EMODnet
European Marine Observation and Data Network

How EMODnet Chemistry can contribute to MSFD process

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OGS

Interaction EMODnet and MSFD process
9 September 2014, DG MARE, Brussels

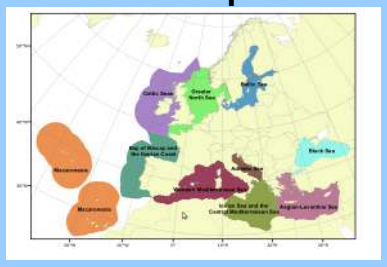
MSFD DATA FLOWS: SCHEMAS

Structural and Process Elements

	Data Collection	Data Assembly	Indicator provision	Assessment
EU Process governance				
Methodology	With P01 provides information on analitical methods	DIVA interpolation	Provides DIVA maps as basic information	
Operational basis	Collects information on QA/QC methods	QA/QC, data aggregation and validation		
Operators	Involves operators (MS) in the data collection process			

The Chemistry portal covers more than **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

The parameters:

In 3 matrices:

-water column;

-biota;

-sediment.

Group	**Examples**
pesticidides and biocides	DDT, HCB
antifoulants	TBT, TPT
Pharmaceuticals	oxytetracycline
heavy metals	mercury, cadmium, lead
Hydrocarbons	anthracene, fluoroanthene
Radionuclides	Cs^{137}, Pu^{239}
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_2, Total Inorganic Carbon, alkalinity)	pH

EMODnet Chemistry: How

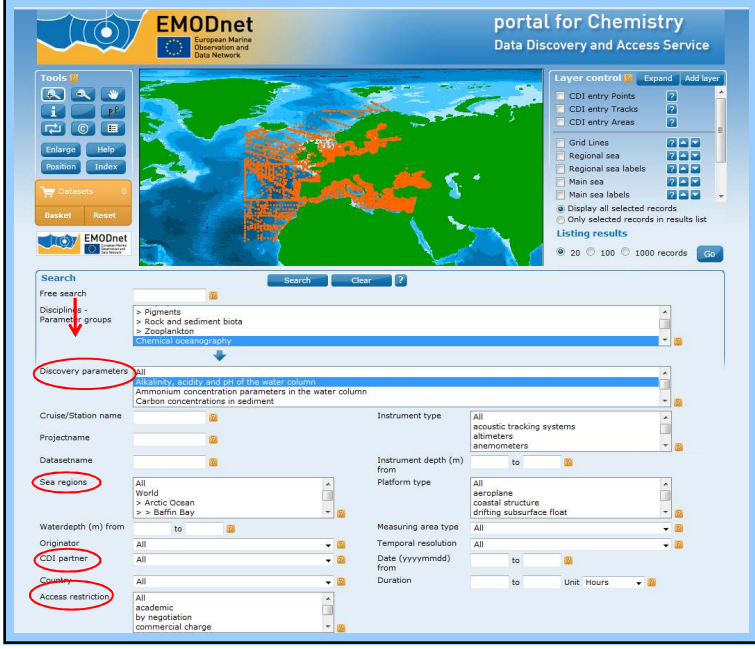
- Based on **SeaDataNet**

- **Distributed Marine Data Management Infrastructure** for:
  - **Data→ flagged** with **Quality** information;
  - **Metadata→ data discovery and long term use;**

- Actively involved in **EU standards implementation** to guarantee:
  - **Common infrastructure for geospatial data→ following INSPIRE (ISO);**
  - **Interoperability→ Open Geospatial Consortium protocols (WMS, WFS...)** ;
  - **Common Terms →Common Vocabularies ;**

- An EU *de-facto standard* with: **32 partners** and **14 subcontractors** from **28 countries EU and not**.

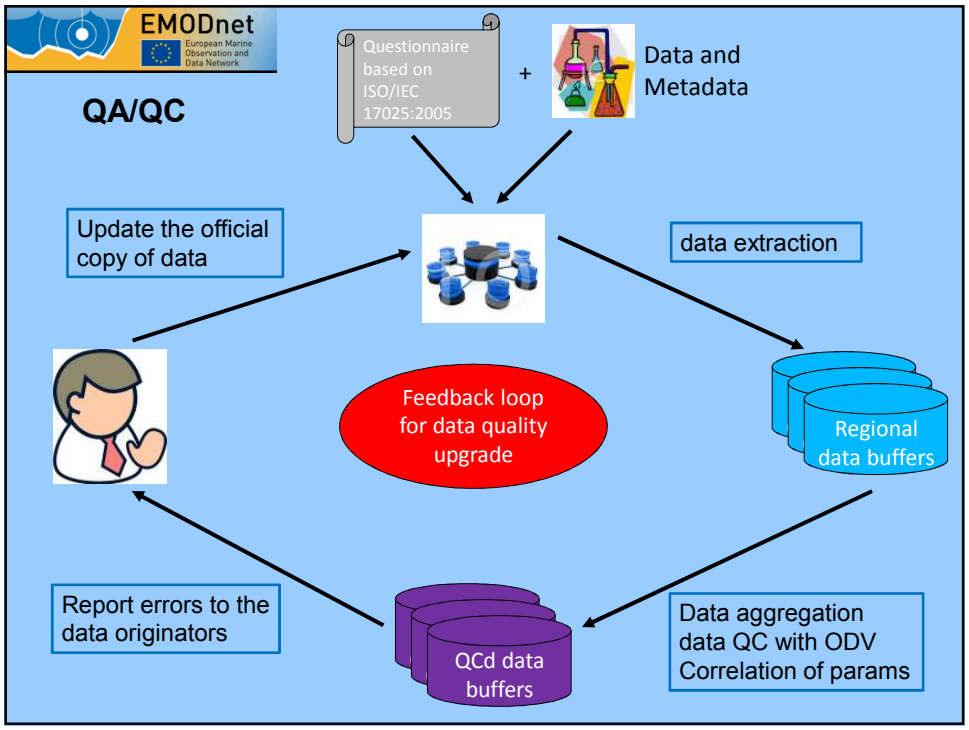
Single Data Discovery and Access interface for all the sources.



2 linked parameter search criteria:
- general (P03)
→ more analytic (P02)

Area selection:
- Classic geobox
- Selection by Sea Regions polygons

Data are provided as ASCII files with P01 Parameter Usage Vocabulary (ODV format)

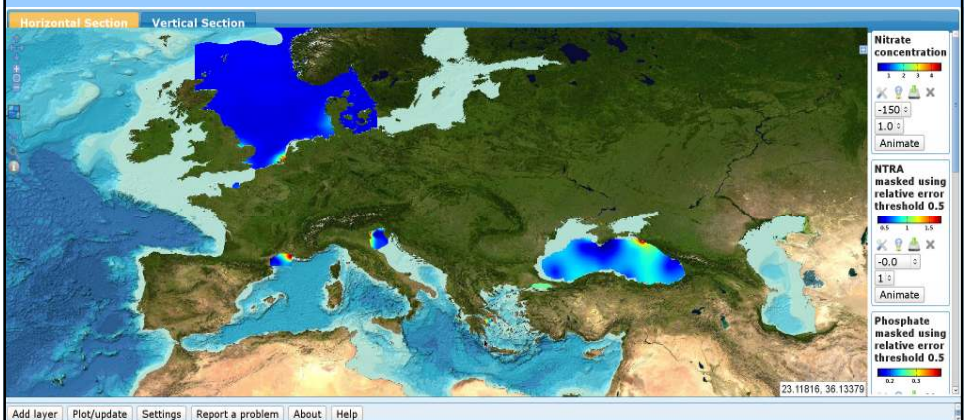


Methodology for Data Assembly

Data collection highlighted 2 main subsets of the available data:

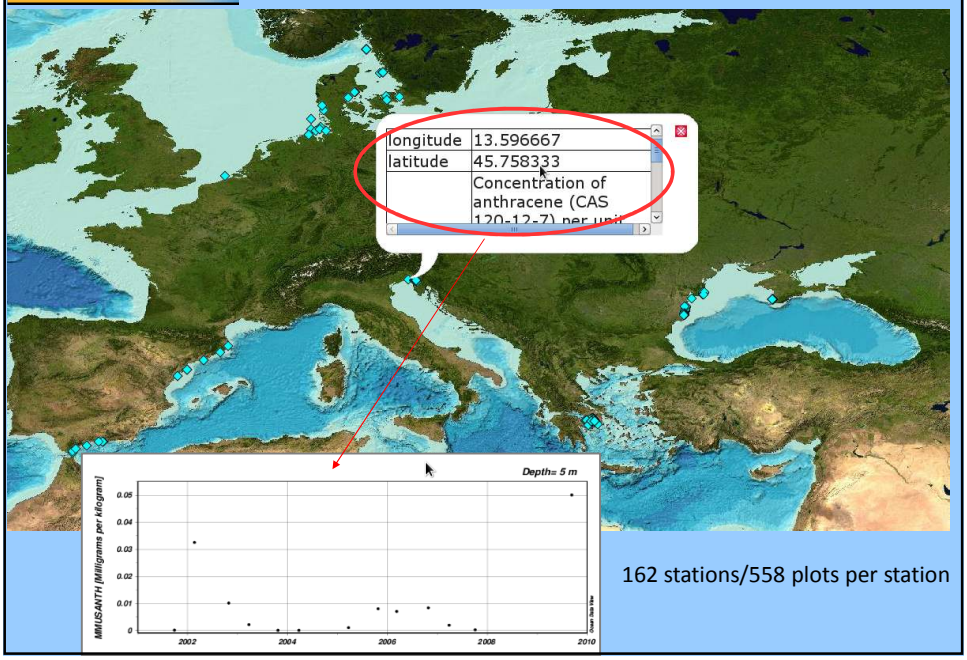
Homogeneous distribution In time and space (basins)	Not homogeneous ditribution In time and space (basins)
-**DIVA (Data-Interpolating Variational Analysis) horizontal maps** produced for parameters **with homogeneous data coverage**, measured on **basin scale**;	-**Time series plots** produced for not homogeneous data (**coastal points** repeated in time, datasets with **fragmented coverage**.)
Dynamic maps of spatial coverage with data values varying in time	**Dynamic time series plots** and **coastal visualization tools**

Horizontal maps



North Sea	Seasonal	Nutrients
Black Sea	Annual/seasonal	Nutrients, Metals, Radioniclides
Med Sea	Annual/seasonal	Nutrients

Time Series plots

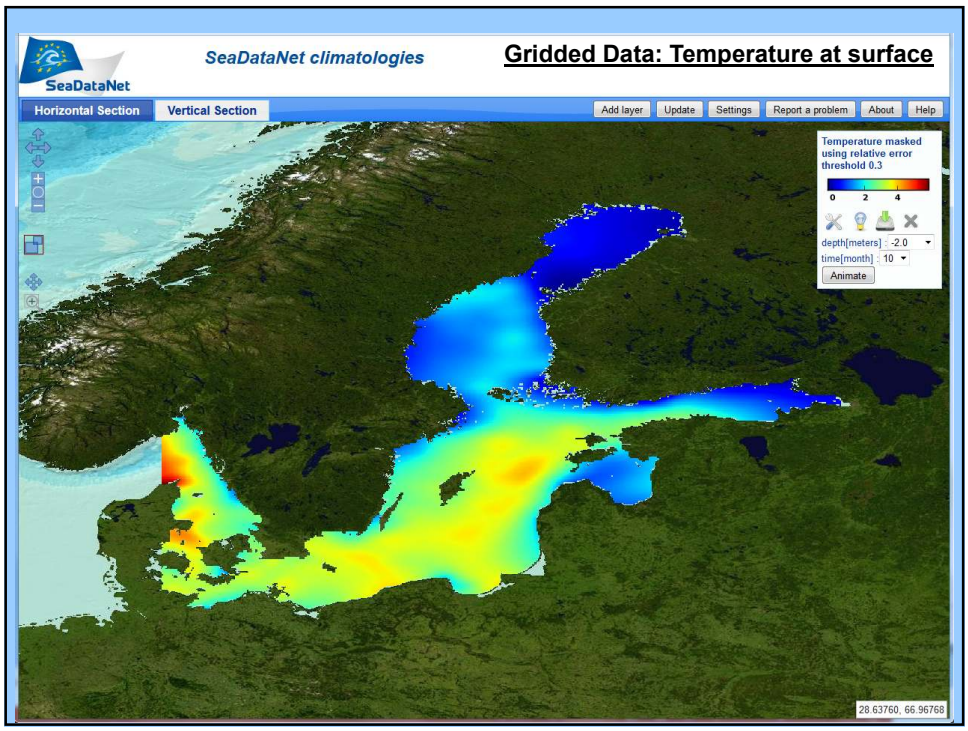


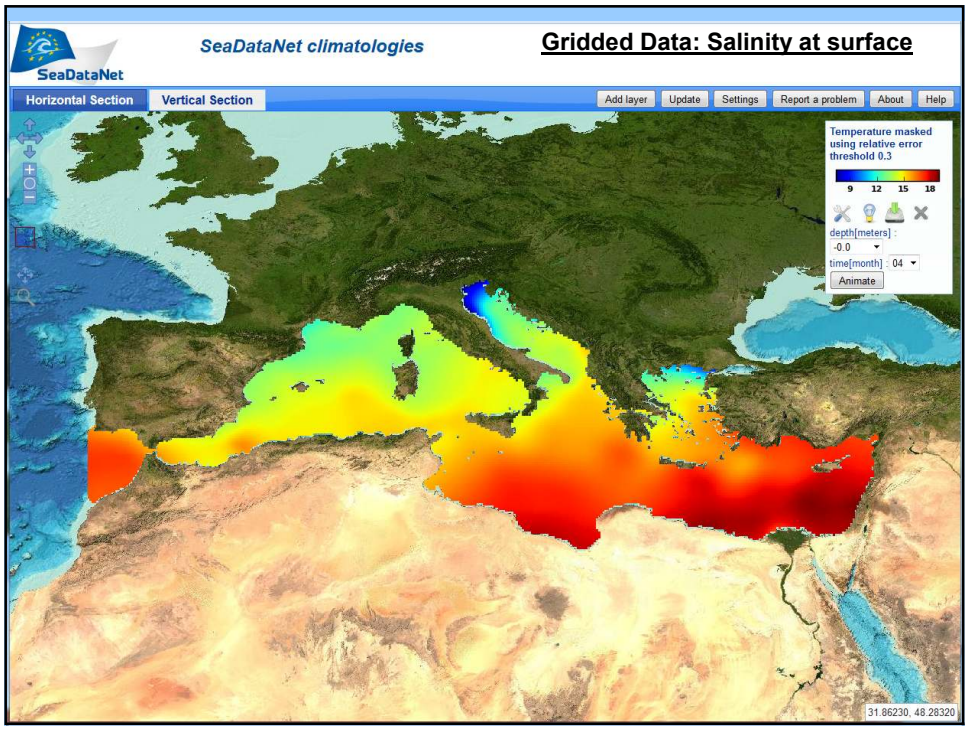
162 stations/558 plots per station

Biodiversity (1): mobile species and water column

EMODnet can contribute with information and data on Temperature, Salinity, pH, Nutrients and Chlorophyll-a

Descriptor	Criterion	Indicator	Type of Indicator
D1 Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.	1.1 Species distribution	1.1.1 Distributional range	S
		1.1.2 Distributional pattern within the latter, where appropriate	S
		1.1.3 Area covered by the species (for sessile/benthic species)	S
	1.2 Population size	1.2.1 Population abundance and/or biomass, as appropriate	S
	1.3 Population condition	1.3.1 Population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity rates, survival/mortality rates)	S
		1.3.2 Population genetic structure, where appropriate	S
	1.4 Habitat distribution	1.4.1 Habitat distributional range	S
		1.4.2 Habitat distributional pattern	S
	1.5 Habitat extent	1.5.1 Habitat area	S
		1.5.2 Habitat volume, where relevant	S
	1.6 Habitat condition	1.6.1 Condition of the typical species and communities	S
		1.6.2 Relative abundance and/or biomass, as appropriate	S
		1.6.3 Physical, hydrological and chemical conditions	S
	1.7 Ecosystem structure	1.7.1 Composition and relative proportions of ecosystem components (habitats and species)	S


SeaDataNet climatologies
Gridded Data: Temperature at surface
SeaDataNet
Horizontal Section
Vertical Section
Add layer
Update
Settings
Report a problem
About
Help
Temperature masked using relative error threshold 0.3
0
2
4
depth[meters] : -2.0
time[month] : 10
Animate
28.63760, 66.96768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SeaDataNet
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Vertical Section
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Settings
Report a problem
About
Help
Temperature masked using relative error threshold 0.3
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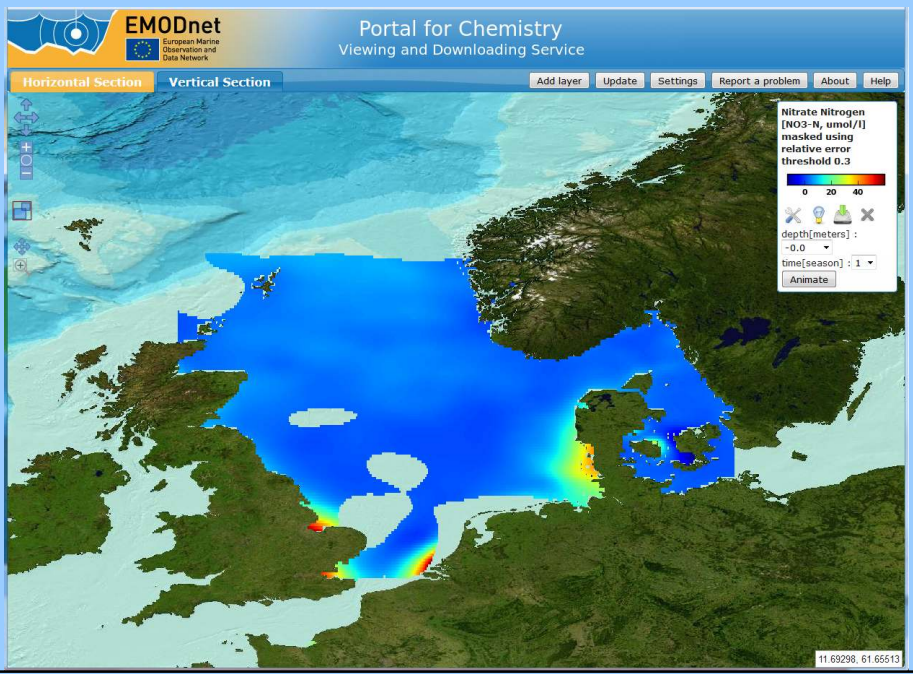
12
15
18
depth[meters] :
-0.0
time[month] : 04
Animate
31.86230, 48.28320

Gridded Data: winter Nitrate at surface



Biodiversity (2): seabed habitats/seafloor integrity

EMODnet can contribute with distribution maps of:
-bottom oxygen concentrations (hypoxia and anoxia conditions)
-bottom organic matter (as index of eutrophication – D5)

Data of contaminants in the three matrices (for multi-metric/integrated benthic index)*

Descriptor	Criterion	Indicator	Type of Indicator
D6 Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.	6.1 Physical damage, having regard to substrate characteristics	6.1.1 Type, abundance, biomass and areal extent of relevant biogenic substrate	S/I
		6.1.2 Extent of the seabed significantly affected by human activities for the different substrate types	I
	6.2 Condition of benthic community	6.2.1 Presence of particularly sensitive and/or tolerant species	S/I
		6.2.2 Multi-metric indexes assessing benthic community condition and functionality, such as species diversity and richness, proportion of opportunistic to sensitive species	S/I
		6.2.3 Proportion of biomass or numbers of individuals in the macrobenthos above some specified length/size	S/I
		6.2.4 Parameters describing the characteristics (shape, slope and intercept) of the size spectrum of the benthic community	S/I

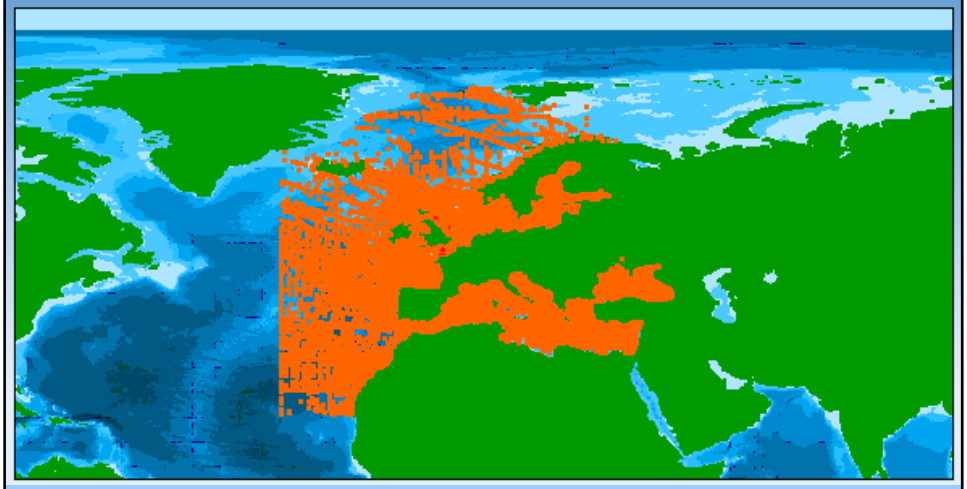
* as indicated in the MSFD – Task Group 6 Report: oxygen and contaminants are requested to assess the GES in the bottom layer and sea-floor

EMODnet
European Marine Observation and Data Network

Data available at 1/9/2014

Total 399.270 stations

P02: Dissolved oxygen parameters in the water column (bottom layer)



EMODnet
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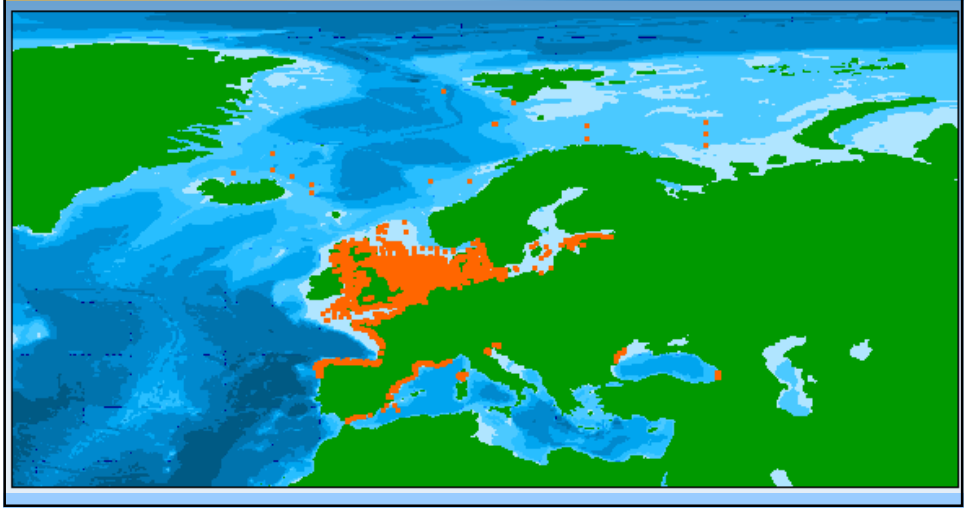
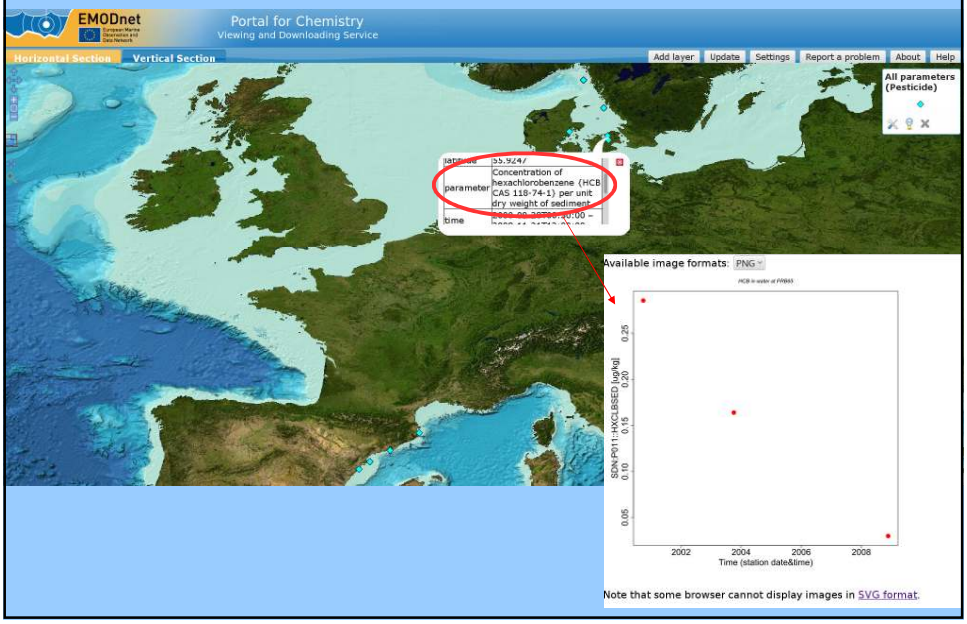
Data available at 1/9/2014

Total 16.382 stations

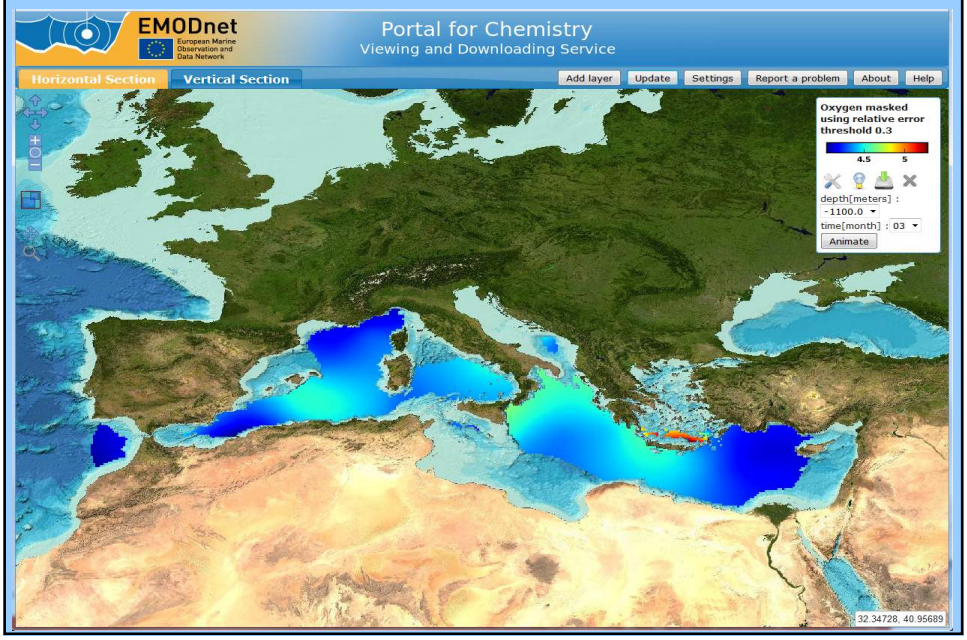
P02: Concentration of PCBs, PHAs, metals, organometallic species, pesticides, trace metalloid in biota and in sediment samples



Time series plot of hexaclorobenzene in the sediment



Water column deep layer: O2 map at -1100 m



Chemistry (1): nutrients/chlorophyll/oxygen

EMODnet already contributes with concentration maps of:
- Nutrients (NO3, NOx, Total Nitrogen, PO4, Total Phosphorus, SiO4, NH4)
- Chlorophyll
- Oxygen

computed as 10-year moving average from 1960 to 2014, by season and standard levels

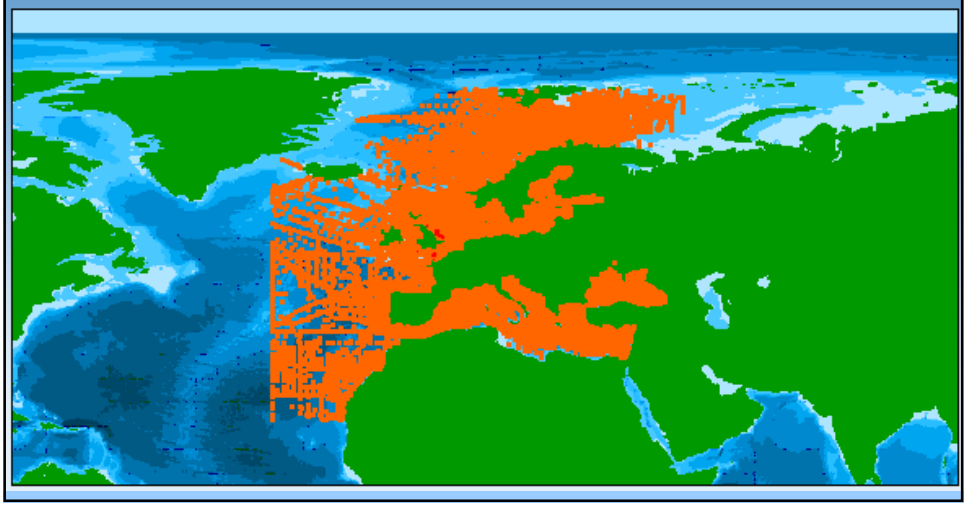
Time series plots of long time series measured data

D5 Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.	5.1 Nutrients level	5.1.1 Nutrients concentration in the water column	P
		5.1.2 Nutrient ratios (silica, nitrogen and phosphorus), where appropriate	P
	5.2 Direct effects of nutrient enrichment	5.2.1 Chlorophyll concentration in the water column	I
		5.2.2 Water transparency related to increase in suspended algae, where relevant	I
		5.2.3 Abundance of opportunistic macroalgae	I
		5.2.4 Species shift in floristic composition such as diatom to flagellate ratio, benthic to pelagic shifts, as well as bloom events of nuisance/toxic algal blooms (e.g. cyanobacteria) caused by human activities	I
	5.3 Indirect effects of nutrient enrichment	5.3.1 Abundance of perennial seaweeds and seagrasses (e.g. fucoids, eelgrass and Neptune grass) adversely impacted by decrease in water transparency	I
		5.3.2 Dissolved oxygen, i.e. changes due to increased organic matter decomposition and size of the area concerned	I

Data available at 1/9/2014

Total 263.356 stations

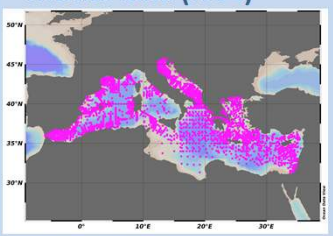
P02: Ammonium, DIN, dissolved total and organic N and P, NO3, NO2, particulate total and organic N and P, PO4, SiO4 in the water column



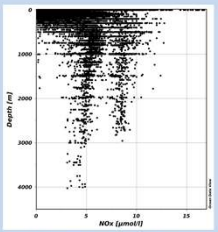
Regional data aggregation and QC

- Use only data with QF=0, 1, 2, 6 as initial collection to use only good data
- Unit conversion and aggregation (P35 vocabs): µmol/l

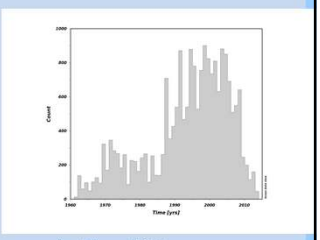
Nitrate data (NO3)



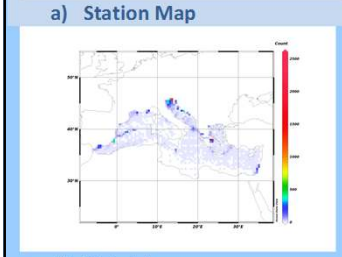
a) Station Map



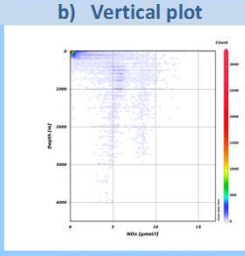
b) Vertical plot



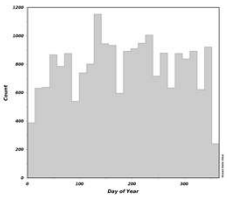
c) Time histogram



d) Data bins



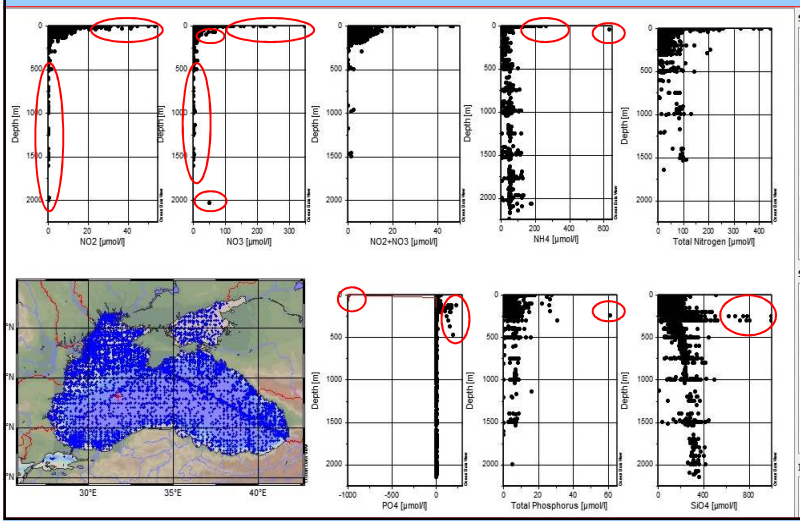
e) X/Y distribution



f) Season histogram

Regional data aggregation and QC

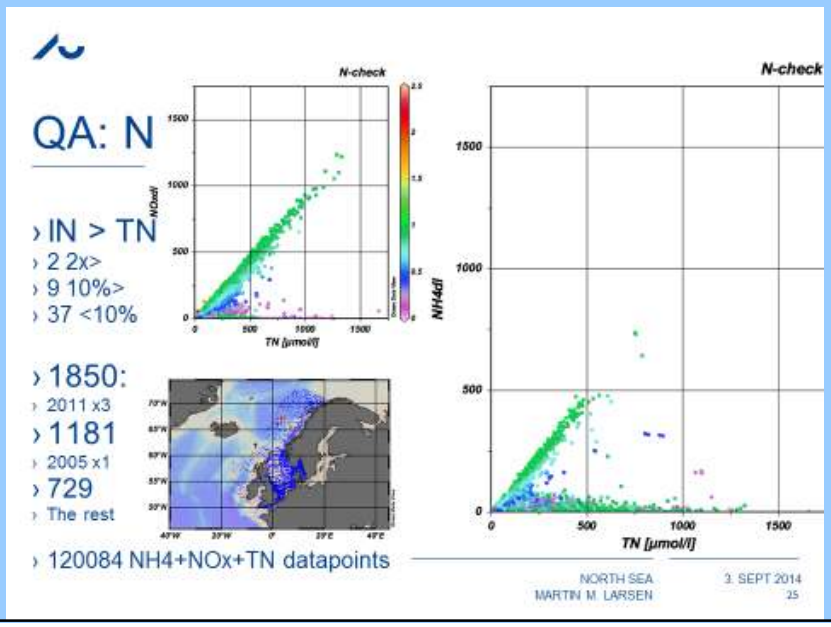
- **Search for duplicates and eliminate**
- **Perform QC with ODV - broad range check, QF=4 or QF=1**



Station ID: 19906		
Accession Num...	6793	
Cruise	PK_20	
Station	21212 (C)	
Position	31.75°E / 43.25°N	
Date	02 March 1989	
Time	09:32:00.000	
Depth Range [m]	[0.00 - 150.00]	
LOCAL_CDI_ID	21212	
EDMO_code	727	
Bot. Depth [m]	1888	
Platform type		
Instrument / ge...		
Sample: 1 / 9		
1: Depth [m]	0.00	1
2: NO2 [µmol/l]		9
3: NO3 [µmol/l]		9
4: NO2+NO3 [...		9
5: NH4 [µmol/l]		9
6: Total Nitrog...		9
7: PO4 [µmol/l]	-988.0000	4
8: Total Phosp...		9
9: SiO4 [µmol/l]		9
Isosurface Values		
Longitude	31.750	
Latitude	43.250	

Regional data aggregation and QC

- **Last step - add additional criteria as: Nitrate to Phosphate ratio and comparison with Total N and P**



Detection of trends

10 years moving windows (or other time frame) to reveal long term variabilities

Centered in the middle of the decade

- 1970 until 1979 as 1975
- 1971 until 1980 as 1976
- ….

Seasonal Analysis

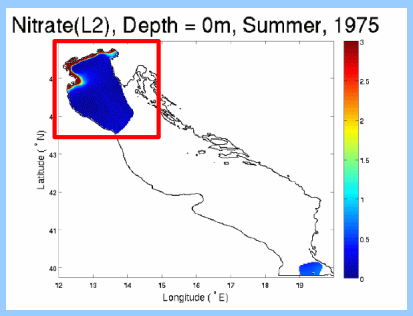
- January to March as winter
- April to June as spring
- ….

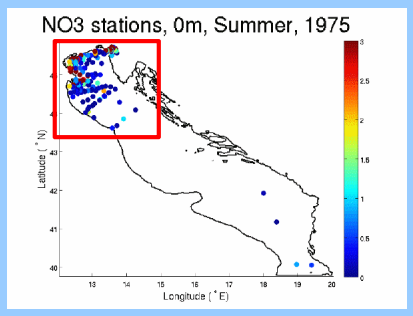
Reference field

- Climatic seasonal from all available years (with detrending for removal of uneven spatial distribution in time)

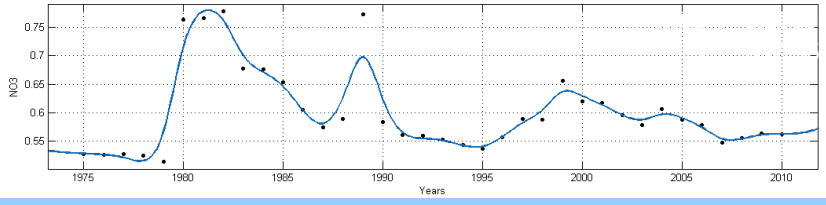
Without detrending

Detection of trends

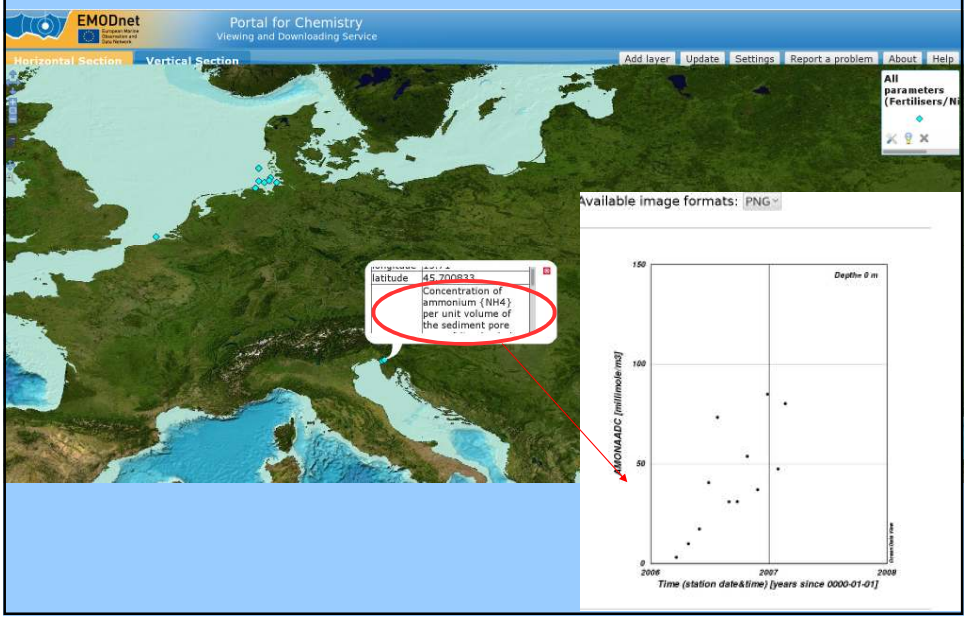




Mean summer NO3 at first 10 m, over the area N43.5-46, E12-15



Time series plot of ammonium in the sediment



Chemistry (1): nutrients/chlorophyll/oxygen

Response from EMODnet Chemistry:

With the available data, EMODnet contributes with **horizontal distribution maps**, produced with **10-year moving window** for trend detection

EMODnet contributes with dynamic time series plots and distribution maps

Perspectives from EMODnet Chemistry:

Products focused on **nutrient ratio** (Si, N, P)

Correlation with hydrological properties (temperature, salinity, transparency not directly included in the call)

Correlation with driving forces and pressures (as contribution to DPSIR framework)

Chemistry (2): contaminants (D8/9)

EMODnet already contributes with time series plots of long time series of measured data

Descriptor	Criterion	Indicator	Type of Indicator
D8 Concentrations of contaminants are at levels not giving rise to pollution effects.	8.1 Concentration of contaminants	8.1.1 Concentration of the contaminants mentioned above, measured in the relevant matrix (such as biota, sediment and water) in a way that ensures comparability with assessments under Directive 2000/60/EC	P
	8.2 Effects of contaminants	8.2.1 Levels of pollution effects on the ecosystem components concerned, having regard to the selected biological processes and taxonomic groups where a cause/effect relationship has been established and needs to be monitored	I
		8.2.2 Occurrence, origin (where possible), extent of significant acute pollution events (e.g. slicks from oil and oil products) and their impact on biota physically affected by this pollution	P/I
D9 Contaminants in fish and other seafood for human consumption do not exceed levels established by EU legislation or other relevant standards.	9.1 Levels, number and frequency of contaminants	9.1.1 Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels	P/I
		9.1.2 Frequency of regulatory levels being exceeded	P/I

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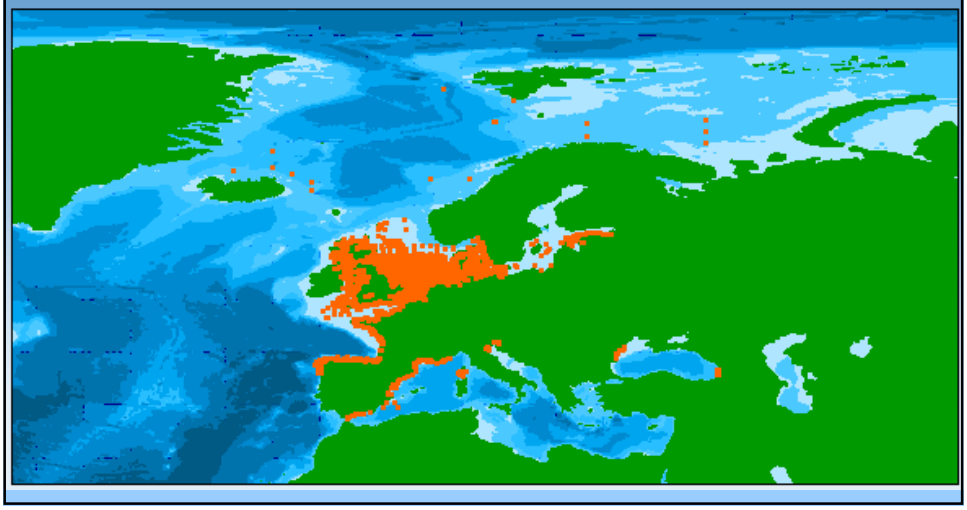
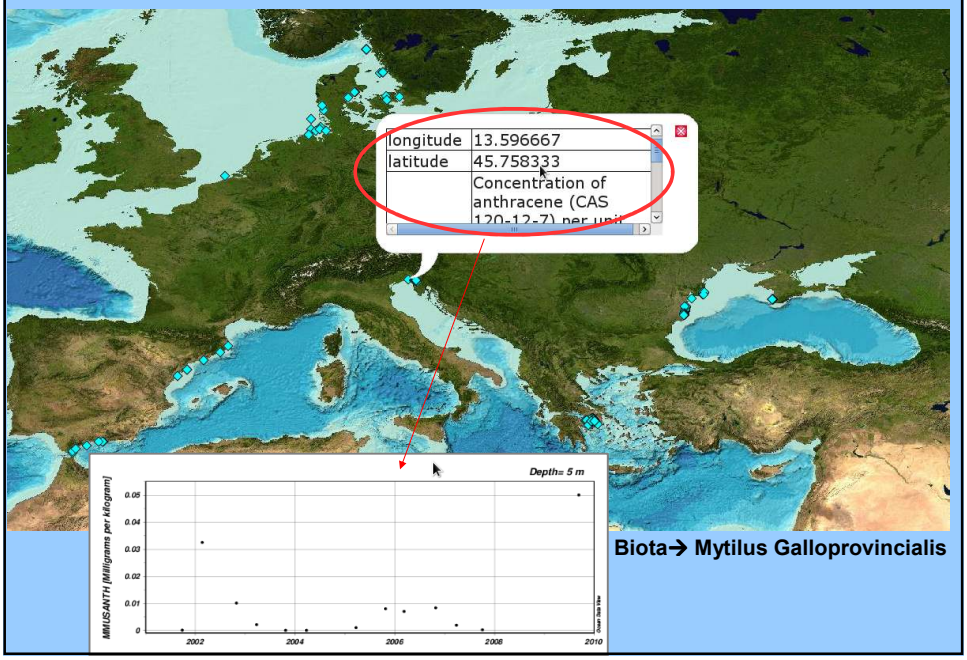
Total 16.382 stations

P02: Concentration of PCBs, PHAs, metals, organometallic species, pesticides, trace metalloid in biota and in sediment samples

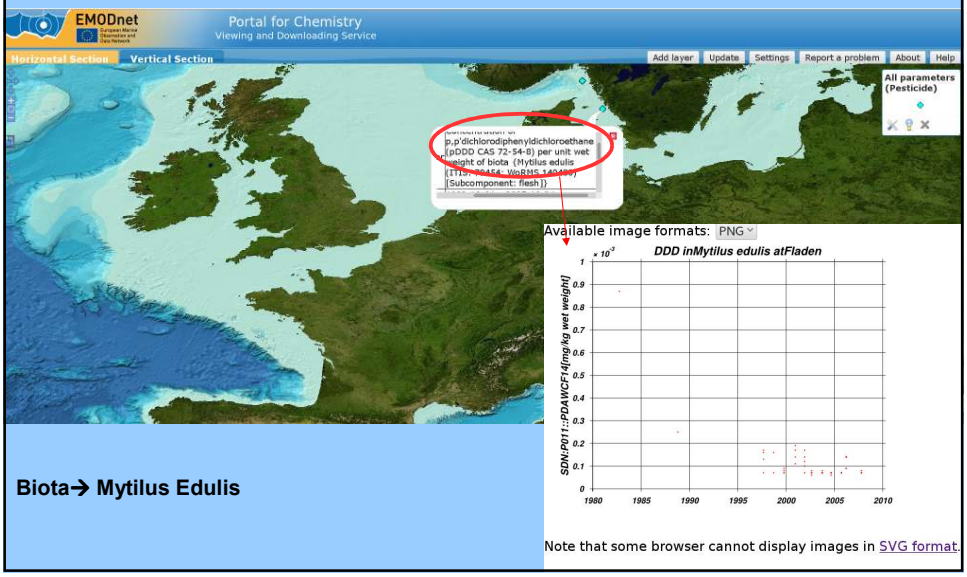


Time series plot of anthracene in Mytilus



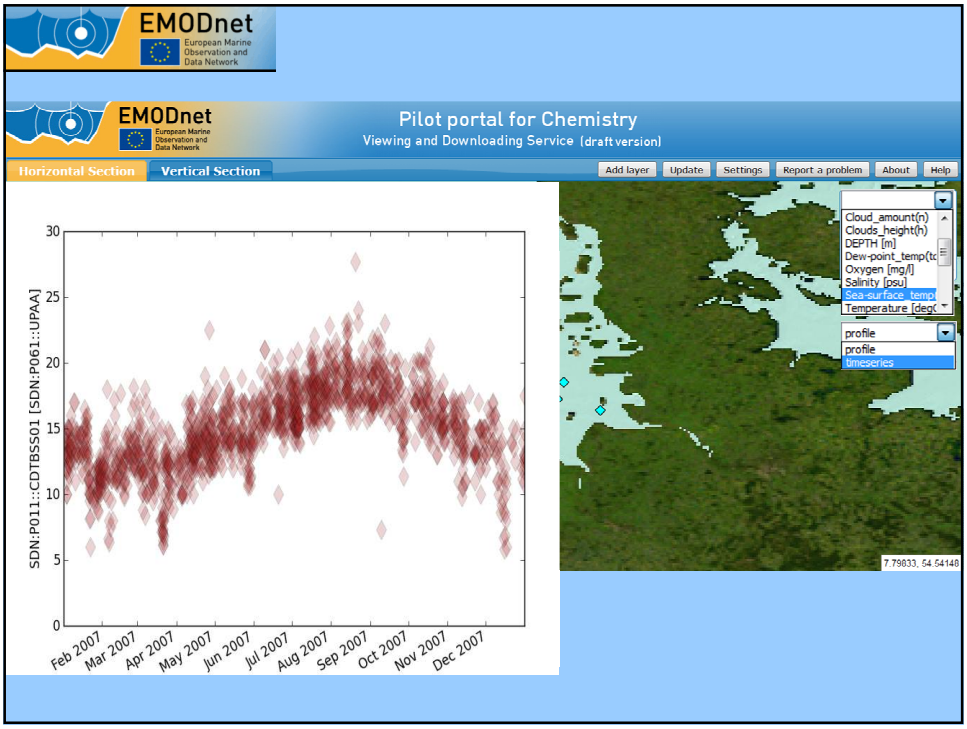
Biota→ Mytilus Galloprovincialis

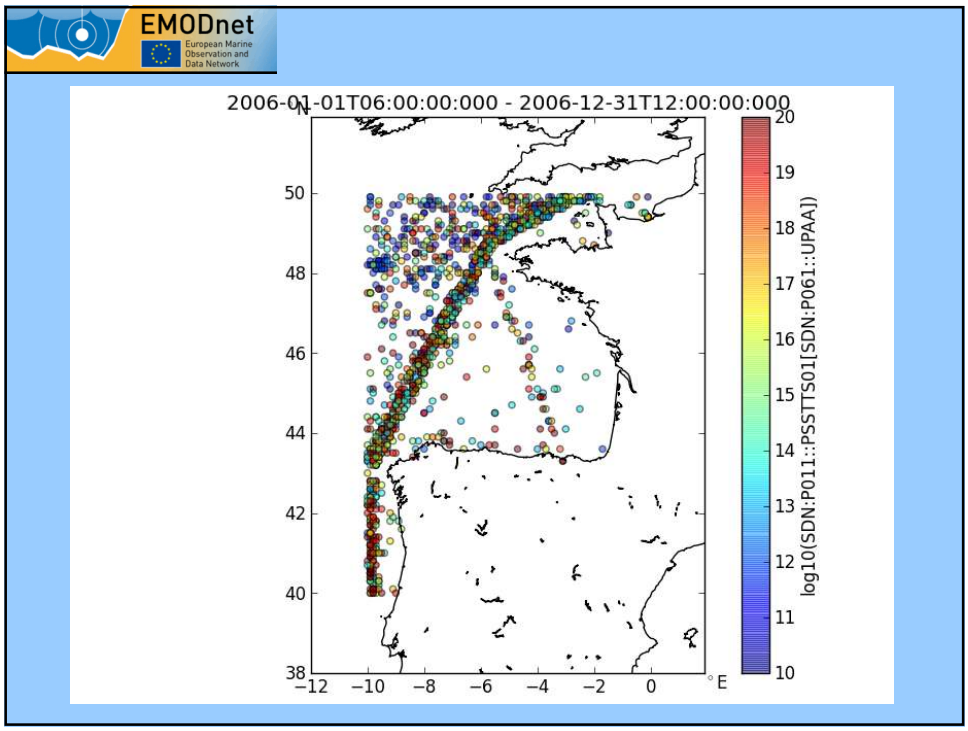
Time series plot of DDD in Mytilus



Biota→ Mytilus Edulis

Note that some browser cannot display images in SVG format.




EMODnet
European Marine Observation and Data Network
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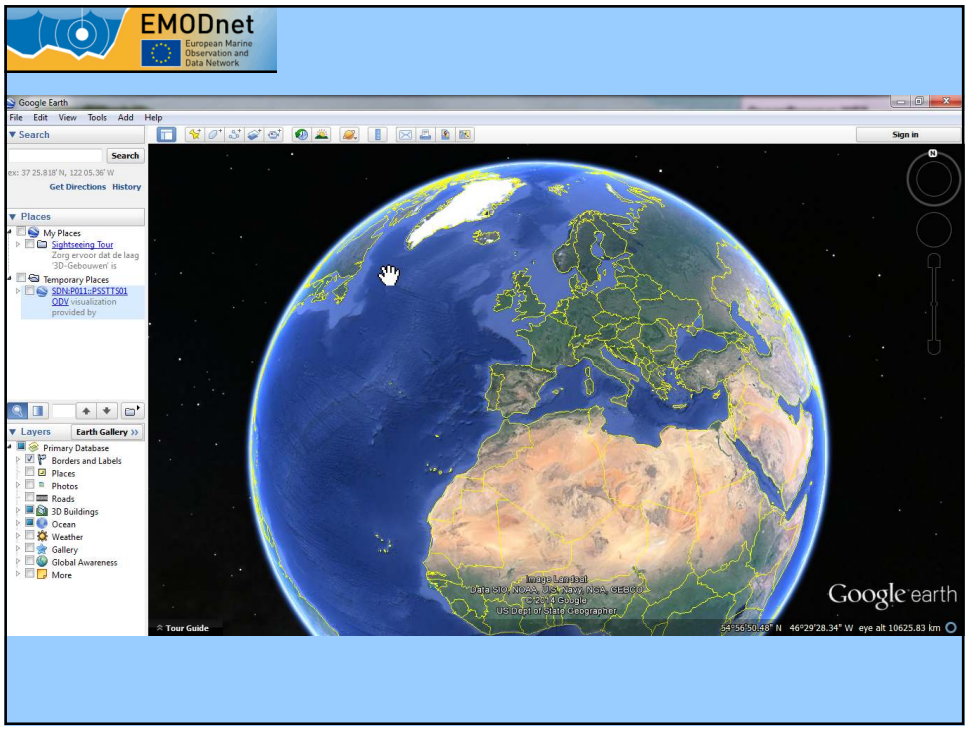
EMODnet
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Sightseeing Tour
Temporary Places
SDN:P011::PSSTTS01
ODV visualization
provided by
Layers
Earth Gallery
Primary Database
Borders and Labels
Places
Photos
Roads
3D Buildings
Ocean
Weather
Gallery
Global Awareness
More
Tour Guide
Google earth

Chemistry (2): contaminants (D8/9)

Response from EMODnet Chemistry:

With the available data, EMODnet contributes with **time series** from **sediment and biota matrix,** dynamic plots and distribution maps**.**

From originators is reported that **Water contaminants diluition is still an** issue for their measurement.

Perspectives from EMODnet Chemistry:

Define a **QA/QC procedure** with extended vocabularies and robust statistics

Depending on the data distribution, **local/coastal horizontal maps** of contaminants in the sediments

EMODnet contaminats are originated by **National Environmental Agencies** while additional information from **Health Care Agencies** may add value