

# **Eutrophication and contaminant data management for EU marine policies: the EMODnet Chemistry infrastructure.**

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- **Intro**
- **Chemistry Lot: what, where and how**
- **Quality loop**
- **Chemistry Lot and MSFD**
- **Architecture/workflow**
- **From data to products**

# EMODnet introduction:

Increasing interest in the **environmental/oceanographic data management** to go :

- **FROM** fragmented and inaccessible environmental data → **TO** a continuous, public-accessible, interoperable and long-term-use data flow.

**Why?** (EU Green Paper for MK2020)

- **Seas and Oceans** provide an essential part of our **wealth and well-being** but are under huge pressure from human activities and climate change
- To increase **Quality and Quantity of environmental data/human pressures information** to build a “**knowledge base**” able to **monitor** and drive a sustainable development.

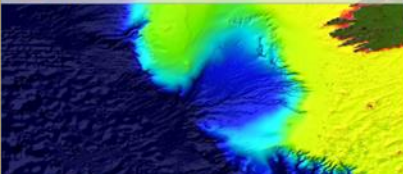








**At EU level two main principles/directives :**

- **INSPIRE directive (2007):** standards and implementing rules for harmonized and interoperable EU Geographic Information Infrastructure for **Geographic Data, Metadata and Services**;
- **MSFD (2008):** for monitoring seas and oceans at national → regional → EU level with reporting (**WISE Marine**) of environmental status based on:  
**Descriptors → Criteria → Indicators. The objective is definition and achievement of Good Environmental Status.**

# EMODnet introduction:

- Six service contracts were launched in **2009 (3 years)** by DG-MARE for creating **pilot components** of the **European Marine Observation and Data Network (EMODNET)**.
- In **2012**, a new call was opened to conclude **7 service contracts** for assembling **marine data, metadata** and **data products** and facilitating **their access and re-use**:

<p><b>Bathymetry</b></p>  <p>Data on bathymetry (water depth), coastlines, and geographical location of underwater features: wrecks.</p> <p><a href="#">Read more</a> <a href="#">Portal</a></p>	<p><b>Geology</b></p>  <p>Data on seabed substrate, sea-floor geology, coastal behaviour, geological events, and minerals.</p> <p><a href="#">Read more</a> <a href="#">Portal</a></p>	<p><b>Seabed Habitats</b></p>  <p>Data on modelled seabed habitats based on seabed substrate, energy, biological zone, and salinity.</p> <p><a href="#">Read more</a> <a href="#">Portal</a></p>
<p><b>Chemistry</b></p>  <p>Data on the concentrations of pesticides, heavy metals, and antifoulants, in water, sediments and biota.</p> <p><a href="#">Read more</a> <a href="#">Portal</a></p>	<p><b>Biology</b></p>  <p>Data on temporal and spatial distribution of species abundance and biomass from several taxa.</p> <p><a href="#">Read more</a> <a href="#">Portal</a></p>	<p><b>Physics</b></p>  <p>Data on salinity, temperature, waves, currents, sea-level, light attenuation, and FerryBoxes.</p> <p><a href="#">Read more</a> <a href="#">Portal</a></p>
<p><b>Human Activities</b></p>  <p>Data on the intensity and spatial extent of human activities at sea.</p> <p><a href="#">Read more</a> <a href="#">Portal</a></p>		

# EMODnet Chemistry

**Collects data on:**

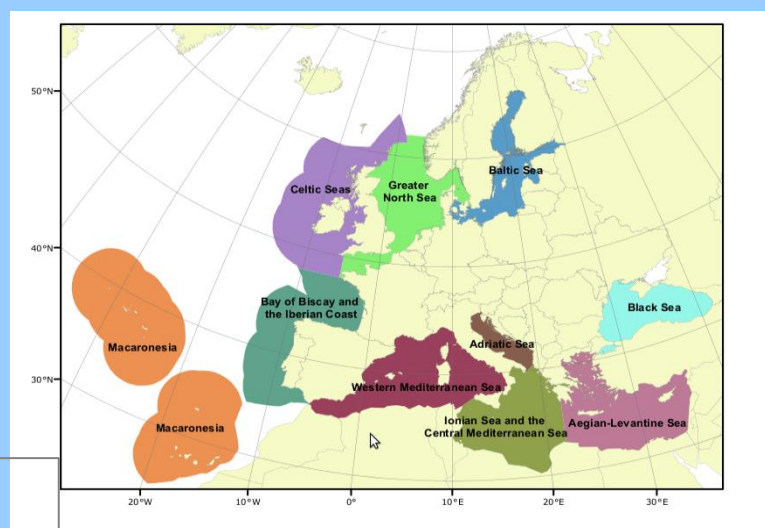
**In 3 matrices:**

- water column;
- biota;
- sediment.

Group	Examples
pesticides and biocides	DDT, HCB
antifoulants	TBT, TPT
Pharmaceuticals	oxytetracycline
heavy metals	mercury, cadmium, lead
Hydrocarbons	anthracene, fluoroanthene
Radionuclides	Cs <sup>137</sup> , Pu <sup>239</sup>
fertilisers	nitrogen (DIN, TN), phosphorus (DIP, TP)
organic matter(e.g. from sewers or mariculture)	total carbon (TOC)
Chlorophyll	
Silicates	
partial pressures of dissolved gases	oxygen, carbon dioxide
Plastics	polyethelyne, polypropylene
Acidity (from pH, pCO <sub>2</sub> , Total Inorganic Carbon, alkalinity)	pH

**The portal should cover all European waters**

1	Adriatic Sea
2	Aegean Levantine Sea
3	Baltic Sea
4	Black Sea
5	Celtic Seas
6	Greater North Sea
7	Iberian Coast and Bay of Biscay
8	Ionian Sea and Central Mediterranean
9	Macaronesia
10	Norwegian Sea
11	Western Mediterranean Sea



Note: This map is derived from the EU Tender document but lacks the Norwegian sea



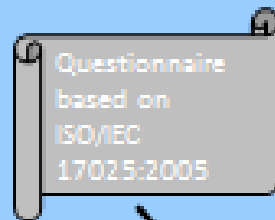
# EMODnet Chemistry: How

## Based on SeaDataNet :

- **An efficient distributed Marine Data Management Infrastructure** for large and diverse sets of data from in situ and remote observation of the seas and oceans.
- **Actively involved in standards implementation following INSPIRE**(in contact with **INSPIRE Marine Pilot**);
- *A de-facto standard* with around **100 nodes** from **35 countries** (including some non-EU countries).
- **Connected to Marine Data Management Infrastructure from USA and Australia** thanks to the **ODIP project** activities.

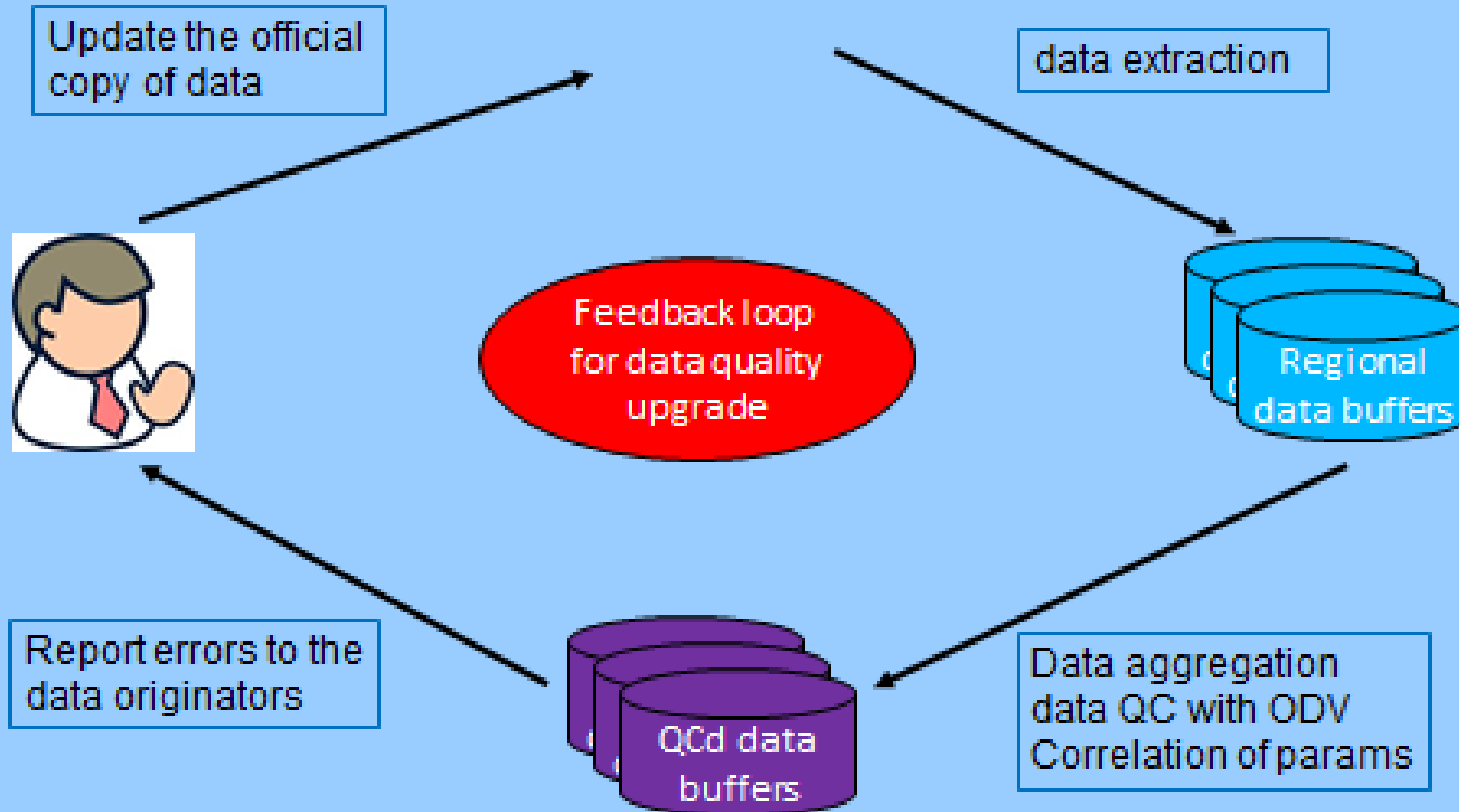


## QA/QC



Data and  
Metadata

Data are **checked, flagged and completed with metadata** by **National Collators**



**“To ensure the data consistency within a single data set and within a collection of data sets and to ensure that the quality and errors of the data are apparent to the user who has sufficient information to assess its suitability for a task.” (IOC/CEC Manual, 1993)**

# EMODnet Chemistry → MSFD Descriptors:

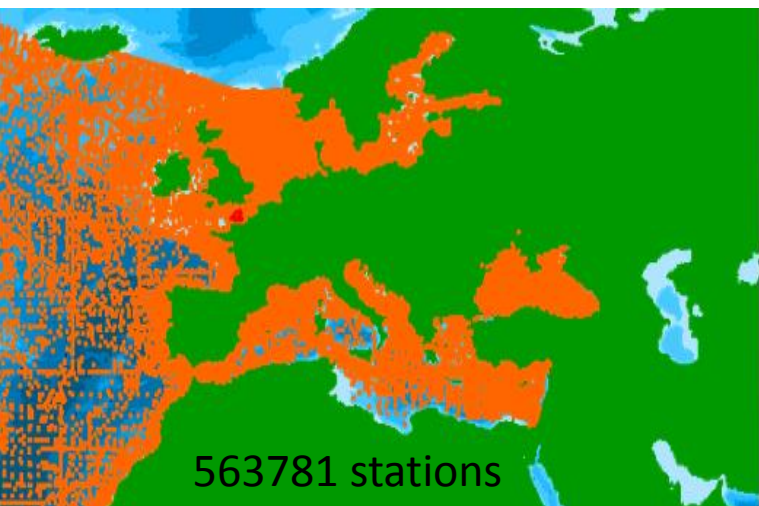
Descriptor	Criterion	Indicator
<b>D5 Eutrophication</b>	5.1 Nutrient levels	5.1.1 Nutrient concentration in the water column
	5.2 Direct effects of nutrient enrichment	5.2.1 Chlorophyll concentration in the water column
	5.3 Indirect effects of nutrient enrichment	5.3.2 Dissolved oxygen
<b>D8 Contaminants</b>	8.1 Concentration of contaminants	8.1.1 Concentration of contaminants in the relevant matrix (biota, sediment, water)
<b>D9 Contaminants in seafood</b>	9.1 Levels, number and frequency of contaminants	9.1.1 Actual levels of contaminants



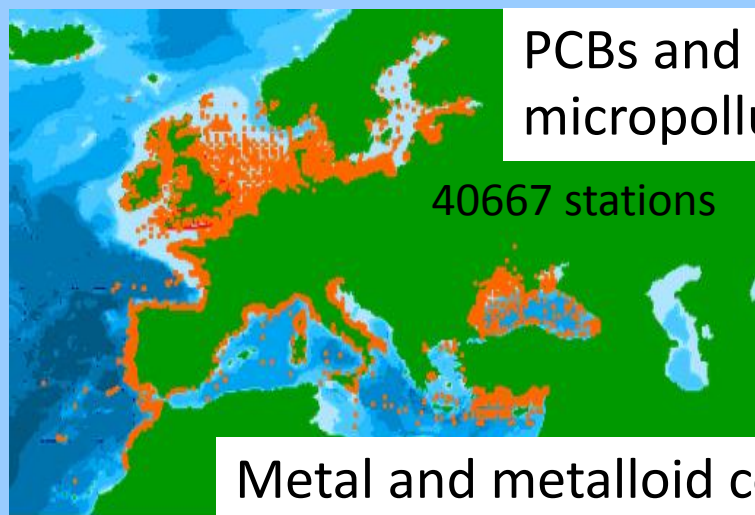
## 8.1.1 Concentration of contaminants in the relevant matrix (biota, sediment, water)

5.1.1 Nutrient concentration in the water column

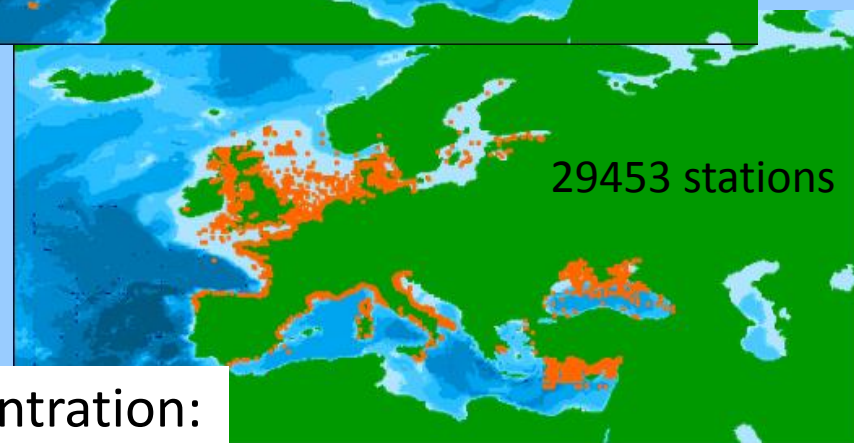
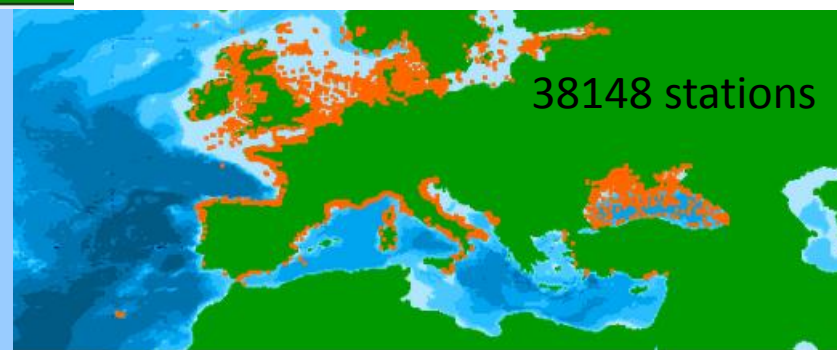
5.2.1 Dissolved oxygen



PCBs and other organic micropollutants:



Metal and metalloid concentration:



Hydrocarbon concentration:

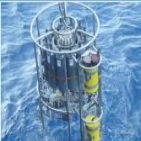
# EMODnet Chemistry: How


European Marine  
Observation and Data  
Network on EU maritime  
forum

NEWS

- EMODnet Chemistry 2nd Expert Workshop, 21/10/2015, Ostende
- EMODnet Chemistry 2nd Year Meeting, 15-16 June 2015, Istanbul
- The SeaDataNet TTG and EMODnet TWG meeting 03-04 March, 2015, Trieste (Italy)
- 2nd MSFD-EMODnet meeting 27/02/2015 Brussels
- 4th Steering Committee, Amsterdam
- European Atlas


OLD NEWS (show/hide)





Search Chemicals by Regions

EMODnet Chemistry has a focus on measurement data for groups of chemical variables. The Matrix below indicates per sea region and per chemicals group by map and table how many measurement data are available. **Hovering over a coloured square** in the table gives the exact number of data sets and a map with their geospatial distribution. **Clicking on a coloured square** triggers a query on the Common Data Index (CDI) Data Discovery and Access service that allows you to browse the metadata of these data sets in more detail, to narrow down your query and to request access to a selection of data sets.



Legend - number of measurement data sets for each variable per marine region.

■ 1-50    ■ 51-250    ■ 251-1000    ■ 1001-2500  
■ 2501-5000    ■ 5001-10000    ■ 10001-25000    ■ >25000

Sea regions

Group of Variables	Greater North Sea - Celtic Sea - Norwegian Sea	Baltic Sea	Iberian peninsula - Mediterranean Sea	Mediterranean Sea	Black Sea - Sea of Azov
Acidity	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>
Antifoulants	<span style="color: green;">■</span>	<span style="color: green;">■</span>	<span style="color: red;">■</span>	<span style="color: yellow;">■</span>	<span style="color: green;">■</span>
Chlorophyll	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: cyan;">■</span>	<span style="color: blue;">■</span>	<span style="color: green;">■</span>
Dissolved gasses	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>
Fertilisers	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>
Hydrocarbons	<span style="color: blue;">■</span>	<span style="color: green;">■</span>	<span style="color: orange;">■</span>	<span style="color: green;">■</span>	<span style="color: cyan;">■</span>
Heavy metals	<span style="color: blue;">■</span>	<span style="color: green;">■</span>	<span style="color: yellow;">■</span>	<span style="color: green;">■</span>	<span style="color: green;">■</span>
Organic matter	<span style="color: blue;">■</span>	<span style="color: cyan;">■</span>	<span style="color: yellow;">■</span>	<span style="color: green;">■</span>	<span style="color: green;">■</span>
Polychlorinated biphenyls	<span style="color: blue;">■</span>	<span style="color: yellow;">■</span>	<span style="color: yellow;">■</span>	<span style="color: green;">■</span>	<span style="color: green;">■</span>
Pesticides and biocides	<span style="color: cyan;">■</span>	<span style="color: yellow;">■</span>	<span style="color: yellow;">■</span>	<span style="color: green;">■</span>	<span style="color: green;">■</span>
Pharmaceuticals	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>
Plastics	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>
Radionuclides	<span style="color: yellow;">■</span>	<span style="color: yellow;">■</span>	<span style="color: orange;">■</span>	<span style="color: green;">■</span>	<span style="color: green;">■</span>
Silicates	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>	<span style="color: cyan;">■</span>	<span style="color: blue;">■</span>	<span style="color: blue;">■</span>

List of variables managed by EMODnet Chemistry and specific list of parameters

## Group of variables: Hydrocarbons

### Used parameters:

Parameter	Description
BCAH	Concentration of polycyclic aromatic hydrocarbons (PAHs) in biota
BCOC	Concentration of other organic contaminants in biota
OHWC	Concentration of other hydrocarbons in the water column
PCAH	Concentration of polycyclic aromatic hydrocarbons (PAHs) in suspended particulate material
PCHW	Concentration of polycyclic aromatic hydrocarbons (PAHs) in the water column
PCOC	Concentration of other organic contaminants in suspended particulate material
SALK	Concentration of aliphatic hydrocarbons in sediment samples
SCAH	Concentration of polycyclic aromatic hydrocarbons (PAHs) in sediment samples
SCOC	Concentration of other organic contaminants in sediment samples
WCOC	Concentration of other organic contaminants in the water column

# From Data to Products

- The analysis of **available data**(Expert workshop, Marine Conventions)
- Highlighted **2 main subsets** from the available data :



Homogeneous distribution  
In time and space (basins)

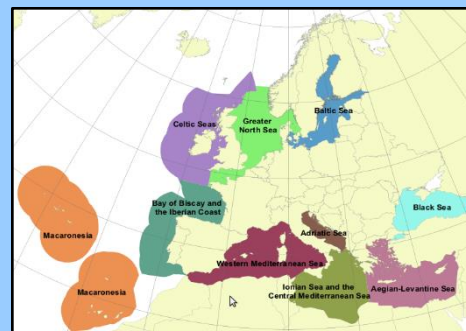
Not homogeneous distribution  
In time and space (basins)

**How to highlight data features?**

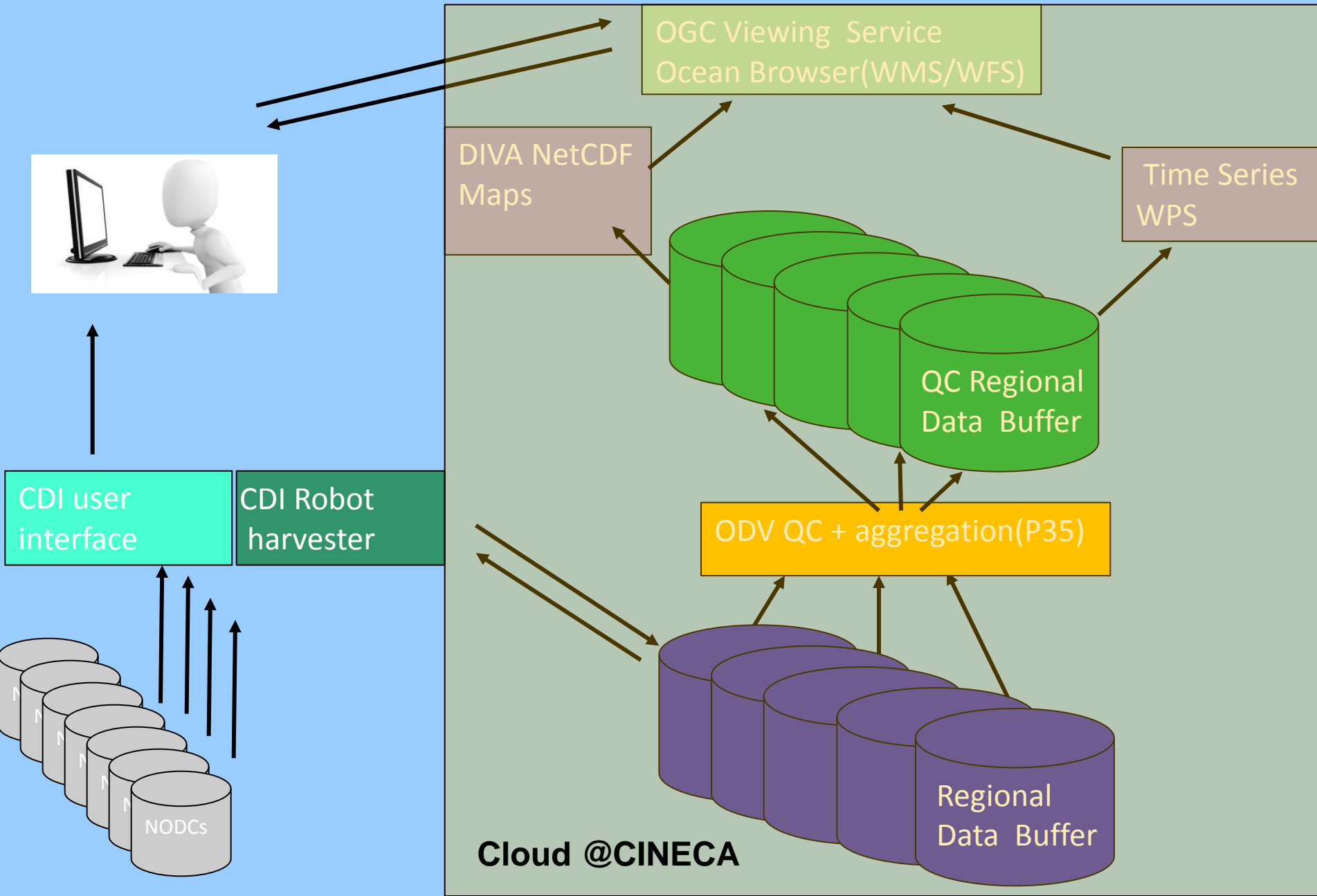
**-DIVA (Data-Interpolating Variational Analysis) horizontal maps** produced for parameters **with homogeneous data coverage**, measured on **basin scale**.

**-Plots of measured data** produced for not homogeneous data (**coastal points** repeated in time, datasets with **fragmented coverage**.)

Products generation is organized at  
Regional level.

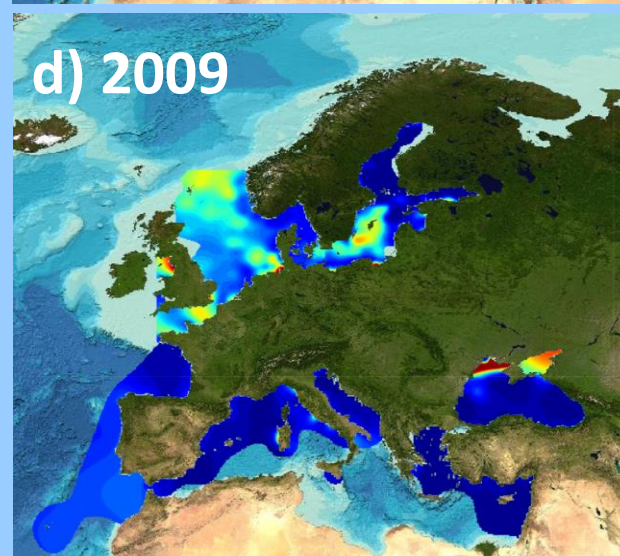
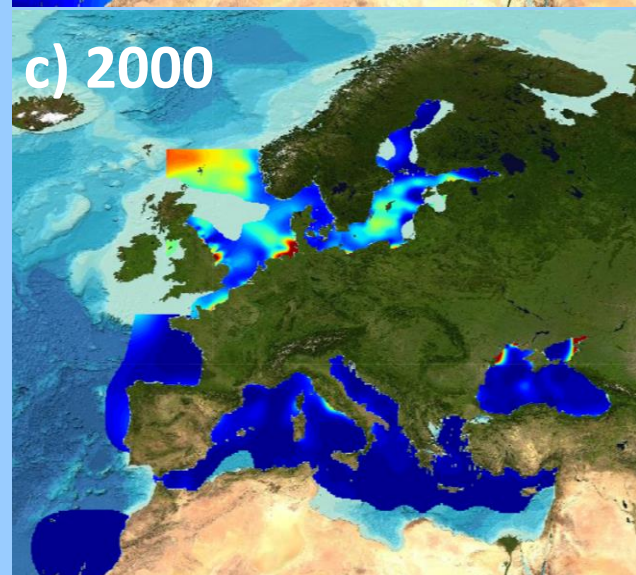
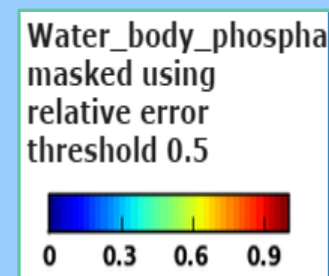
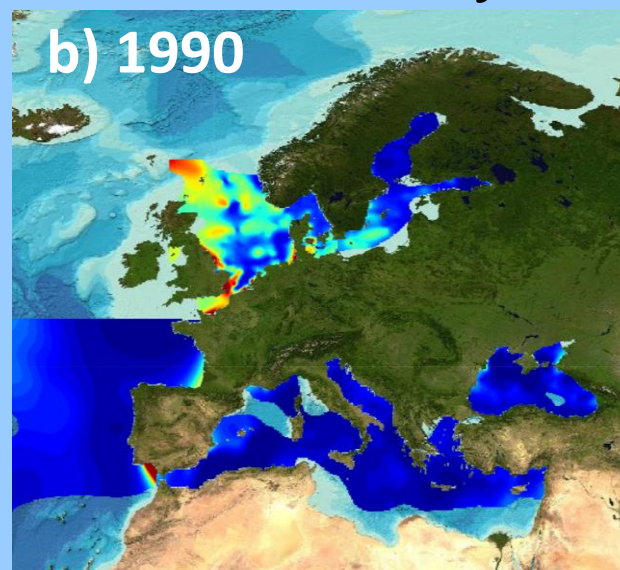
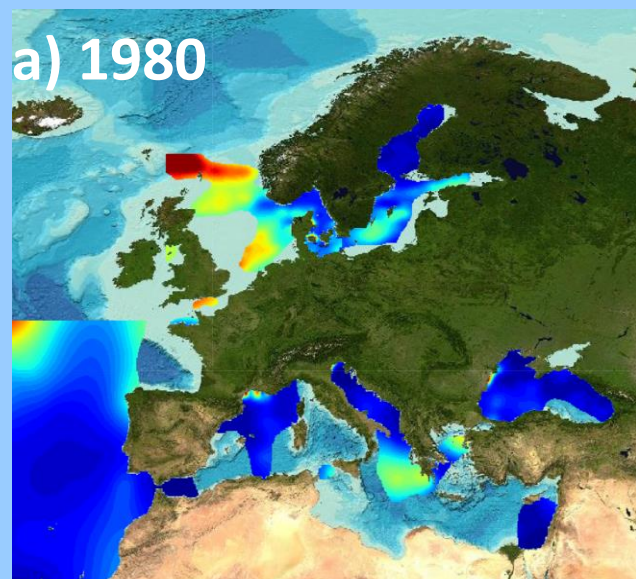


# From Data to Products – workflow





# DIVA horizontal maps as OGC-WMS layers

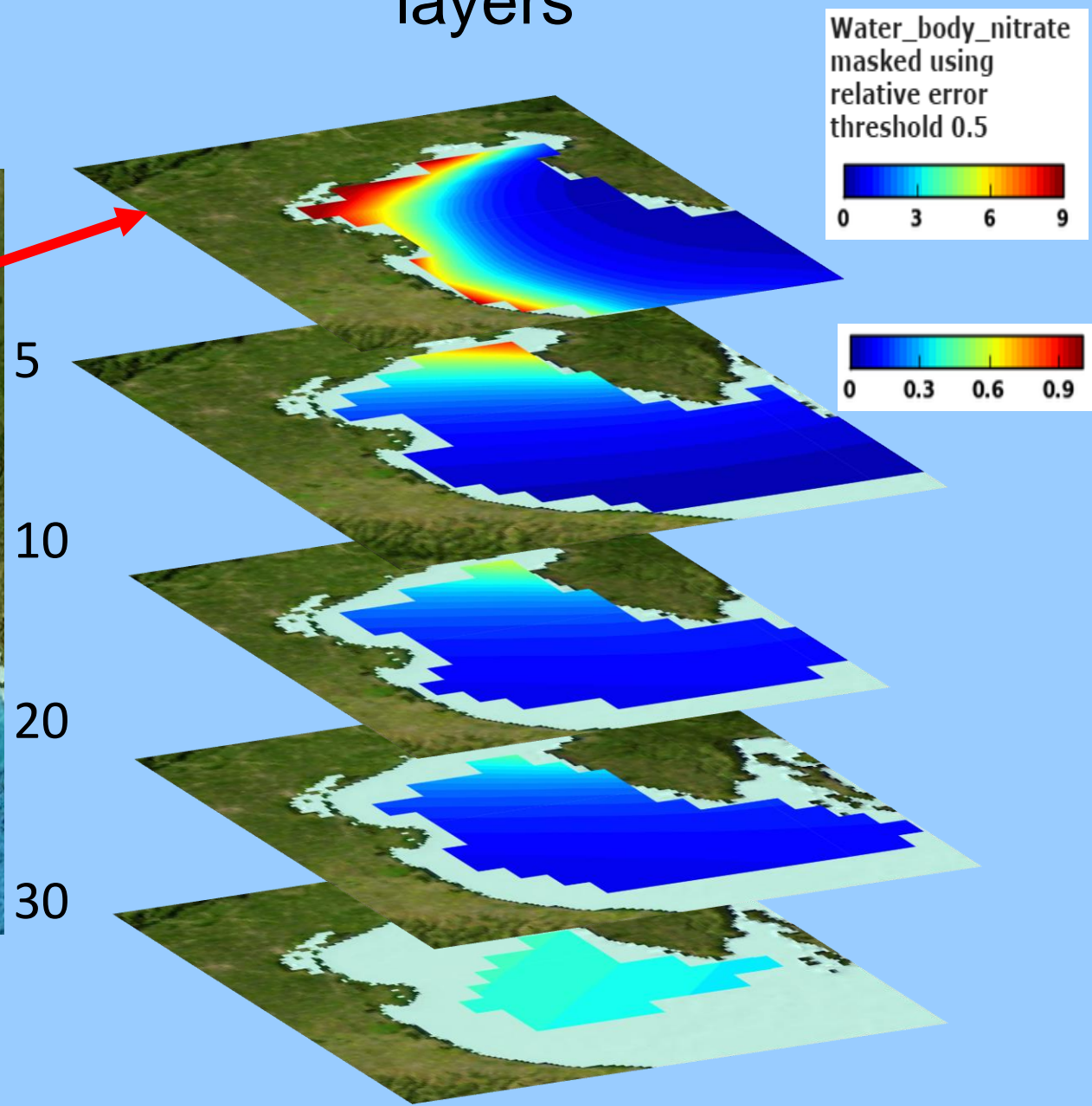


Spring surface distribution of phosphate ( $\mu\text{mol/l}$ ) for the decades 1975-1984 (a), 1985-1994 (b), 1995-2004 (c), and 2004-2013 (d).

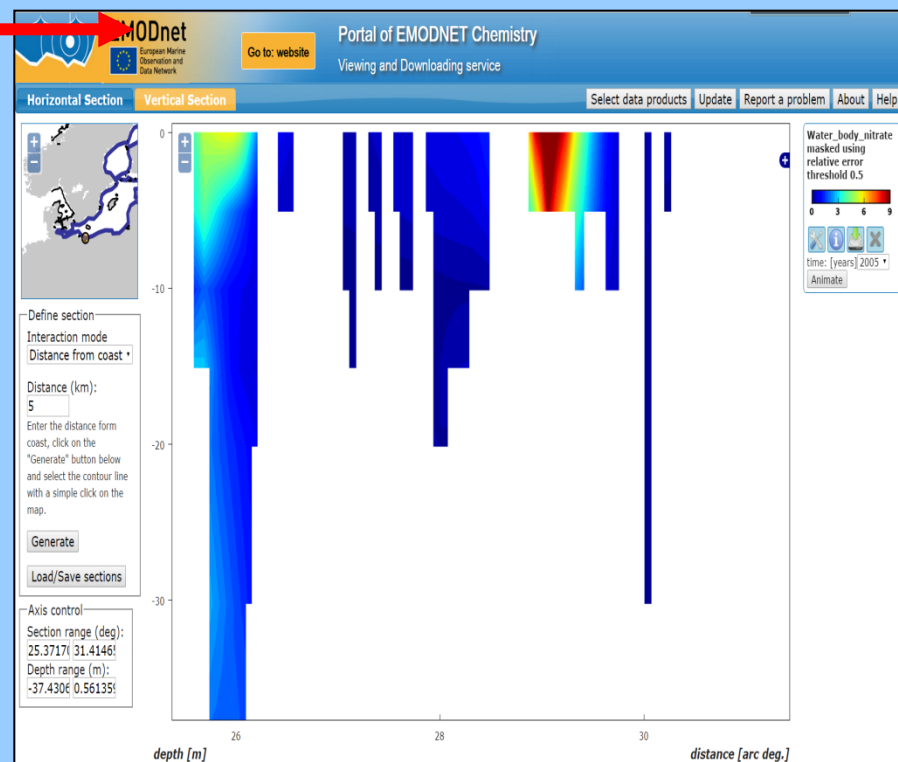
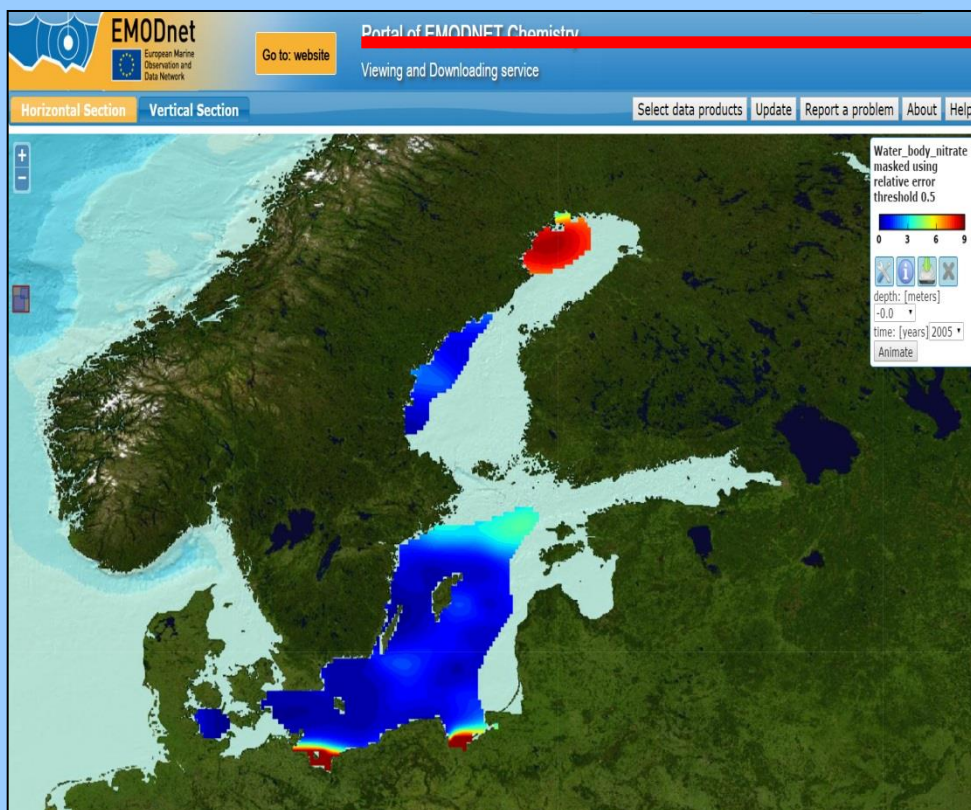
10-year running mean centred on the year indicated



# DIVA horizontal maps as OGC-WMS layers

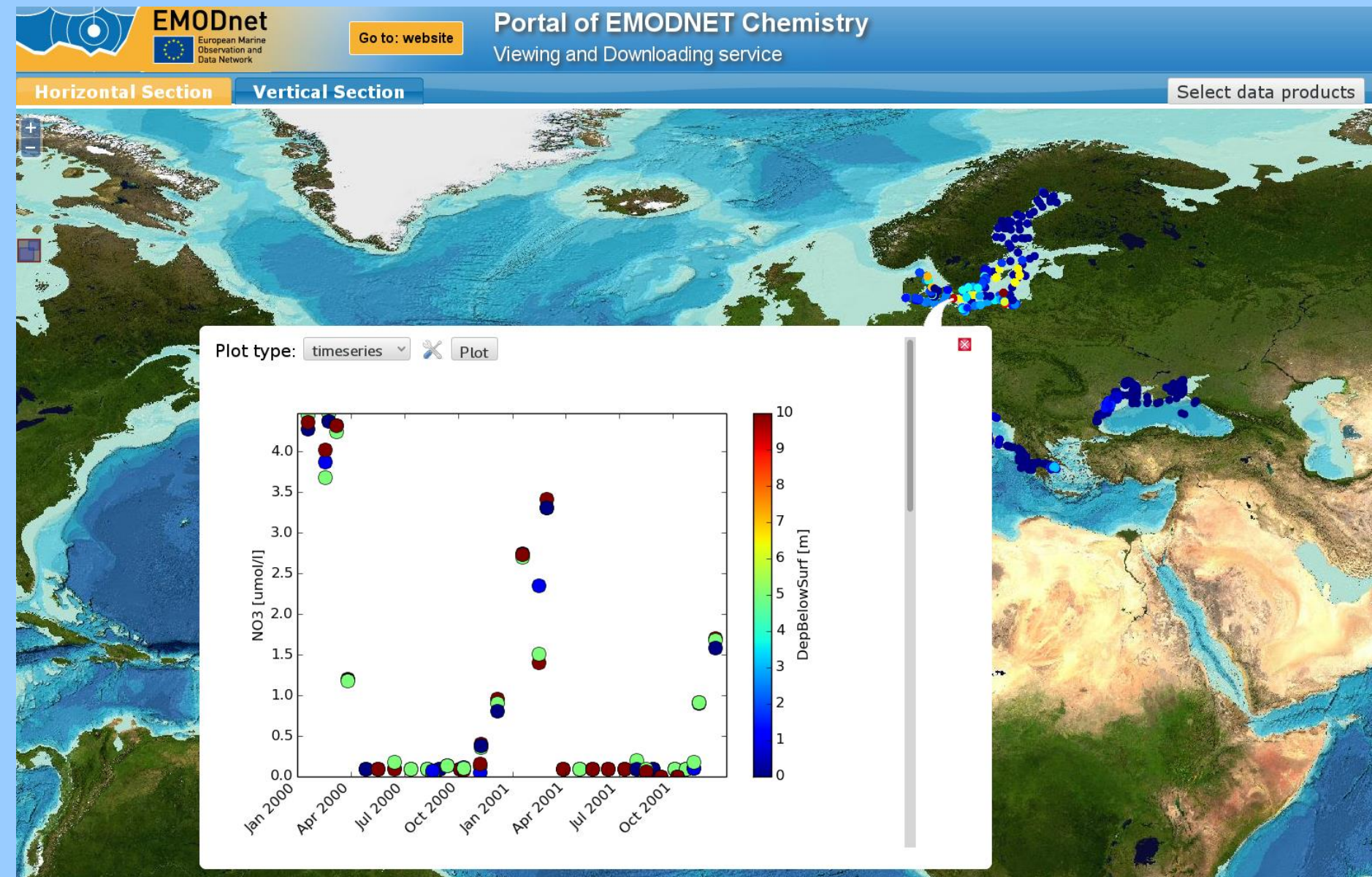


# DIVA horizontal maps as OGC-WMS layers





# Stations density maps and plots as OGC-WPS/WFS



<http://www.emodnet-chemistry.eu/>

Thanks for your attention !  
Questions?