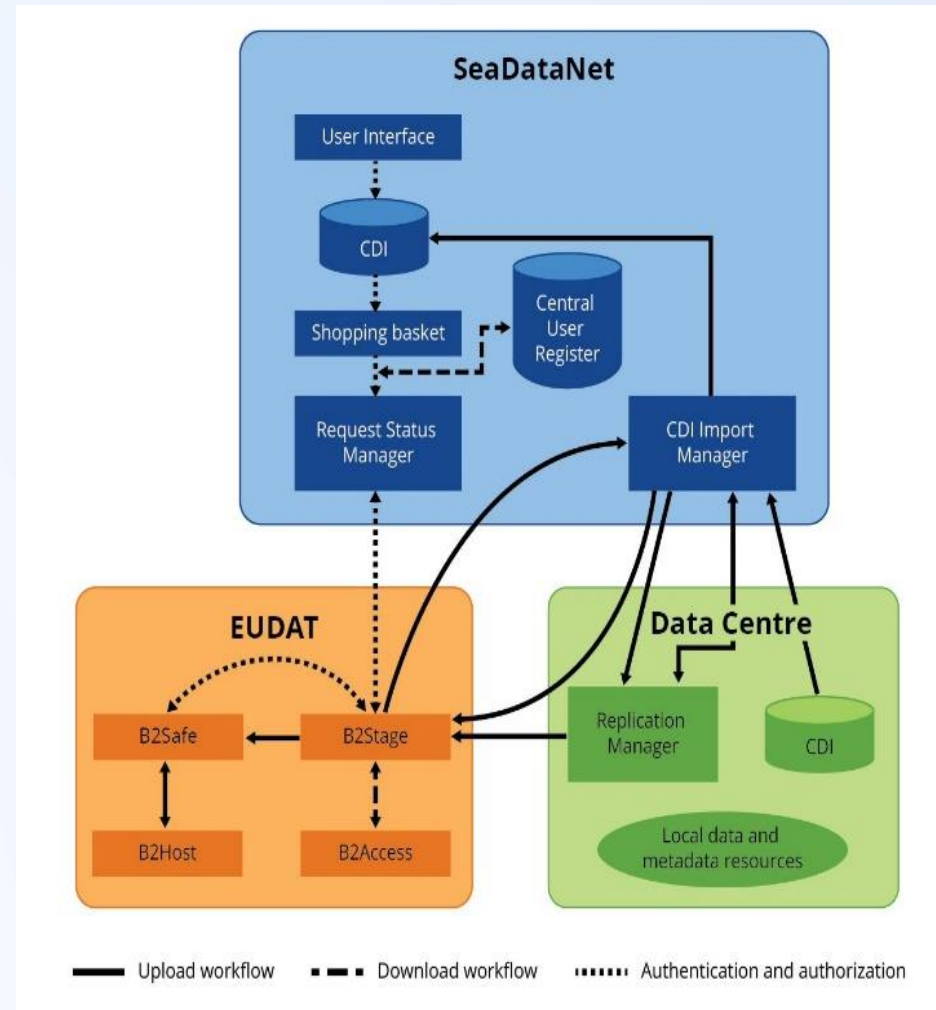


# SeaDataNet fit for handling different data types



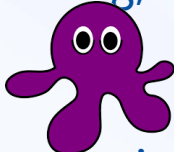
- **SeaDataNet data formats for:**
  - **Physical** data sets, developed with NODCs
  - **Chemistry** datasets, developed with EMODnet Chemistry
  - **Biological** data sets, developed with EurOBIS
  - **Geological and geophysical** data sets, developed with EuroGeoSurveys
  - **Bathymetry** data sets, developed with EMODnet Bathymetry
  - **HF-Radar** data sets, developed with EuroGOOS and EMODnet Physics
  - **Glider** data sets, developed with Ocean Glider network
  - **Flow Cytometry** data together with CNRS and JERICO
  - **Marine Litter** data (beach, seafloor, and micro litter), developed with EMODnet Chemistry and TG ML
- **SeaDataNet Controlled Vocabularies** expanded with new lists and new terms:
  - Currently, 115 lists with > 90000 terms
  - Available as Web Services, SparQL endpoint, User Interfaces, and with PO1 Vocabulary builder and decomposer

# CDI service architecture

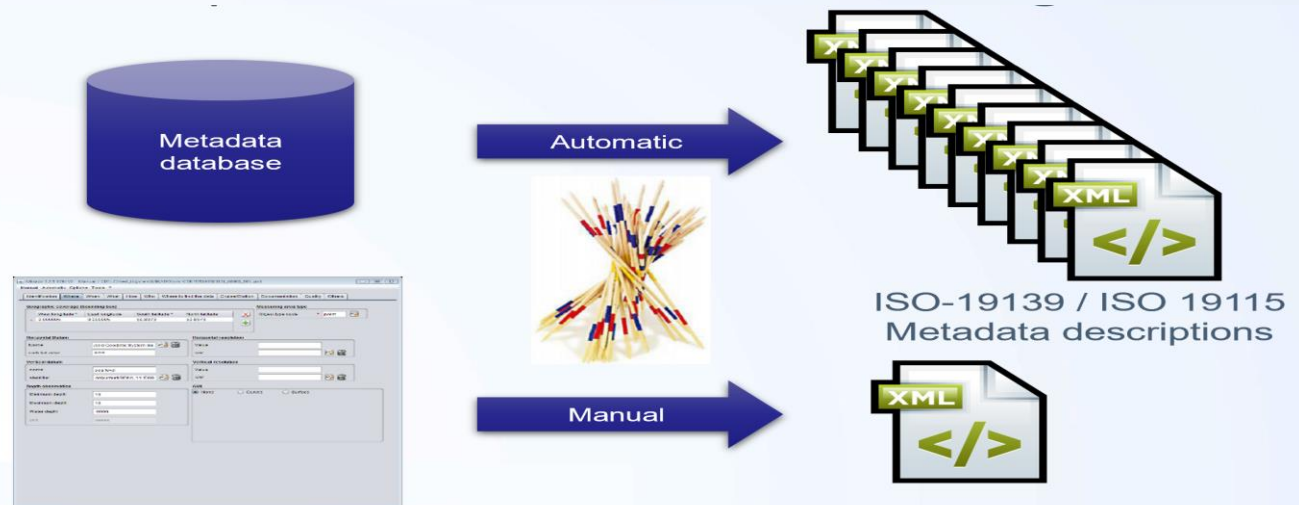
- **Local software tools** at data centres to prepare CDI metadata and data ingestions
- **Replication Manager (RM)** at data centres for transfer entries from data centres to central CDI catalogue and EUDAT data cloud
- **EUDAT cloud** with adapted EUDAT services to store unrestricted data sets
- **CDI User Interface** with central CDI metadata catalogue and facilities for ordering and downloading data sets



# Local software tools at data centres

- Tool for generating XML entries (MIKADO) 
- Tool for converting any ASCII data set to SDN ODV + NetCDF formats (NEMO) 
- Tool for format checking, convert between SDN formats and handle multi-files (OCTOPUS) 
- Vocabulary and Directories web services for marking up metadata

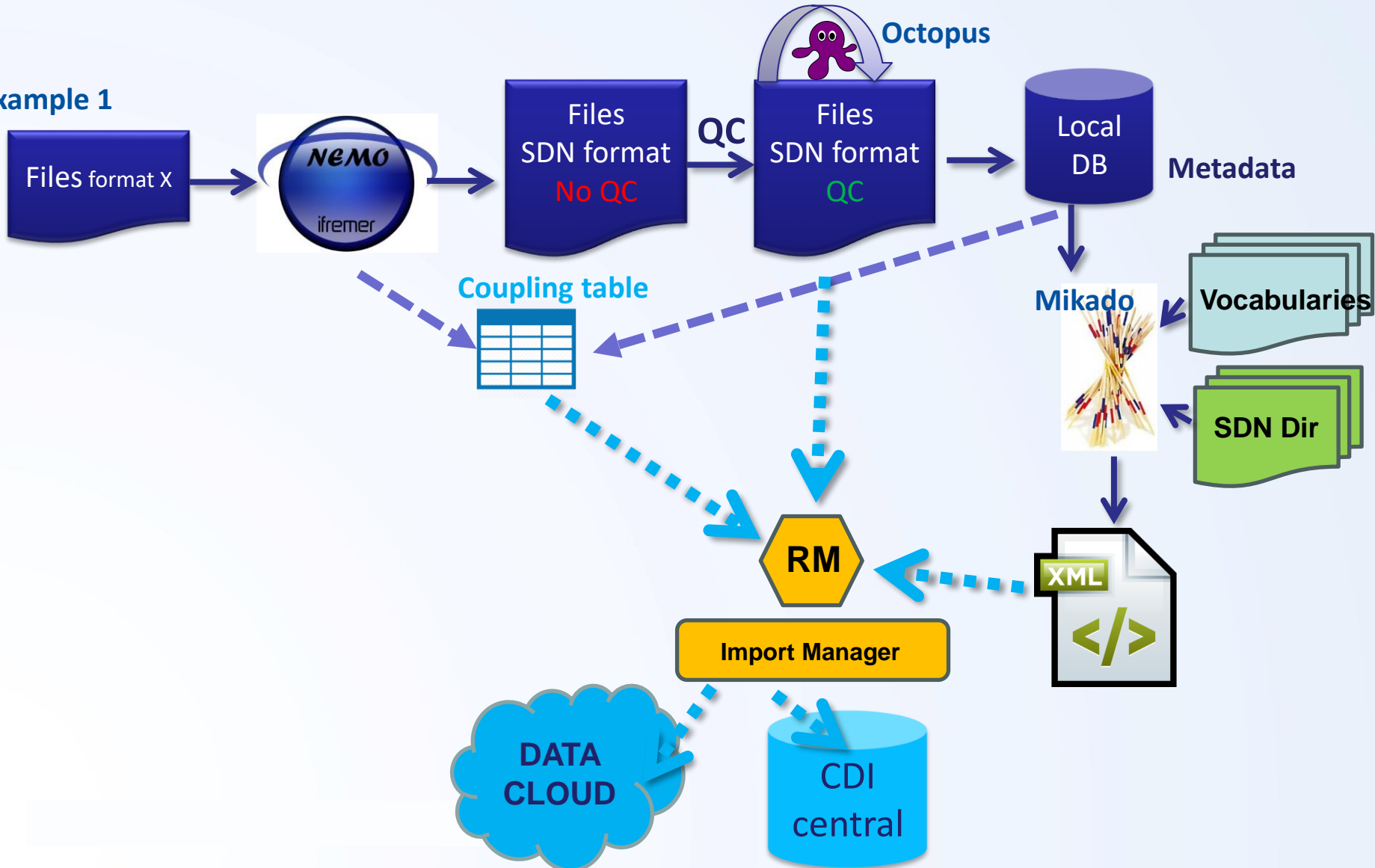
## Preparing CDI XML entries



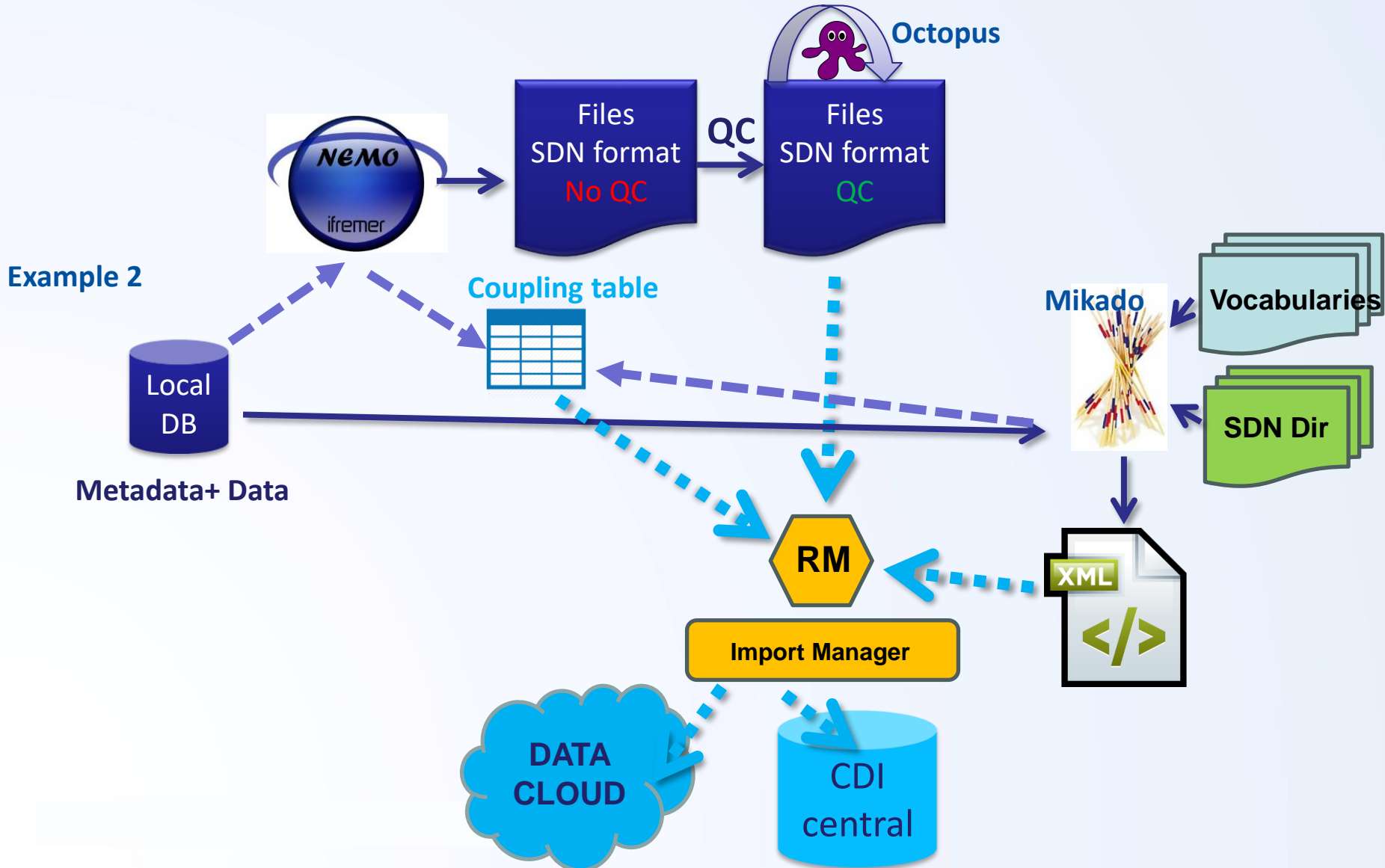


# Examples of data flow in a data centre

## Example 1



# Examples of data flow in a data centre





## Conclusions

- SeaDataNet develops and maintains standards and services for marine data management which are widely adopted, and which have a major impact on the functioning of the marine data landscape in Europe and beyond
- SeaDataNet has a large network of data centres which have direct contacts with hundreds of in-situ data collectors, providing them services for validation, long term stewardship, and wider dissemination of data sets
- SeaDataNet data collections are input for many derived products, for instance for several European data products as generated and published by EMODnet and CMEMS
- SeaDataNet continues to innovate its standards and services to stay state-of-the-art for tomorrows needs. This is done by participating in many EU funded projects.