



# SeaDataCloud

## OGC SWE in SeaDataNet & EMODnet

Dick M.A. Schaap –MARIS (Netherlands)

Oceanology International 2018, London, United Kingdom, 15 March 2018

[sdn-userdesk@seadatanet.org](mailto:sdn-userdesk@seadatanet.org) – [www.seadatanet.org](http://www.seadatanet.org)

# Economy of data acquisition

- Marine data are collected by governments, research institutes, and private industry (in Europe already more than 1.000 organisations)
- Data for physics, geophysics, meteorology, chemistry, biology, geology, bathymetry
- Acquisition of oceanographic and marine data is expensive; annual costs in Europe estimated at **1.4 Billion Euro** (1.0 = in-situ; 0.4 = satellites)



Professional data management is required with agreements on standardisation, quality control protocols, long term archiving, catalogues, and access

# What is SeaDataNet?



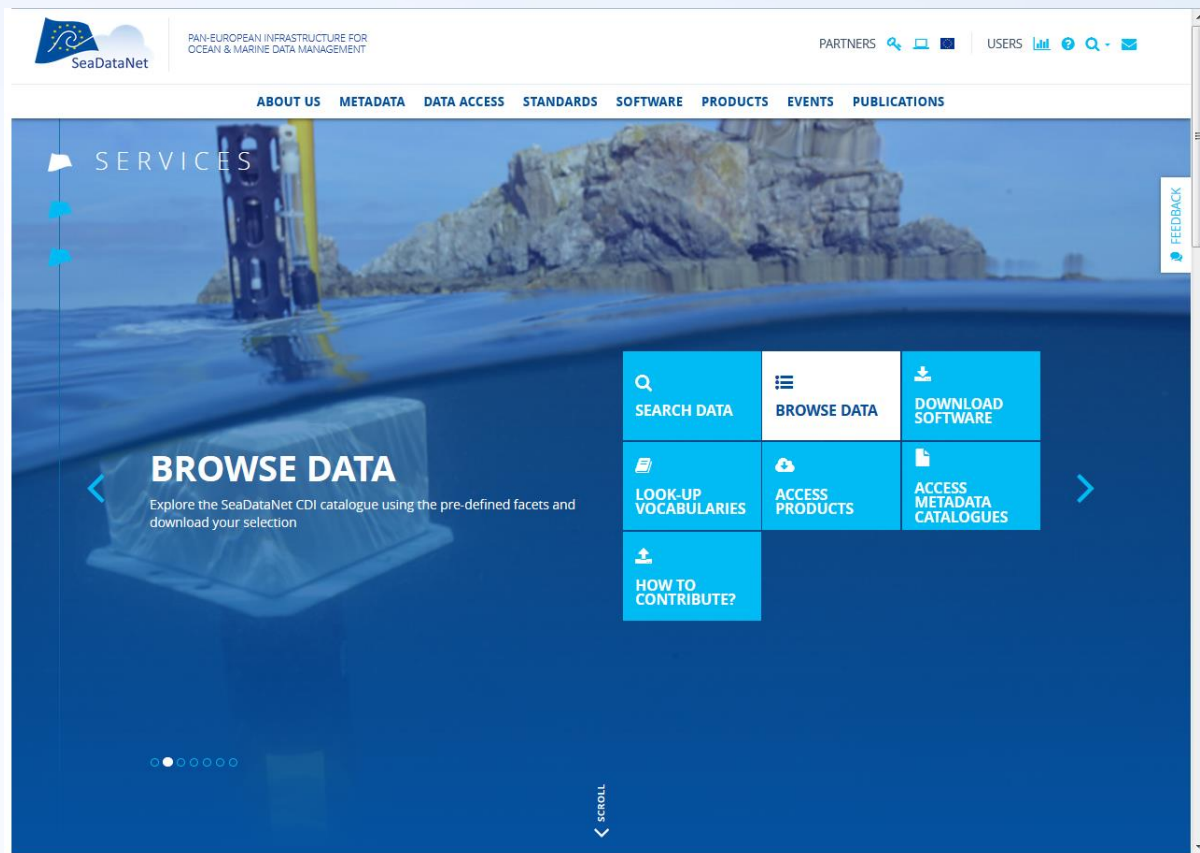
A pan-European infrastructure set up and operated for managing marine and ocean data in cooperation with the NODCs and data focal points of 34 countries bordering the European seas

90s	Metadata directories Medar/MedAtlas
2002-2005	Sea-Search (FP5)
2006-2011	SeaDataNet (FP6)
2011-2015	SeaDataNet II (FP7)
2016-2020	SeaDataCloud (H2020)

# SeaDataNet portal

Giving access to

- Standards, tools both for data centres and other users
- Data and metadata
- Products



<http://www.seadatanet.org>

# SeaDataNet standards

- Set of common standards for the marine domain, adapting ISO and OGC standards and achieving INSPIRE compliance
  - **Adoption of ISO 19115 – 19139 standard for describing metadata** on data sets, research cruises, monitoring networks, and research projects => marine metadata profiles, schemas, schematron rules
  - **Controlled vocabularies** for the marine domain (>65,000 terms in 82 lists), with international governance and web services
  - **Standard data exchange formats** : ODV ASCII and NetCDF (CF) fully supported by controlled vocabularies
- Maintenance and dissemination of standard QA-QC procedures, together with IOC/IODE and ICES



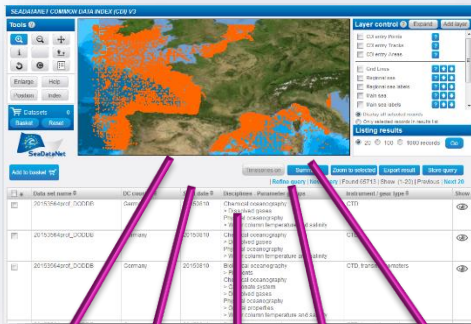
# SeaDataNet services and tools

- **Set of tools** to be used each data centre and freely available from the SeaDataNet portal: metadata editor, data conversion software, data analysis software (ODV), data interpolation software (DIVA)
- **Capacity building** by training workshops for uptake of standards and tools by the data centres in order to achieve standardisation
- **Pan-European services** for harmonised discovery, access, visualisation of data and data products
- **Common SeaDataNet Data Policy** and License



# CDI Data Discovery and Access service

## SeaDataNet portal

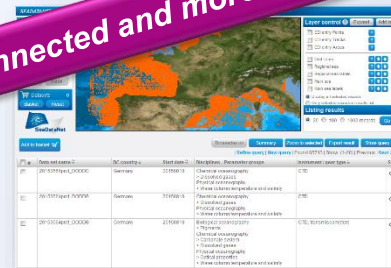


Search and Shop



Data  
Load

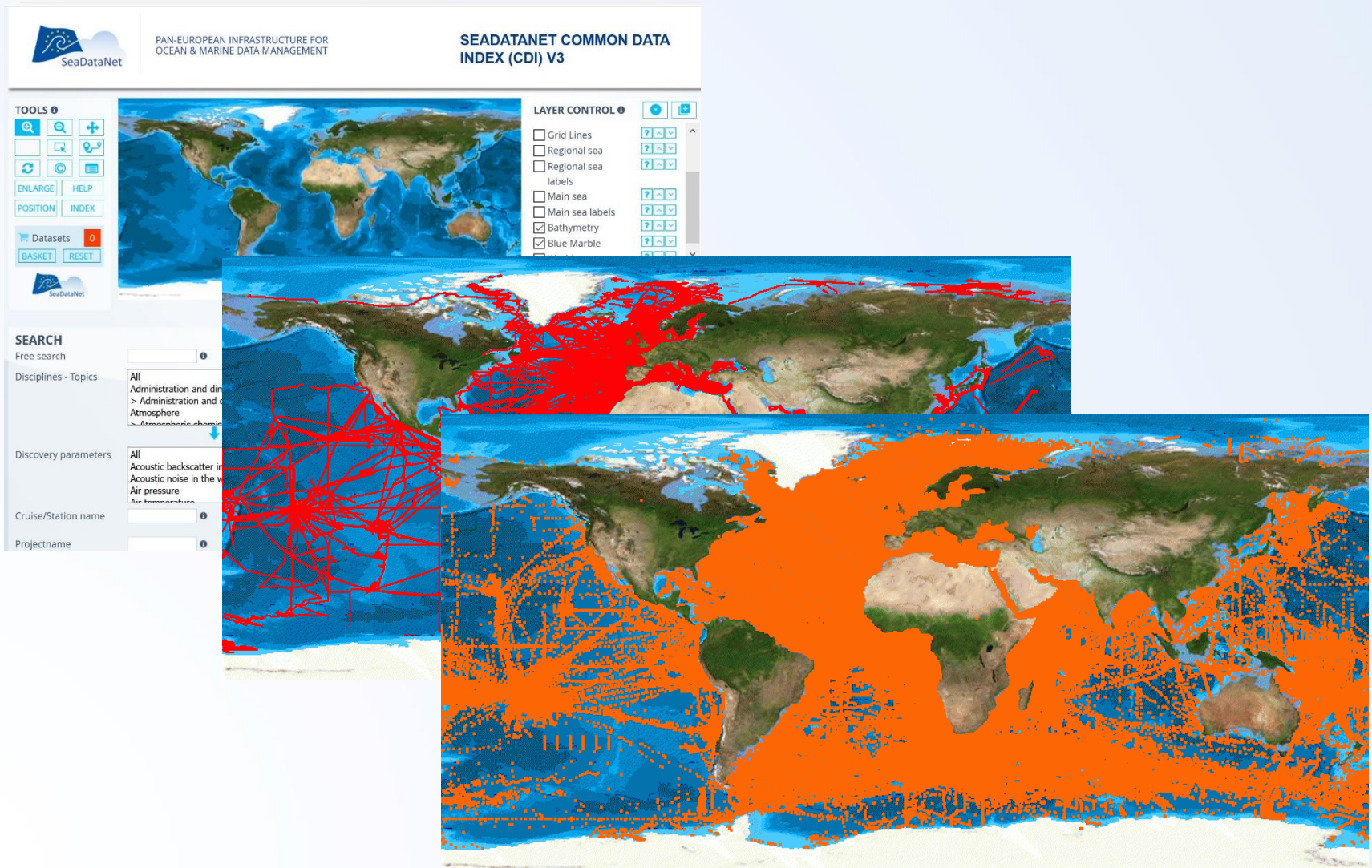
Already 110 data centres connected and more underway



Metadata

+ transaction data

European data sources  
data centres ← ≈ 650 originators



**SeaDataNet**  
PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN & MARINE DATA MANAGEMENT

### SEADATANET COMMON DATA INDEX (CDI) V3

**TOOLS**

- ENLARGE
- HELP
- POSITION
- INDEX
- Datasets: 0
- BASKET
- RESET

**SEARCH**

Free search:

Disciplines - Topics: 

- All
- Administration and d...
- > Administration and d...
- Atmosphere
- Atmospheric science

Discovery parameters: 

- All
- Acoustic backscatter in
- Acoustic noise in the v
- Air pressure
- Air temperature

Cruise/Station name:

Projectname:

**LAYER CONTROL**

- Grid Lines
- Regional sea
- Regional sea labels
- Main sea
- Main sea labels
- Bathymetry
- Blue Marble

The interface displays a world map with two data overlays: a red network of lines and an orange stippled area. The map is part of a layered visualization system where different data layers can be toggled on or off.

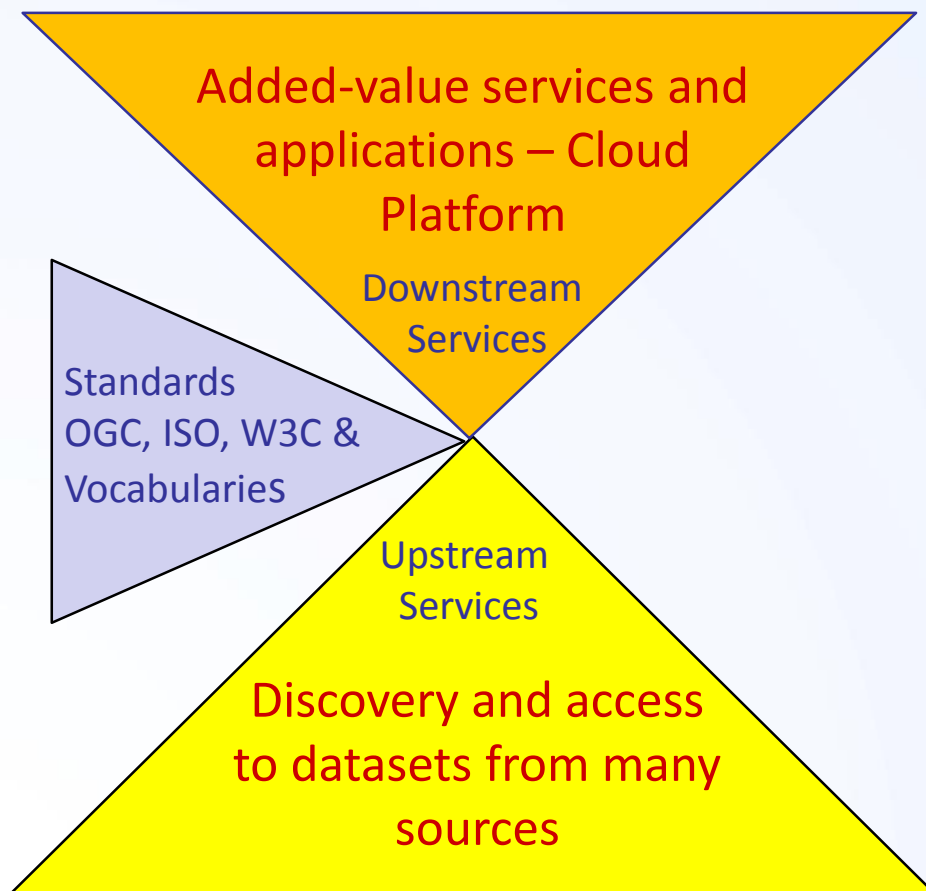




# SeaDataCloud

- Standards and information technology are always evolving, there is a move towards cloud storage and cloud computing, and the SeaDataNet infrastructure must stay up-to-date to maintain and further expand its services to its leads customers and major stakeholders
- SeaDataCloud project, started Nov 2016 with 4 year run and 10 Meuro funding
- A strategic and operational cooperation between the SeaDataNet consortium of marine and ocean data centres and the EUDAT consortium of e-infrastructure service providers

# Towards a Blue Cloud as blue print for the European Open Science Cloud (EOSC)



- Cloud platform with common services for data pre-processing, analyses, visualizations, publishing, DOIs...
- Applying common standards and interoperability solutions for providing harmonised data and metadata
- Providing harmonised discovery and access to data output from multiple sources, European and international



# SeaDataNet cooperation

- **Copernicus Marine Environmental Monitoring Services (CMEMS):** providing long-term archives and standards
- **Marine Strategy Framework Directive (MSFD):** providing infrastructure, standards and data collections for several indicators
- **Large ocean monitoring systems (EuroGOOS, AtlantOS, Euro-ARGO, JERICO-Next, ..):** providing standards and validation + long-term archiving services
- **Ocean Data Interoperability Platform (ODIP):** exploring and demonstrating common standards and interoperability with leading data management infrastructures in USA and Australia
- **GEOSS - EuroGEOSS:** Maintaining the GEOSS portal with SeaDataNet in-situ data collections from large community of European data holders (> 100 data centres; >600 data originators)
- **European Open Science Cloud (EOSC):** shaping the pilot Blue Cloud
- **European Marine Observation and Data Network (EMODnet)** driven by Marine Knowledge 2020 and Blue Growth

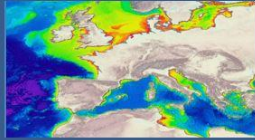

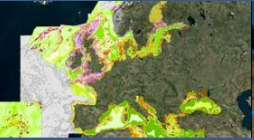
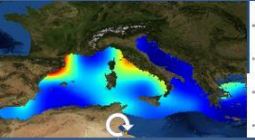
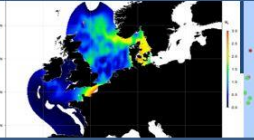




# SeaDataNet and EMODnet

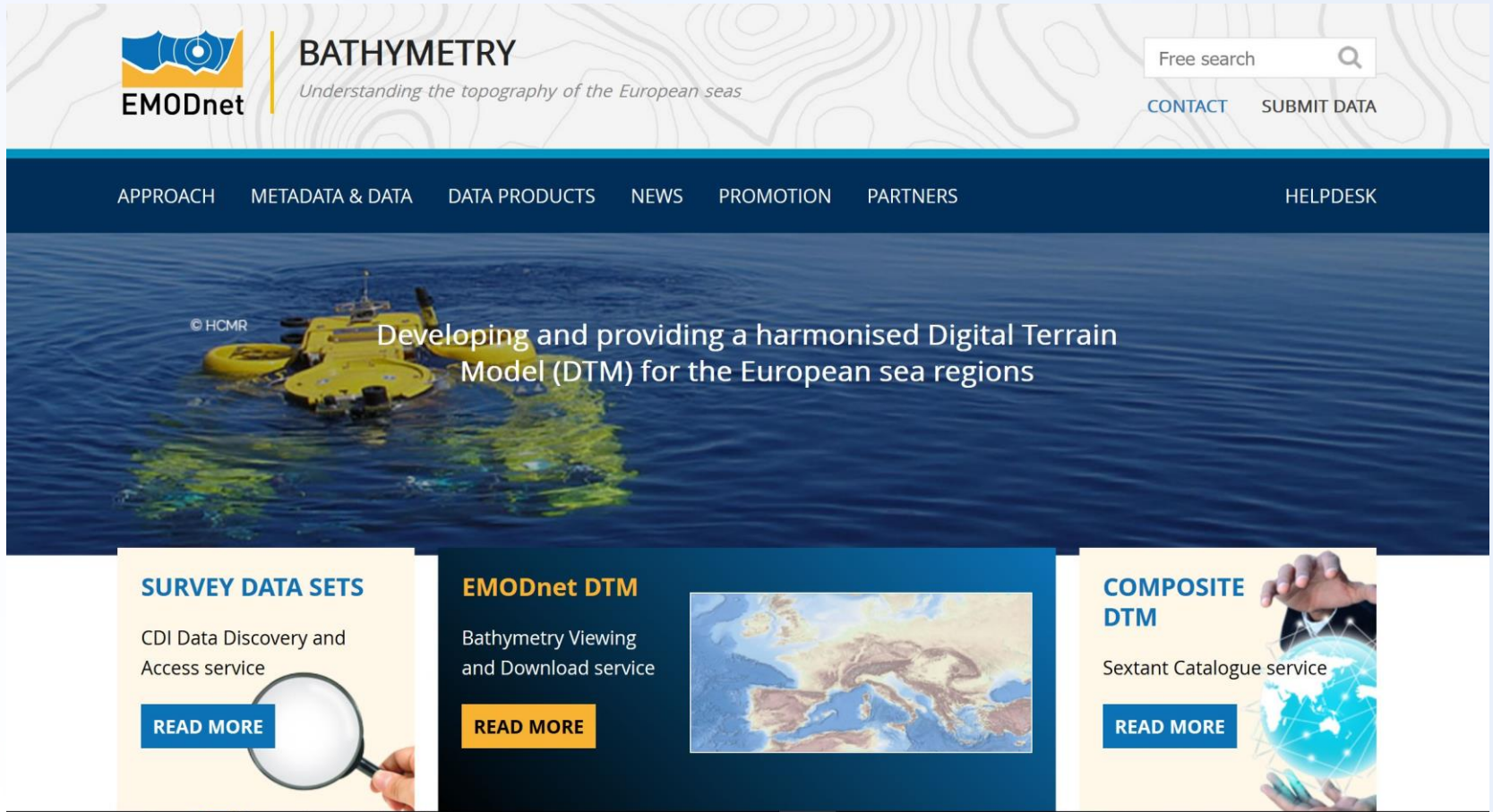
- EU initiative for an overarching **European Marine Observation and Data Network (EMODNet)** driven by Marine Knowledge 2020 and Blue Growth
- SeaDataNet qualified as a leading infrastructure for the EMODnet data management component and is driving several thematic portals from the start in 2008
- *‘Bottom-up meets top-down’*
- 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 thematic portals

Bathymetry	Geology	Seabed Habitats	Chemistry	Biology	Physics	Human activities
						
<p>Minimum cell water depth</p> <p>Maximum cell water depth</p> <p>Average cell water depth</p> <p>Standard deviation of cell water depth</p> <p>Number of values used for interpolation of cell water depth</p> <p>Horizontal coordinate reference system</p> <p>Depth reference system</p> <p>Lowest Astronomical Tide</p>	<p>Seabed substrate</p> <p>Sediment accumulation rate</p> <p>Sea-floor geology</p> <p>Seabed lithology</p> <p>Stratigraphy</p> <p>Coastline migration</p> <p>Aggregate resources</p> <p>Geological events</p>	<p>Data on modelled seabed habitats (depth, seabed substrate, broad scale biological zone, T, S, light, oxygen, energy due to waves &amp; current)</p> <p>Broad-scale physical habitat map</p> <p>Detailed habitat maps from surveys</p> <p>Individual habitat modelling outputs</p> <p>Habitat point data</p>	<p>Pesticides &amp; Biocides</p> <p>Antifoulants</p> <p>Pharmaceuticals</p> <p>Heavy Metals</p> <p>Hydrocarbons</p> <p>Radionuclides</p> <p>Fertilizers</p> <p>Acidity</p> <p>Dissolved Gasses</p> <p>Plastics</p> <p>Marine Litter Beach litter Seafloor litter Micro litter</p> <p>Chlorophyll Silicates Organic Matter</p>	<p>Biomass</p> <p>Abundance</p> <p>Gridded Abundance maps</p> <p>species groups:</p> <ul style="list-style-type: none"> <li>• phytoplankton</li> <li>• zooplankton</li> <li>• angiosperms</li> <li>• macro-algae</li> <li>• invertebrate bottom fauna</li> <li>• birds</li> <li>• mammals</li> <li>• reptiles</li> <li>• Fish</li> </ul>	<p>Waves</p> <p>Water temperature</p> <p>Water salinity/conductivity/density</p> <p>Currents</p> <p>Light attenuation/fluorescence</p> <p>Sea level</p> <p>Atmospheric parameters</p> <p>Wind</p> <p>Underwater noise</p> <p>Rivers</p> <p>Ice</p>	<p>Aggregate Extraction Dredging</p> <p>Fisheries</p> <p>Hydrocarbon Extraction Main Ports</p> <p>Mariculture</p> <p>Ocean Energy Facilities</p> <p>Pipelines and Cables</p> <p>Protected Areas</p> <p>Waste Disposal</p> <p>Wind Farms</p> <p>Other Forms of Area Management / Designation</p>

# EMODnet Bathymetry portal



The screenshot shows the EMODnet Bathymetry portal homepage. At the top left is the EMODnet logo, which consists of a stylized blue and yellow wave icon above the text 'EMODnet'. To the right of the logo is the word 'BATHYMETRY' in a large, bold, blue font, followed by the tagline 'Understanding the topography of the European seas' in a smaller, italicized font. In the top right corner, there is a search bar with the text 'Free search' and a magnifying glass icon, and two buttons labeled 'CONTACT' and 'SUBMIT DATA'. Below the header is a dark blue navigation bar with white text for 'APPROACH', 'METADATA & DATA', 'DATA PRODUCTS', 'NEWS', 'PROMOTION', 'PARTNERS', and 'HELPDESK'. The main content area features a large blue background image of a yellow autonomous underwater vehicle (AUV) on the surface of the ocean. Overlaid on this image is the text '© HCMR' and 'Developing and providing a harmonised Digital Terrain Model (DTM) for the European sea regions'. Below this image are three white boxes with blue borders. The first box is titled 'SURVEY DATA SETS' and contains the text 'CDI Data Discovery and Access service' and a blue 'READ MORE' button. The second box is titled 'EMODnet DTM' and contains the text 'Bathymetry Viewing and Download service' and a blue 'READ MORE' button. The third box is titled 'COMPOSITE DTM' and contains the text 'Sextant Catalogue service' and a blue 'READ MORE' button. Each box also features a small image: a magnifying glass for Survey Data Sets, a bathymetry map for EMODnet DTM, and a globe for Composite DTM.

# EMODnet Bathymetry example



> 7000 survey data sets used to generate and provide a harmonized and higher resolution digital terrain model for all European seas – comparison with GEBCO

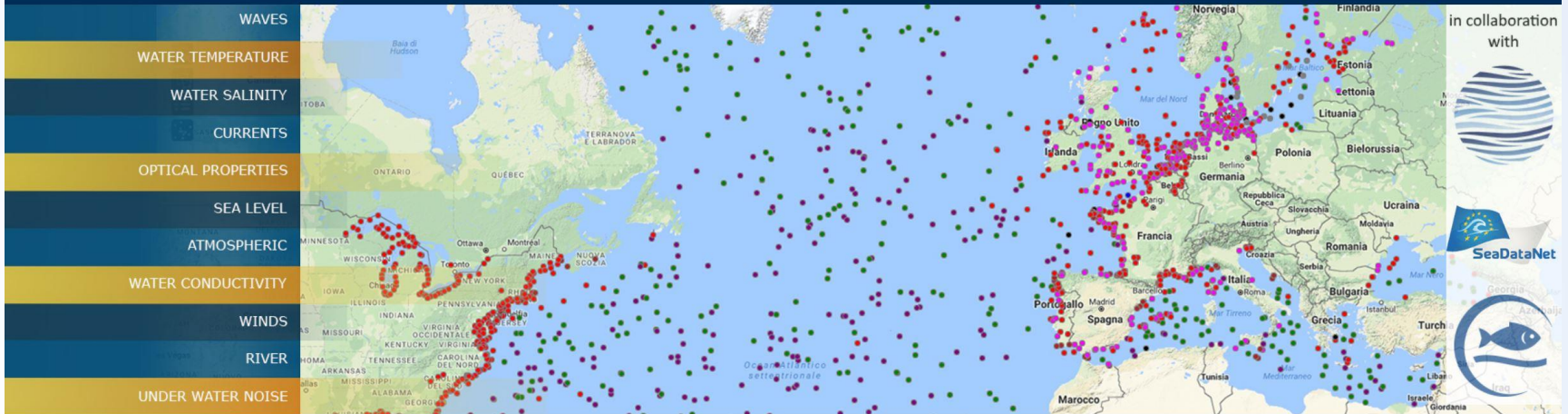


## PHYSICS

Oceans Physics at your fingertips

[CONTACT US](#) [SUBMIT DATA](#)

- [HOME](#)
- [MAP VIEWER](#)
- [CATALOGUE](#)
- [ABOUT](#)
- [HELPDESK](#)
- [SUBMIT DATA](#)
- [CENTRAL PORTAL](#)



DATA  
INGESTION

- [PRODUCTS](#)
- [THERDS](#)
- [ERDDAP](#)
- [GEOSERVER](#)
- [API REST SOAP](#)
- [WMS WFS](#)
- [DASHBOARD](#)
- [GITHUB](#)
- [VIDEOS](#)





# Pillars under EMODnet Physics



The European Global Ocean Observing System, association and its regional components (ROOSs)



Copernicus Marine Environment Monitoring System (CMEMS)



SeaDataNet, pan-European marine data management infrastructure and network of NODCs

# Developing SWE standards

- SDC is contributing to the formulation of SWE profiles for selected platforms and instruments (SensorML and O&M)
- See: <https://odip.github.io/MarineProfilesForSWE/>
- SDC provides controlled vocabularies to be used for marking up SWE profiles:

[http://seadatanet.maris2.nl/v\\_bodc\\_vocab\\_v2/welcome.asp](http://seadatanet.maris2.nl/v_bodc_vocab_v2/welcome.asp)

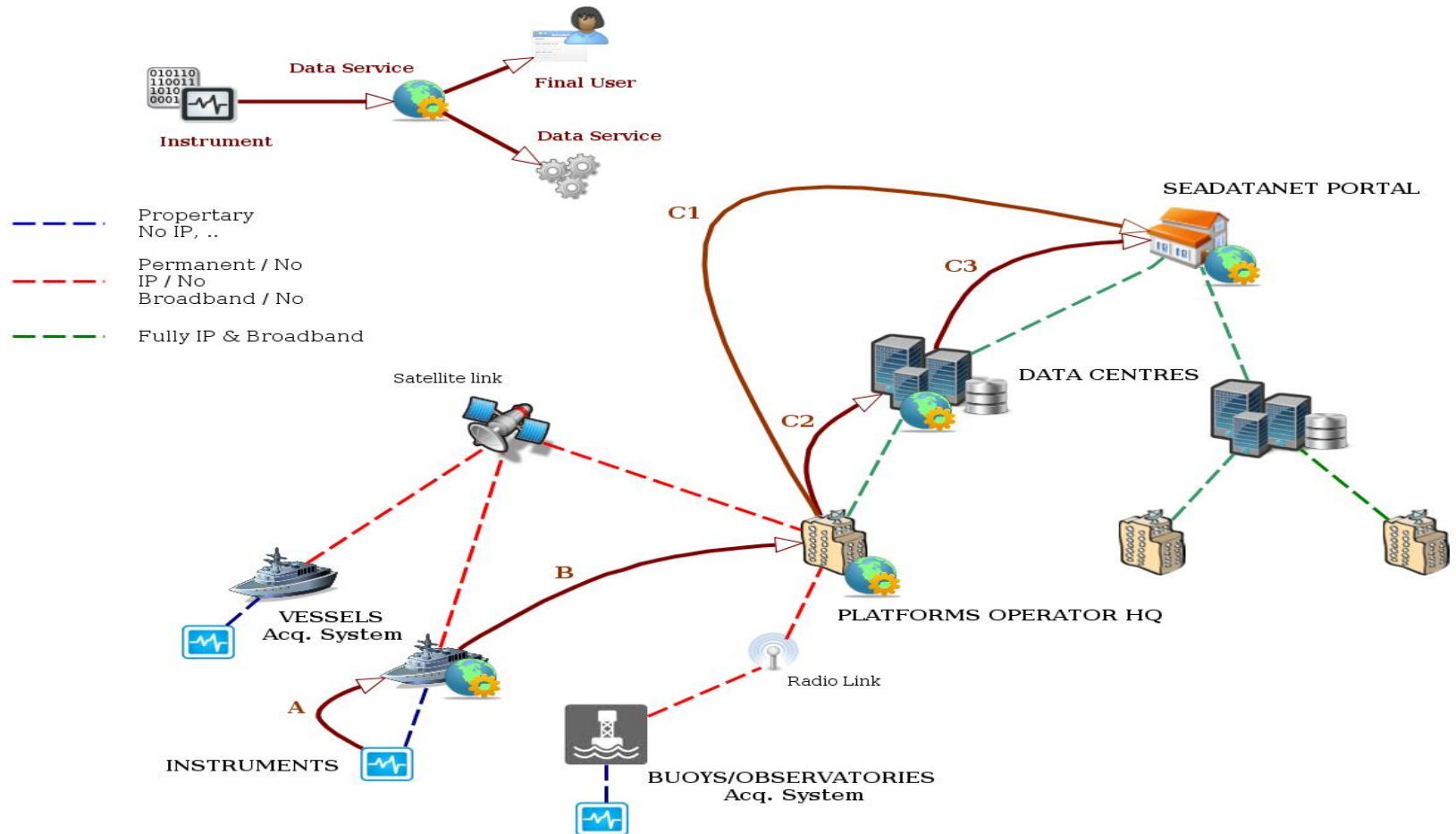
<b>W01</b>	SeaDataNet Sensor Web Enablement and SensorML type vocabulary	SDN SWE type	0	35	1/5/2015 10:03:22 AM
<b>W02</b>	SeaDataNet Sensor Web Enablement and SensorML sub-type vocabulary	SDN SWE sub-type	0	6	1/5/2015 10:05:18 AM
<b>W03</b>	SensorML History Event Types	SensorML Event Types	1	14	6/24/2016 3:00:04 AM
<b>W04</b>	SensorML Capability Section Terms	SensorML Capabilities	2	14	12/9/2017 2:00:02 AM
<b>W05</b>	SensorML Characteristic Section Terms	SensorML Characteristics	3	10	12/9/2017 2:00:02 AM
<b>W06</b>	SensorML Classification Section Terms	SensorML Classifications	1	2	7/21/2016 3:00:02 AM
<b>W07</b>	SensorML Identification Section Terms	SensorML Identifications	2	14	12/9/2017 2:00:02 AM
<b>W08</b>	SensorML Contact Section Terms	SensorML Contacts	1	6	7/21/2016 3:00:02 AM



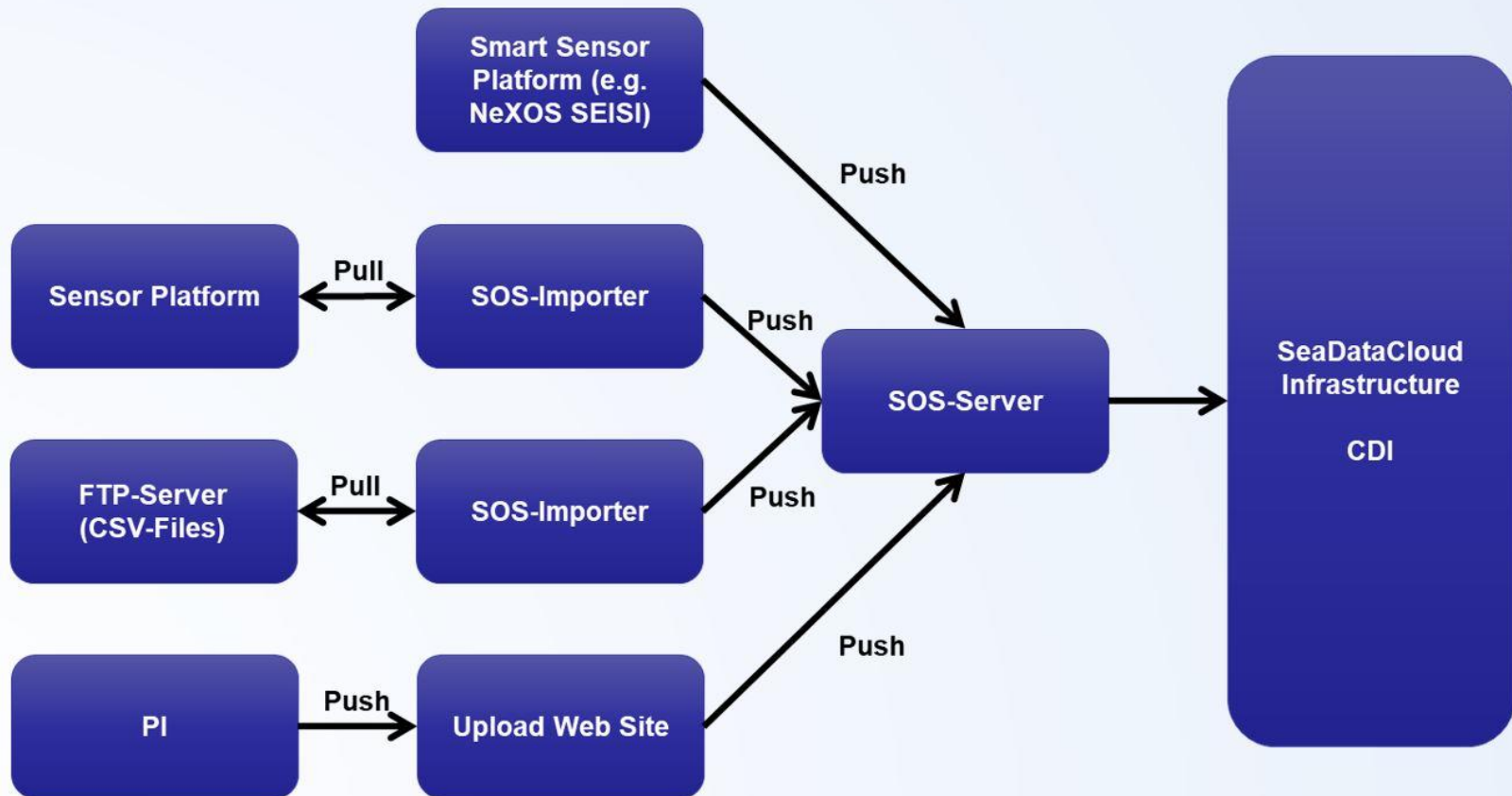
# Promoting SWE uptake

- SDC promotes adoption of SWE by operators of research vessels and observation platforms for:
  - streamlining the (near) real time data flows from platforms to data centres (Eurofleets, JERICO, FixO3, GROOM, .. Projects and EuroGOOS),
  - detailing relevant metadata of these systems and data flows
  - facilitating easy access by means of Sensor Observation Services (SOS);

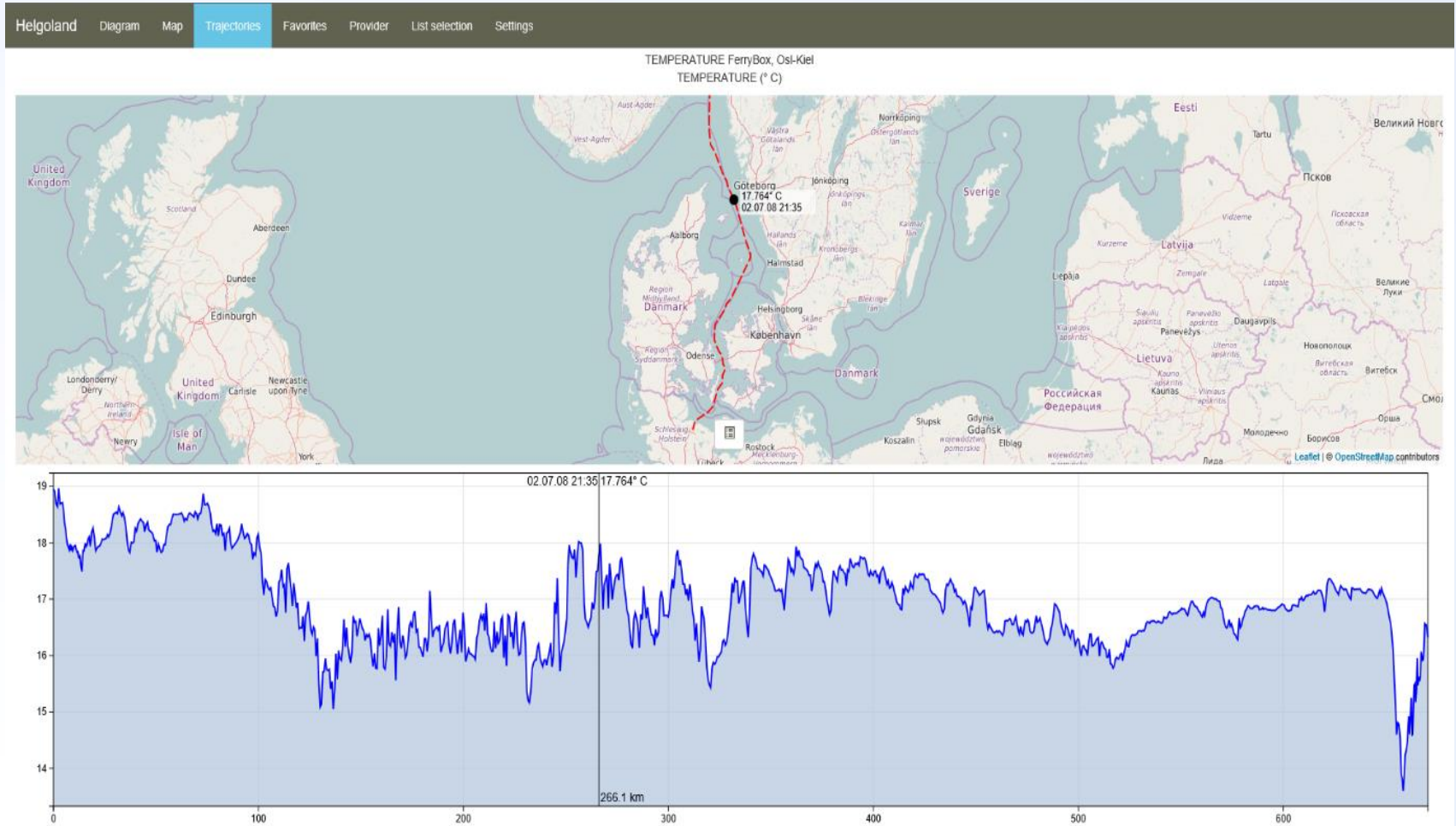
# SWE for research vessels - Eurofleets




# SDC – Developing SWE Ingestion service for SWE-based observation data streams



# SDC – Further developing ‘Helgoland’ viewer



# EMODnet Ingestion – promoting SWE uptake



The screenshot shows the EMODnet Data Ingestion Portal website. The header includes the EMODnet logo, the text "DATA INGESTION PORTAL", the tagline "Wake up your data - set them free for Blue Society", a search bar, and a "CONTACT" link. A navigation menu contains links for "ABOUT", "DATA SUBMISSION", "OPERATIONAL DATA", "SUBMISSIONS", "GUIDELINES", "DATA WANTED", "HELP", "PROMOTION", and "CENTRAL PORTAL". The main content area features a "Home" link, a "Welcome to the EMODnet Data Ingestion portal" heading, and a paragraph describing the network's mission. A "READ MORE" button is present. Below this is a large banner with "EMODNET INGESTION" and "CHECK OUT". Three main sections are highlighted: "Submit your data files" (with a keyboard image), "Ingest operational data" (with a data visualization image), and "View submissions" (with a "DATA ACCESS" image). A red arrow points from the bottom left towards the "Ingest operational data" section.

EMODnet

DATA INGESTION PORTAL  
Wake up your data - set them free for Blue Society

Search

CONTACT

ABOUT DATA SUBMISSION OPERATIONAL DATA SUBMISSIONS GUIDELINES DATA WANTED HELP PROMOTION CENTRAL PORTAL

Home

## Welcome to the EMODnet Data Ingestion portal

The European Marine Observation and Data Network (EMODnet) consists of more than 160 organisations that together work on assembling, harmonising and making marine data, products and metadata more available to public and private users. This Data Ingestion portal facilitates additional data managers to ingest their marine datasets for further processing, publishing as open data and contributing to applications for society.

[READ MORE](#)

## EMODNET INGESTION

CHECK OUT

### Submit your data files

The online Data Submission service facilitates you to submit marine datasets by completing a form. If you are also interested in (Near) Real-Time ((N)RT) data streams from fixed and autonomous ocean

### Ingest operational data

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

### View submissions



# EMODnet Ingestion - Physics

- Identifying and encouraging more operators of operational platforms:
  - to join the European operational oceanography data exchange
  - to include their timeseries into SeaDataNet for validation, long-term stewardship and wider availability
- Enlarging awareness and stimulating uptake of SWE standards and services:
  - promotion and guidelines of SWE at EMODnet Ingestion portal
  - SOS demonstration service (Helgoland viewer) at EMODnet Physics portal