



EMODnet Preparatory Actions Hydrographic and Seabed Mapping

**Service Contracts MARE/2008/03 S12.531515 and
MARE/2009/07 S12.563144**

**By
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Oostende - Belgium, 31st August 2011, ICAN-5 Workshop



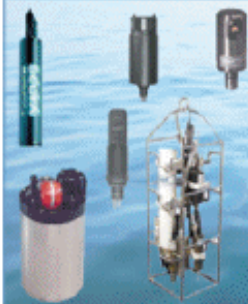
EMODnet

- EU has adopted a new Marine Strategy Framework Directive (MSFD) which includes an initiative for an overarching **European Marine Observation and Data Network** (EMODnet)
- EMODnet can be considered as a network of existing and developing European observation systems, linked by a data management structure covering all European coastal waters, shelf seas and surrounding ocean basins’.
- Part of the implementation trajectory is to undertake preparatory actions by establishing thematic portals.



Essential Components of an Observation Network

Sensors to measure continuously and autonomously physical, chemical and biological parameters



- salinity, temperature
- turbidity, oxygen
- chlorophyll, nutrients
- pH, alkalinity
- bathymetry
- primary production

Platforms or structures anchored on the seabed, floating in the water column or drifting at the sea surface, and remote sensing from satellites.



- buoys, floats
- gliders
- mooring
- AUVs, lander
- FerryBox
- cabled networks
- remote sensing
- living Argo

Sampling and consecutive laboratory analyses from research ships, or shore, including water, sediments and biota (phytoplankton, bacteria, zooplankton, fish)



- inorganic trace compounds
- gases, e.g. CO₂, CH₄, DMS
- organic micropollutants
- abundance & function of biota
- food web
- HABs

Communication systems to transfer in real-time data from sensors to the network and to the land stations



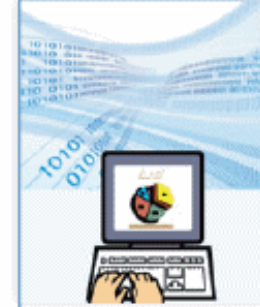
- satcom
- GSM, GPRS
- fibre optics
- acoustics

Data collection and management system for direct control of data quality, and data storage systems to enable data analysis and use for model applications



- data bases
- quality control
- data standards

Software and web based information tools to analyse data for trends, compliance to EU directives, to distribute and disseminate data to end users



- analysis
- Presentation
- web
- GIS

EMODnet preparatory actions



Establishing thematic portals.

Hydrography	North Sea	Celtic Seas, Channel, Mediterranean sea, Adriatic Sea, NW Atlantic
Geology	North Sea	Baltic and Celtic Seas
Biology	North Sea	Bay of Biscay and the Iberian Coast
Chemistry	North Sea	Black Sea + Med spots
Physics	North Sea	All other European seas
Habitats	North Sea	Baltic, Celtic Seas and the Western Mediterranean

SeaDataNet and EMODnet



- **SeaDataNet** is the leading network in Europe, actively operating and further developing a Pan-European infrastructure for managing, indexing and providing access to ocean and marine data sets and data products, acquired from research cruises and other observational activities in European marine waters and global oceans. It connects the National Oceanographic Data Centres (NODCs), and marine information services of major research institutes, from 35 coastal states bordering the European seas, and also includes IOC-IODE, ICES and EU-JRC in its network.
- SeaDataNet has qualified itself as leading infrastructure for the EMODnet data management component and is undertaking several preparatory EMODnet projects:
 - **Chemistry** – focus on the groups of chemicals required for monitoring the MSFD for establishing Good Environmental Status – cooperation with EEA, ICES and Regional Conventions
 - **Hydrography** – to produce and deliver a higher resolution digital bathymetry for European seas
 - **Physics** – together with MyOcean and EuroGOOS Regions to give wide access to operational metocean data, real-time and archives
- The **Geology** lot is producing harmonised seabed maps (WMS). The SeaDataNet infrastructure is adopted via the Geo-Seas project to give overview and access to the underlying geological and geophysical data sets.
- SeaDataNet is data partner in the **Biology** lot and a closer technical relation is foreseen in the SeaDataNet II project (2011-2015).

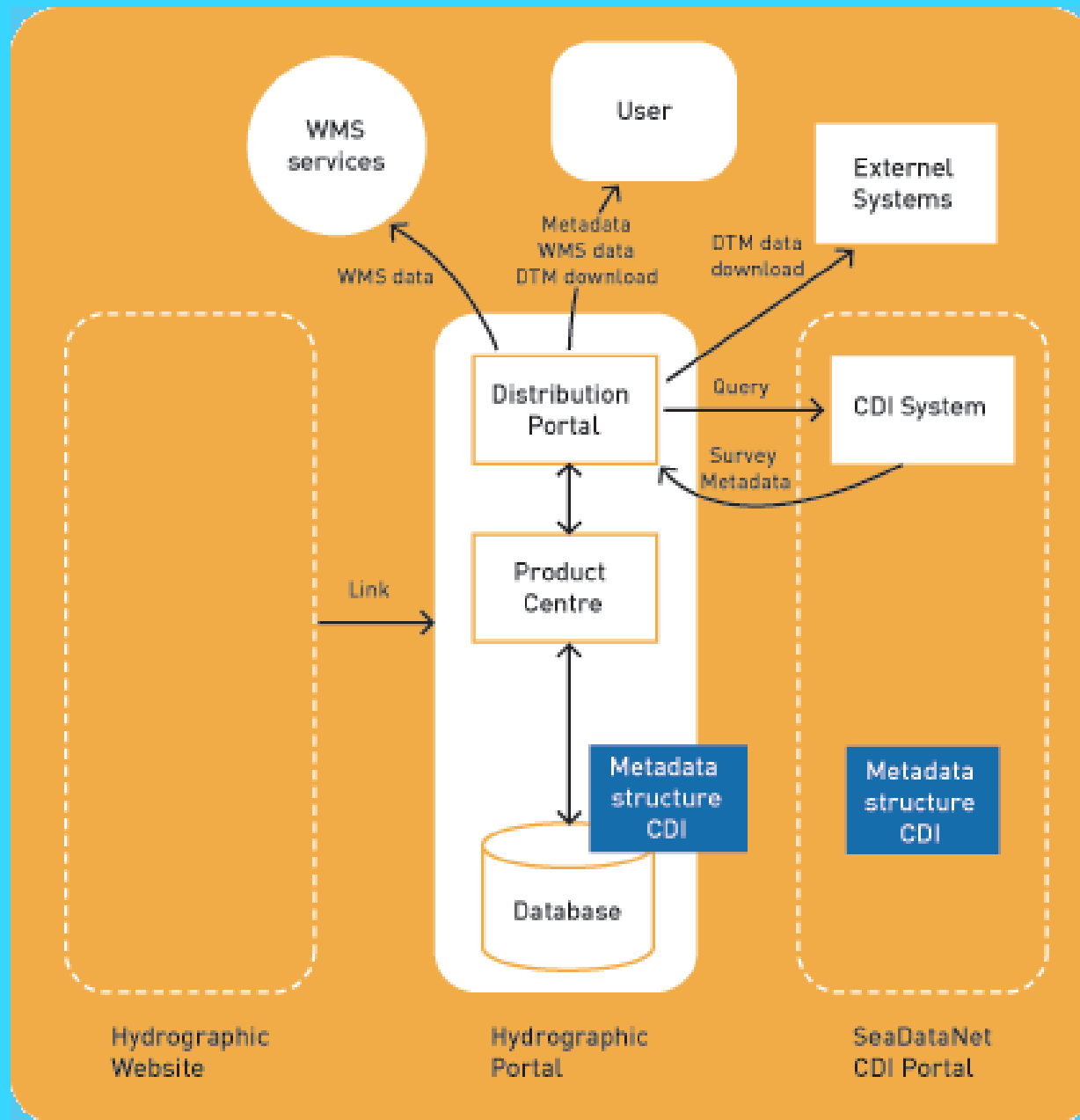
Hydrographic and Seabed Mapping – partnership

- Members of the **SeaDataNet** consortium together with other organisations from marine science, the hydrographic survey community, and industry:
 - **MARIS – NL** (Management, DM and IT expertise)
 - **IFREMER – FR** (Research institute)
 - **ATLIS – NL** (IT expertise, DM hydrography)
 - **IEO – ES** (Research institute)
 - **NERC-NOC – UK** (Research institute)
 - **GSI – IE** (HO – Ireland)
 - **SHOM – FR** (HO – France)
 - **UNEP-GRID Arendal – NO** (International Organisation)
 - **OGS – Oceanography department (IT)** (Research Institute)
 - **HCMR (GR)** (Research Institute)
- Plus Associate partners: **ISMAR-CNR –IT, OGS-RIMA – IT, LNEG – PT, UTM-CSIC – ES, NIOZ - NL** (Research Institutes) + **IHPT – PT** (HO)
- Plus Data provider agreements with **HO's from Germany, Norway, Denmark, Netherlands and Belgium**

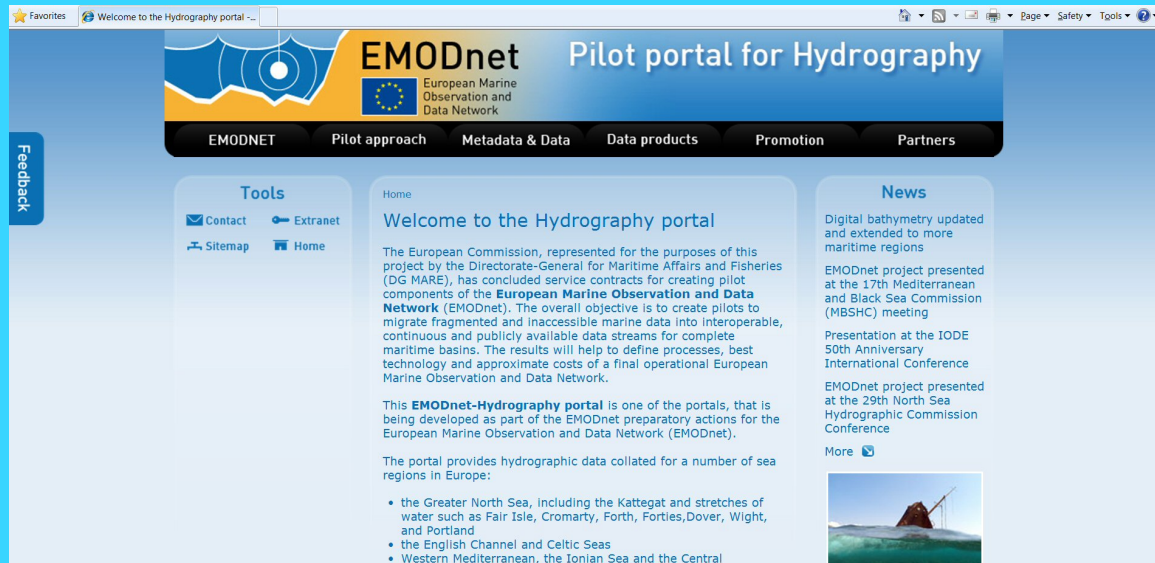
Hydrographic lot – approach

- The following approach has been implemented:
 - Involve research institutes, monitoring authorities, and HO's, in providing hydrographic data sets from which **Digital Terrain Models (DTM)** are produced with resolution of 0,25 * 0,25 minutes for each geographical region and that are loaded and integrated afterwards into a spatial database at the Portal
 - Outfit the spatial database as a **powerful and a high-end Hydrographic data products viewing and downloading service** that is complemented with WMS services (OGC) to serve users and to provide map layers for e.g. the other EMODnet portals, the prototype European Atlas of the Seas, and the broad-scale European Marine Habitats map;
 - Include in the portal a metadata discovery and access service by adopting the **SeaDataNet CDI data discovery and access service** that gives clear information about the hydrographic survey data used for the DTM, their access restrictions and distributors; this also ensures the connection of the Hydrographic portal with the SeaDataNet portal, which includes a shopping mechanism for requesting access to basic measurements data.

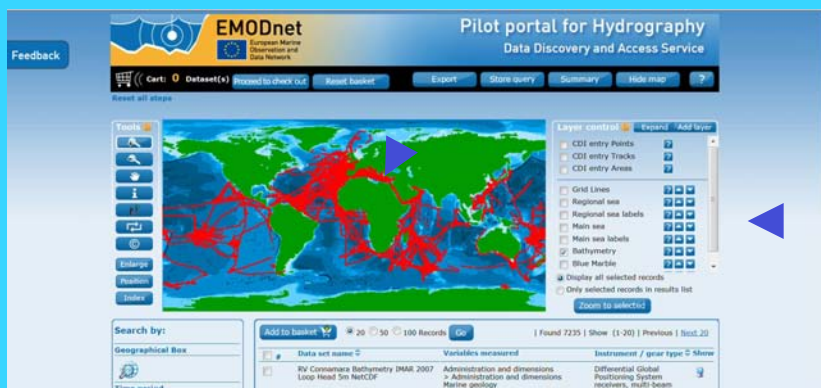
Hydrographic lot – system architecture



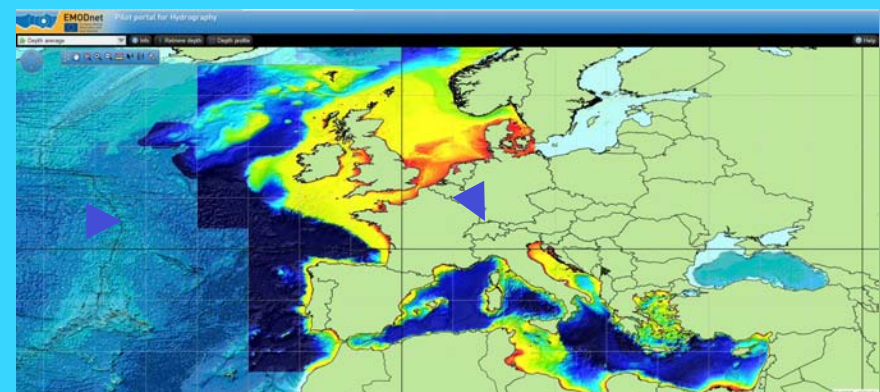
Hydrographic lot – resulting portal



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



CDI metadata service



Data products service

Hydrographic lot – Data access policy

- The CDI metadata in the EMODnet pilot are public domain and freely available for all users.
- The resulting DTM data products (GIS layers) are freely available for all users as OGC WMS service and for downloading in several formats.
- The access to background data sets as detailed in the data inventory and as used for the products respects the data copyrights of owners. The CDI metadata includes a value for data access restriction for every data set it manages as well as a clear indication of the distributor. The SeaDataNet CDI shopping mechanism is fit for dealing with different access restrictions.

Hydrographic lot - Geographical coverage

- The EMODnet Hydrography lot started in 2009 with a focus on:
 - the Greater North Sea, including the Kattegat and stretches of water such as Fair Isle, Cromarty, Forth, Forties, Dover, Wight, and Portland
 - the English Channel and Celtic Seas
 - Western Mediterranean, the Ionian Sea and the Central Mediterranean Sea
- The EMODnet Seabed mapping lot started in 2010 and extends coverage to:
 - Iberian Coast and Bay of Biscay (Atlantic Ocean)
 - Adriatic Sea (Mediterranean)
 - Aegean - Levantine Sea (Mediterranean).

Hydrographic lot - QA/QC and DTM specifications

- **QA/QC specifications** have been prepared. It specifies the DTM to be produced and the QA / QC methodology to be applied. The specifications are finalized in the "Guideline for methodology, metadata and QC standards V1", that can be downloaded from the website.
- Each DTM grid cell has the following parameters:
 - Depth average in meters to LAT
 - Depth Min/Max in meters to LAT
 - Number of depth values used for interpolation
 - Depth standard deviation (as percentage of the water depth)
 - Smoothed depth average in meters to LAT
 - Number of elementary surfaces used to compute the average cell depth
 - An indicator of the offsets between the average and smoothed depth (as a % of the depth)
 - Source of data:
 - Surveys: link to Common Data Index (CDI) metadata sheet of most prevailing survey in the cell
 - Composite DTM: link to DTM metadata sheet
 - GEBCO: reference to GEBCO version

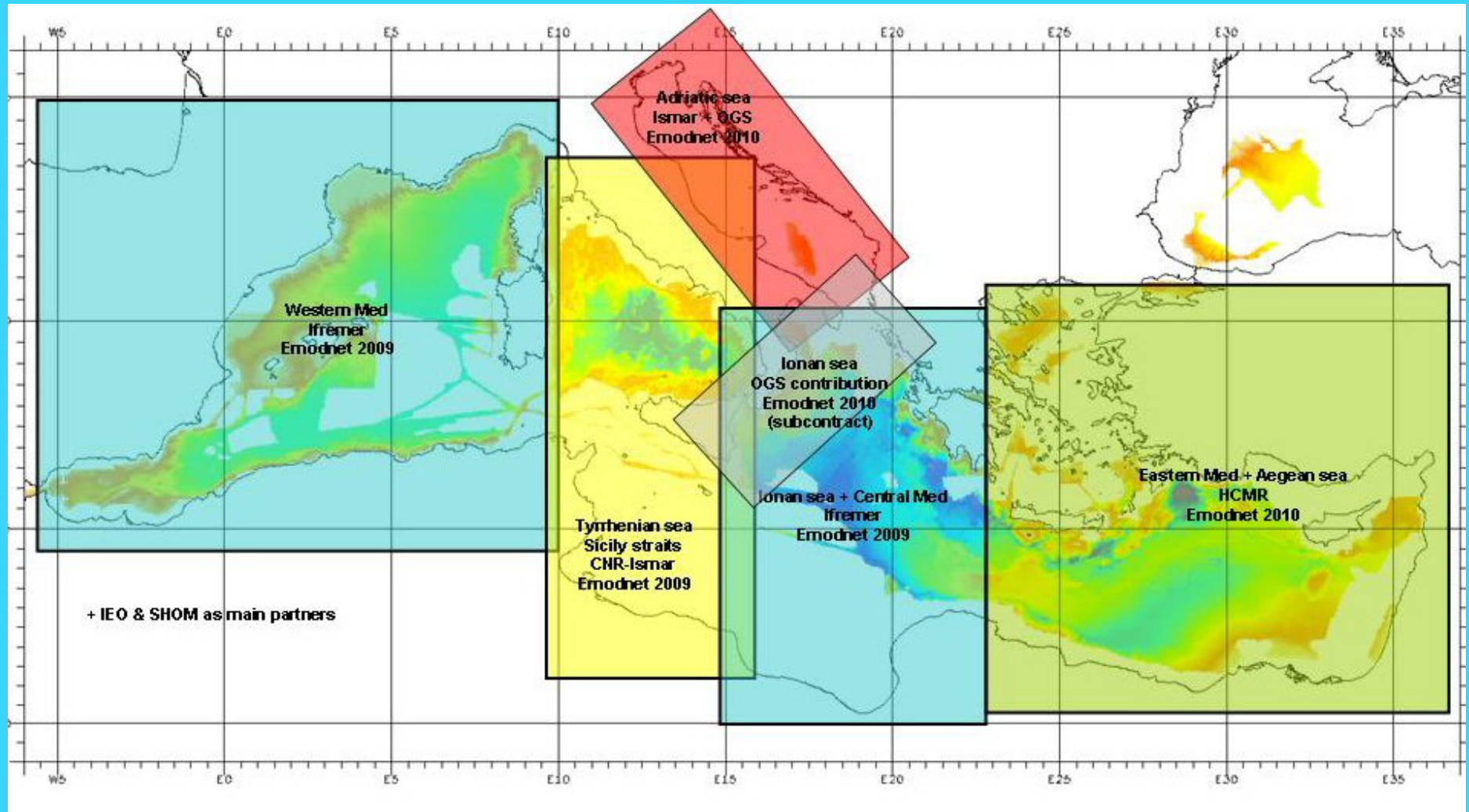
Hydrographic lot – Data gathering approach

- Various organisations are engaged in the acquisition and provision of hydrographic data and data products. These comprise:
 - **Hydrographic Offices**, that are responsible for surveying the navigation routes, fairways and harbour approach channels and producing from these the nautical charts on paper and as Electronic Nautical Charts (ENC), that are used for navigation.
 - **Authorities**, responsible for management and maintenance of harbours, coastal defences, shipping channels and waterways. These authorities operate or contract regular bathymetric monitoring surveys to assure that an agreed nautical depth is maintained or to secure the state of the coastal defences.
 - **Research institutes**, that collect multibeam surveys as part of their scientific cruises.
 - **Industry**, especially the energy industry, that contracts multibeam surveys for pipeline and cable routes (in case of windfarms) and the telecommunication industry for phone and internet cable routes.
- Cooperation is sought from these organisations for data sets (single and multibeam surveys, sounding tracks, composite products) to support a good geographical coverage and high quality.

Hydrographic lot – Data processing approach

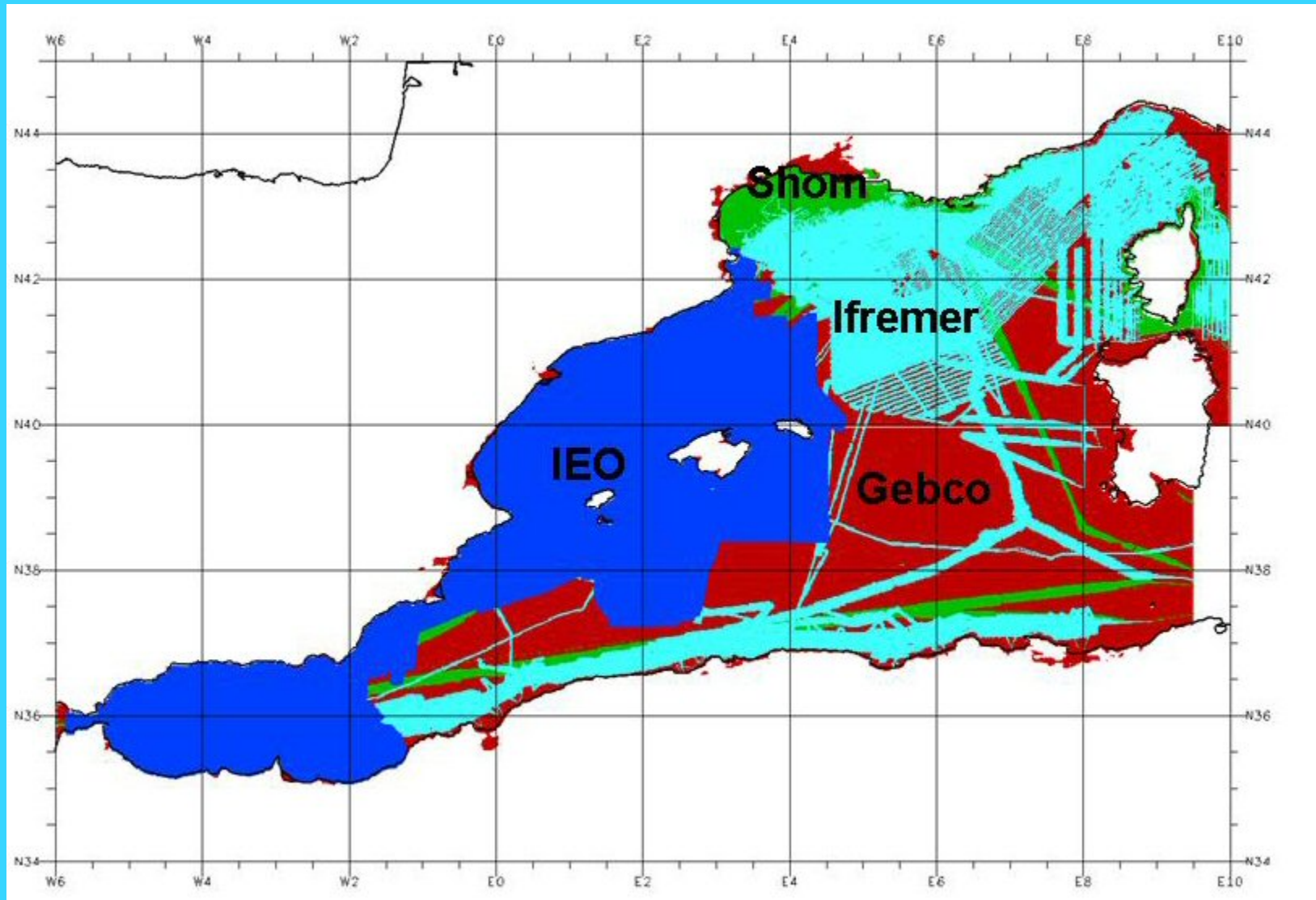
- The data sets are used internally for producing regional Digital Terrain Models (DTM).
- The DTMs are integrated into an overall DTM at the public portal for browsing and downloading
- The survey data sets themselves are not distributed but described in the CDI metadata, giving clear information about the background survey data used for the DTM, and facilitating requests by users to originators.
- The composite DTMs received from some Hydrographic Offices are also not distributed but described in a DTM metadata sheet, giving information about the background and originators of these products.

Hydrographic lot – Data processing coordination



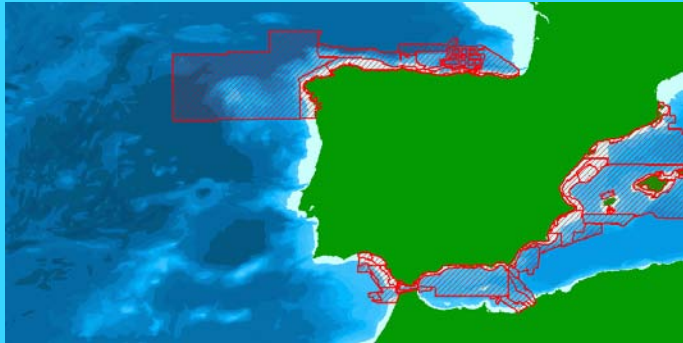
Example for the Mediterranean Sea

Hydrographic lot – Data contributing and coverage

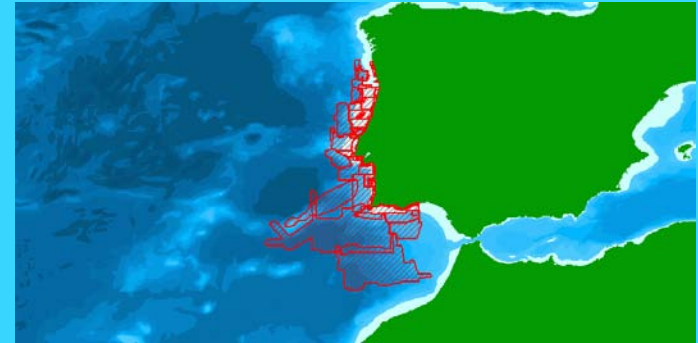


Example for the Western Mediterranean Sea

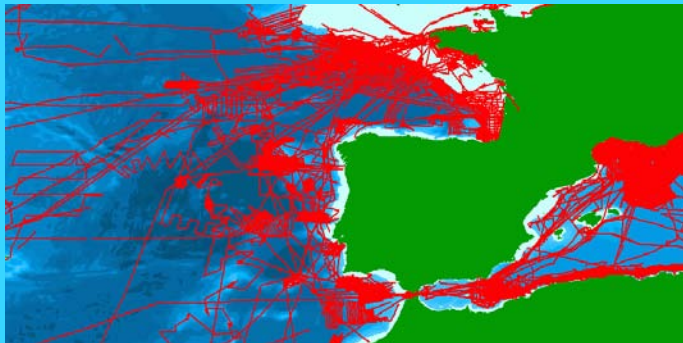
Data gathering – Iberian Coast and Bay of Biscay (Atlantic Ocean)



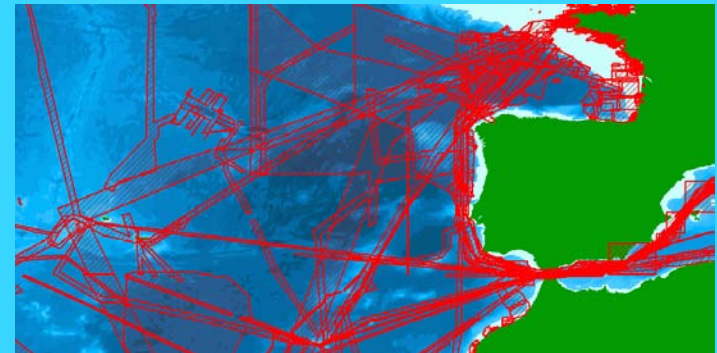
IEO data



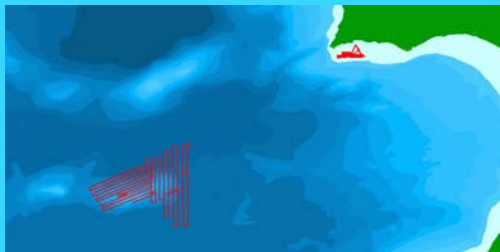
IHPT data



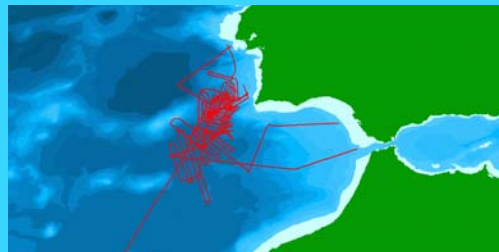
IFREMER data



SHOM data



CNR – ISMAR data



UTM-CSIC data



LNEG data

Data gathering – Mediterranean Sea



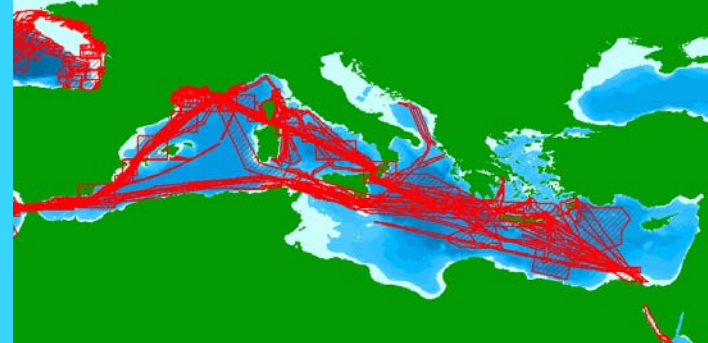
IEO data



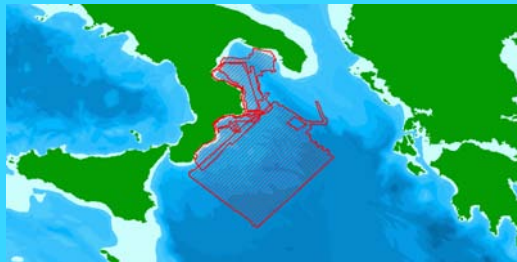
CNR-ISMAR data



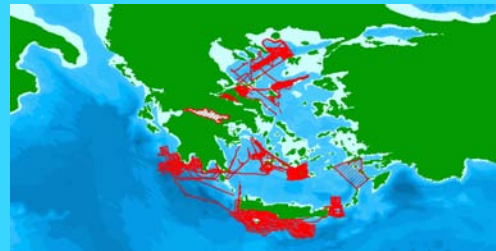
IFREMER data



SHOM data



OGS-RIMA data



HCMR data



OGS data

Progress after 24 months

- Data gathered for the 6 maritime regions as surveys, composite DTM's and if missing completed with GEBCO grid
- These have been compiled into multiple subDTM's applying the QA/QC methodology. Also an intercalibration exercise has taken place between DTM responsible partners for harmonisation.
- Partners have made very good progress with preparing and submitting CDI metadata for the surveys they have compiled
- Gathering additional metadata for composite DTM's of HO's and making these available as factsheets is ongoing

Progress after 24 months

- Up till today, 7235 survey CDI metadata records from 13 data centres and 114 data originators have been collated and imported into a dedicated EMODnet Hydrography CDI data discovery and access service. This service was launched in May 2010 and has been upgraded over time with extra functionality
- The regional DTM's have been imported into the central DTM, the GSHHS coastline and a sample collection of wrecks (North Sea)
- The dedicated EMODnet Hydrography products portal has been launched in May 2010. It sits atop of the central DTM database and interacts with the CDI service and with OGC WMS services
- The Hydrography portal has considerably been upgraded and relaunched in June 2011 in response to feedback and comments received.

Portal

The screenshot shows a web browser window displaying the EMODnet Pilot portal for Hydrography. The browser's address bar shows the URL "Welcome to the Hydrography portal -...". The website header features the EMODnet logo, which includes a stylized blue and yellow wave graphic and the text "EMODnet European Marine Observation and Data Network". To the right of the logo, the text "Pilot portal for Hydrography" is displayed. Below the header is a navigation menu with the following items: "EMODNET", "Pilot approach", "Metadata & Data", "Data products", "Promotion", and "Partners". On the left side of the page, there is a vertical "Feedback" button. The main content area is divided into three columns. The left column, titled "Tools", contains links for "Contact", "Extranet", "Sitemap", and "Home". The middle column, titled "Home", contains a "Welcome to the Hydrography portal" section. This section includes a paragraph explaining that the European Commission, represented by the Directorate-General for Maritime Affairs and Fisheries (DG MARE), has concluded service contracts for creating pilot components of the European Marine Observation and Data Network (EMODnet). It states that the overall objective is to create pilots to migrate fragmented and inaccessible marine data into interoperable, continuous, and publicly available data streams for complete maritime basins. Below this paragraph, it mentions that the EMODnet-Hydrography portal is one of the portals being developed as part of the EMODnet preparatory actions for the European Marine Observation and Data Network (EMODnet). The section also states that the portal provides hydrographic data collated for a number of sea regions in Europe and lists three regions: the Greater North Sea (including the Kattegat and stretches of water such as Fair Isle, Cromarty, Forth, Forties, Dover, Wight, and Portland), the English Channel and Celtic Seas, and the Western Mediterranean, the Ionian Sea, and the Central. The right column, titled "News", contains two news items. The first item is "Digital bathymetry updated and extended to more maritime regions". The second item is "EMODnet project presented at the 17th Mediterranean and Black Sea Commission (MBSHC) meeting". Below these items, there are two more news items: "Presentation at the IODE 50th Anniversary International Conference" and "EMODnet project presented at the 29th North Sea Hydrographic Commission Conference". A "More" link with a blue arrow icon is located below the second news item. At the bottom of the news section, there is a small image of a red boat on the water.

EMODnet Pilot portal for Hydrography

EMODNET Pilot approach Metadata & Data Data products Promotion Partners

Tools

- Contact
- Extranet
- Sitemap
- Home

Home

Welcome to the Hydrography portal

The European Commission, represented for the purposes of this project by the Directorate-General for Maritime Affairs and Fisheries (DG MARE), has concluded service contracts for creating pilot components of the **European Marine Observation and Data Network (EMODnet)**. The overall objective is to create pilots to migrate fragmented and inaccessible marine data into interoperable, continuous and publicly available data streams for complete maritime basins. The results will help to define processes, best technology and approximate costs of a final operational European Marine Observation and Data Network.

This **EMODnet-Hydrography portal** is one of the portals, that is being developed as part of the EMODnet preparatory actions for the European Marine Observation and Data Network (EMODnet).

The portal provides hydrographic data collated for a number of sea regions in Europe:

- the Greater North Sea, including the Kattegat and stretches of water such as Fair Isle, Cromarty, Forth, Forties, Dover, Wight, and Portland
- the English Channel and Celtic Seas
- Western Mediterranean, the Ionian Sea and the Central

News

Digital bathymetry updated and extended to more maritime regions

EMODnet project presented at the 17th Mediterranean and Black Sea Commission (MBSHC) meeting


Presentation at the IODE 50th Anniversary International Conference

EMODnet project presented at the 29th North Sea Hydrographic Commission Conference

More

www.emodnet-hydrography.eu

CDI Data Discovery and Access Service



EMODnet
European Marine
Observation and
Data Network

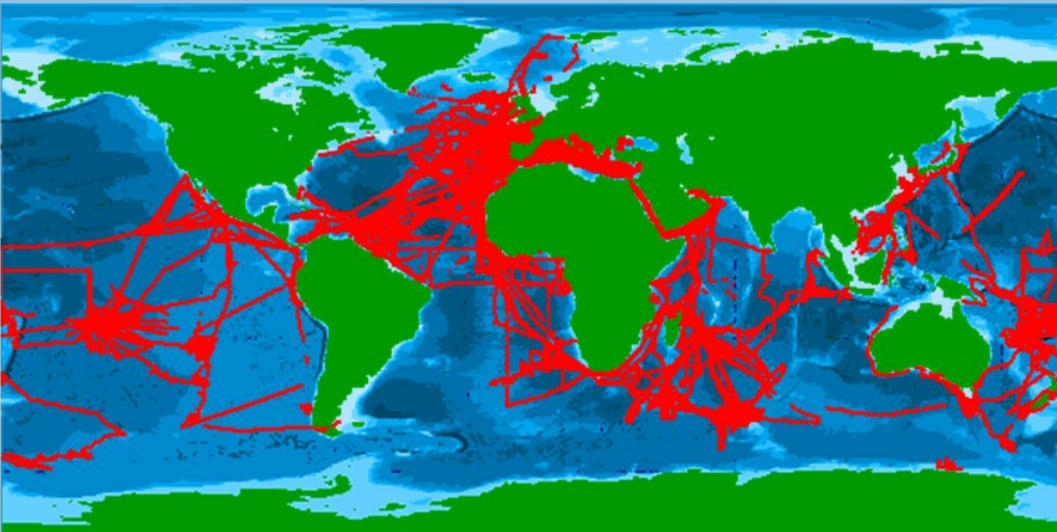
Pilot portal for Hydrography
Data Discovery and Access Service

Cart: 0 Dataset(s) [Proceed to check out](#) [Reset basket](#) [Export](#) [Store query](#) [Summary](#) [Hide map](#) [?](#)

[Reset all steps](#)

Tools ?

- [+](#)
- [-](#)
- [Hand](#)
- [i](#)
- [PP](#)
- [↺](#)
- [©](#)
- [Enlarge](#)
- [Position](#)
- [Index](#)



Layer control ? [Expand](#) [Add layer](#)


- CDI entry Points ?
- CDI entry Tracks ?
- CDI entry Areas ?
- Grid Lines ? ▲ ▼
- Regional sea ? ▲ ▼
- Regional sea labels ? ▲ ▼
- Main sea ? ▲ ▼
- Main sea labels ? ▲ ▼
- Bathymetry ? ▲ ▼
- Blue Marble ? ▲ ▼

Display all selected records
 Only selected records in results list


[Zoom to selected](#)

Search by:


Geographical Box



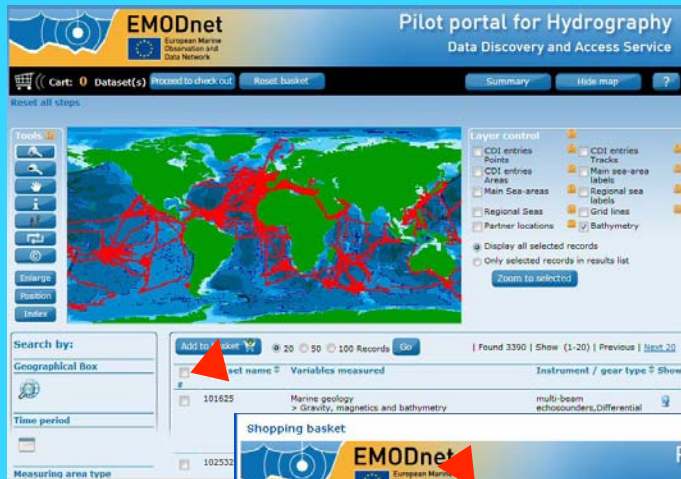
Time period

[Add to basket](#)  20 50 100 Records [Go](#)

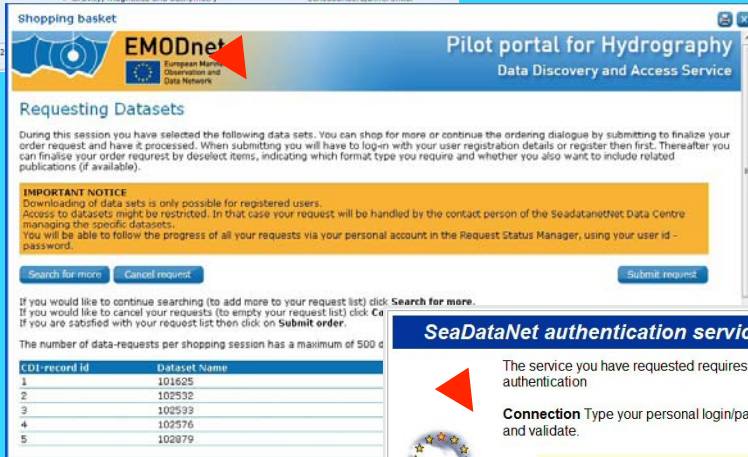
| Found 7235 | [Show \(1-20\)](#) | [Previous](#) | [Next 20](#)

	#	Data set name	Variables measured	Instrument / gear type	Show
<input type="checkbox"/>		RV Connamara Bathymetry IMAR 2007 Loop Head 5m NetCDF	Administration and dimensions > Administration and dimensions Marine geology > Gravity, magnetics and bathymetry	Differential Global Positioning System receivers, multi-beam echosounders	

CDI Shopping mechanism to request downloading



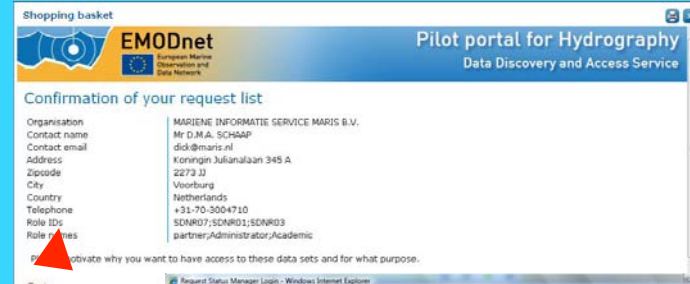
Search Results Include in Basket



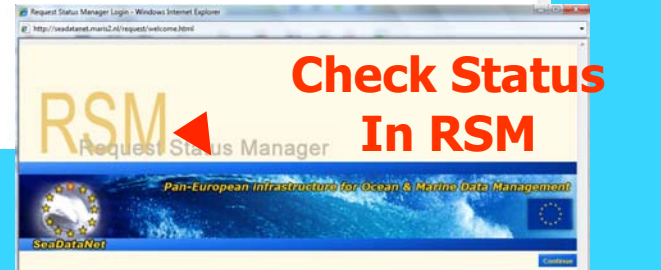
Shopping list



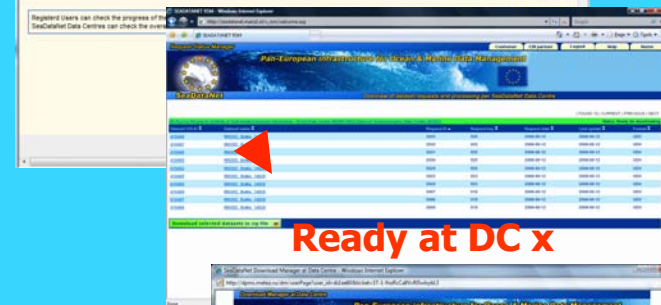
Submit + Authentication



Request Confirmed



Check Status In RSM



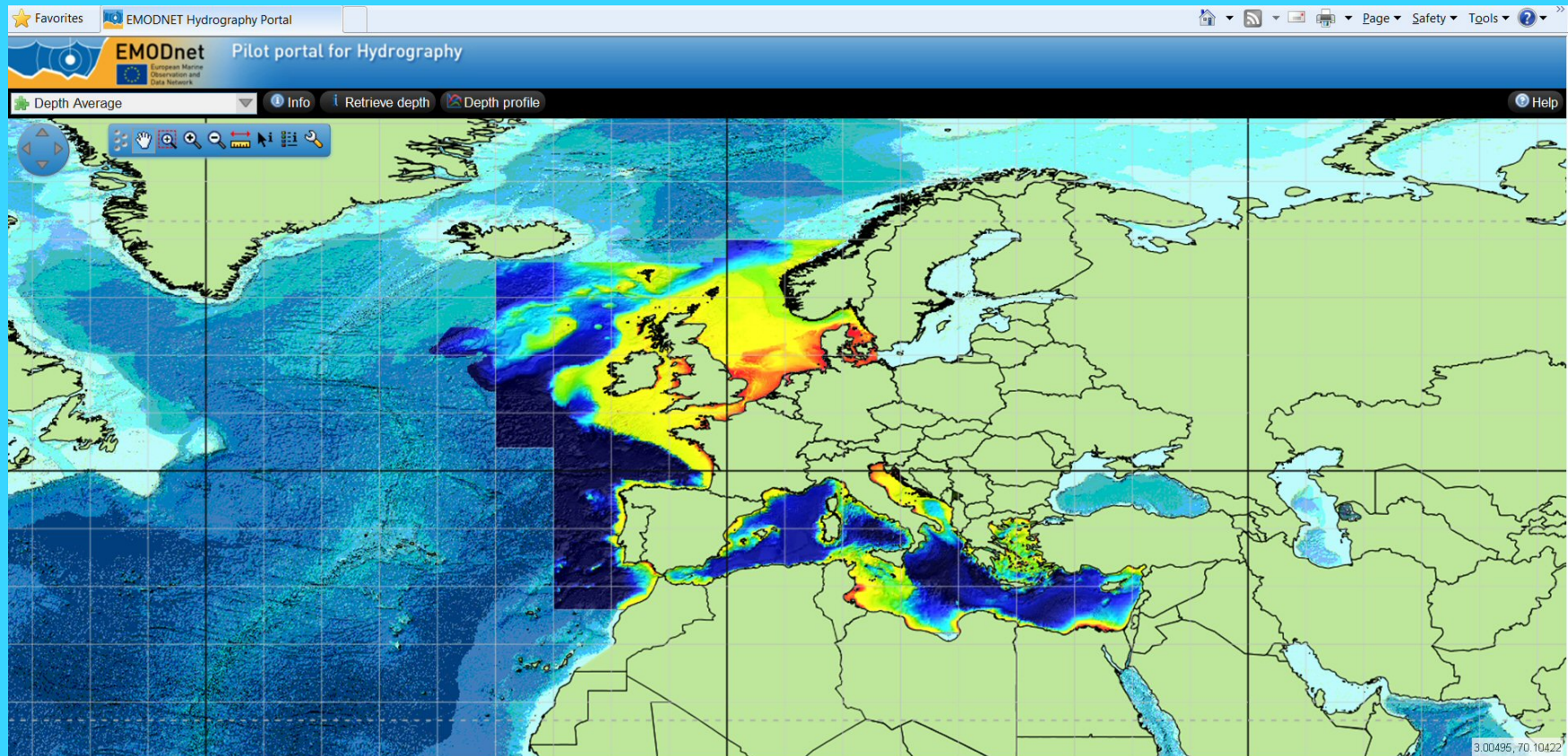
Ready at DC x



Data

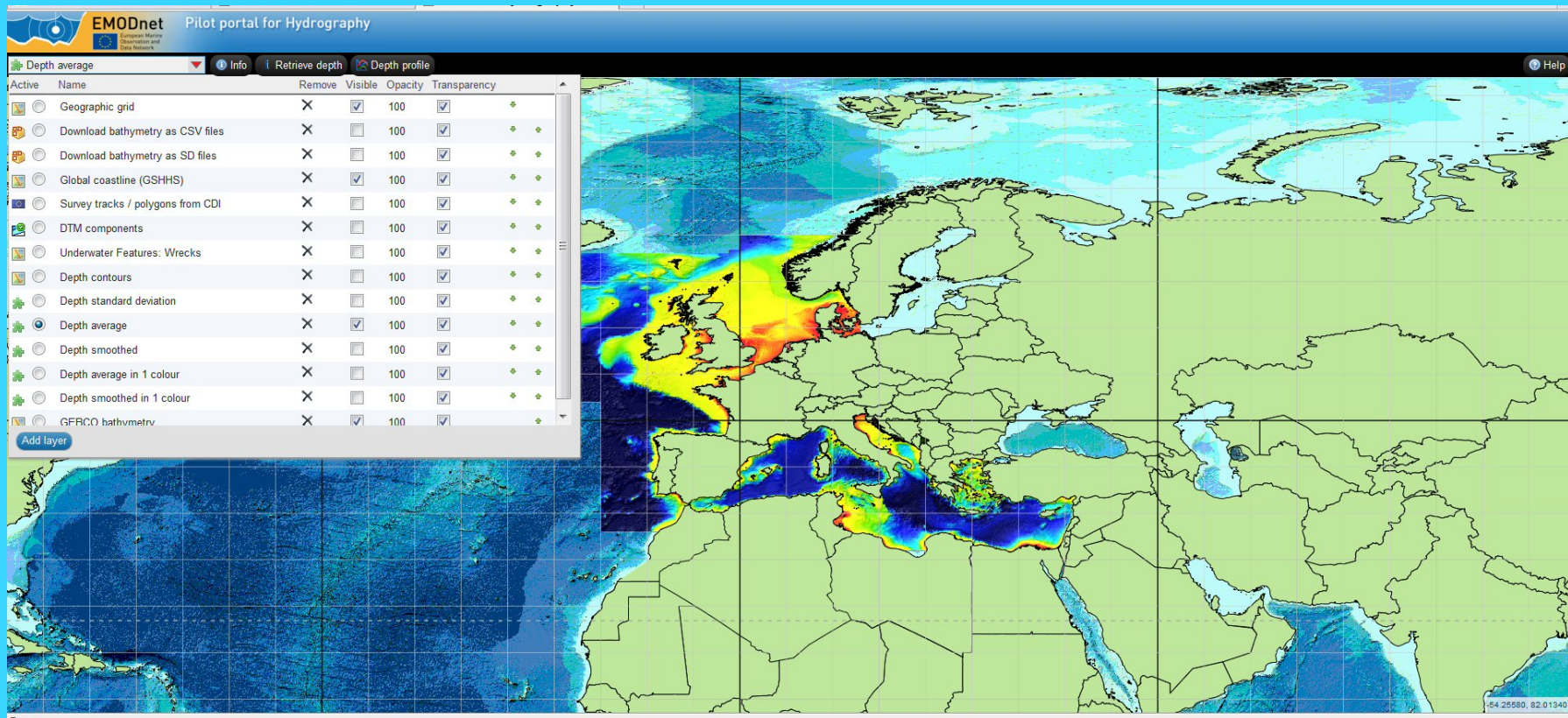
SDN format

Hydrographic Data Products viewing service



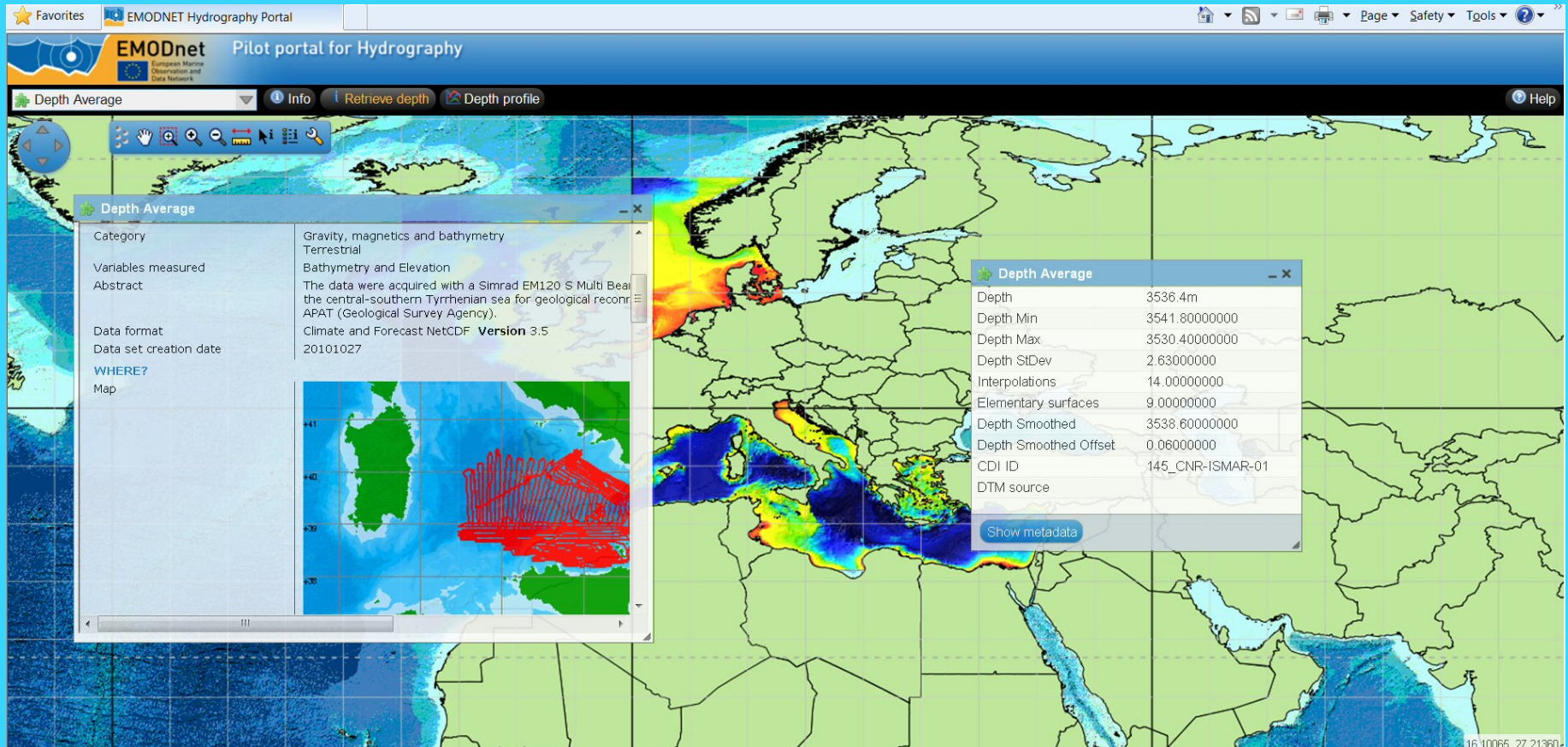
- *Start page of the upgraded Data Products Viewing Service with GIS layers of digital bathymetry and other information*

Hydrographic Data Products viewing service



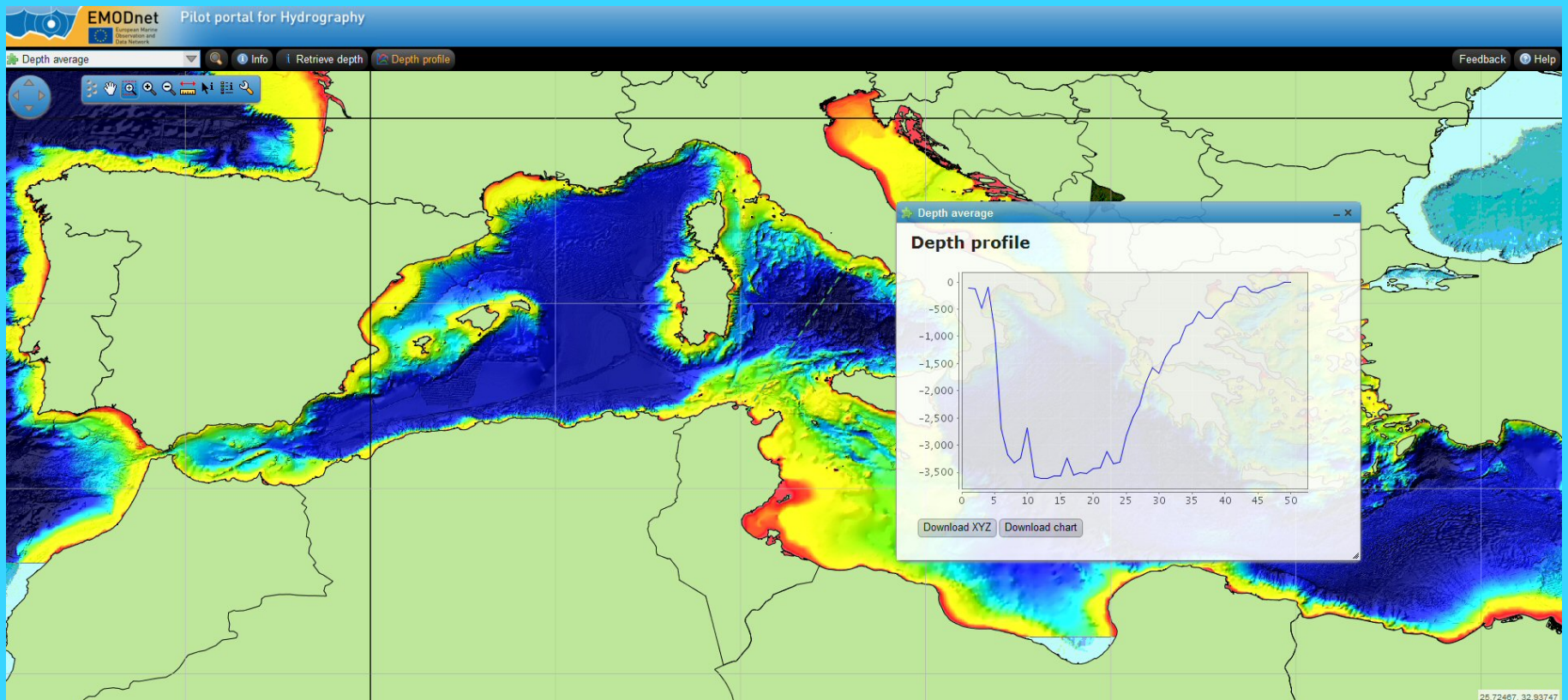
■ *Pull down menu with GIS layers and options for viewing and requesting extra information*

Hydrographic Data Products viewing service



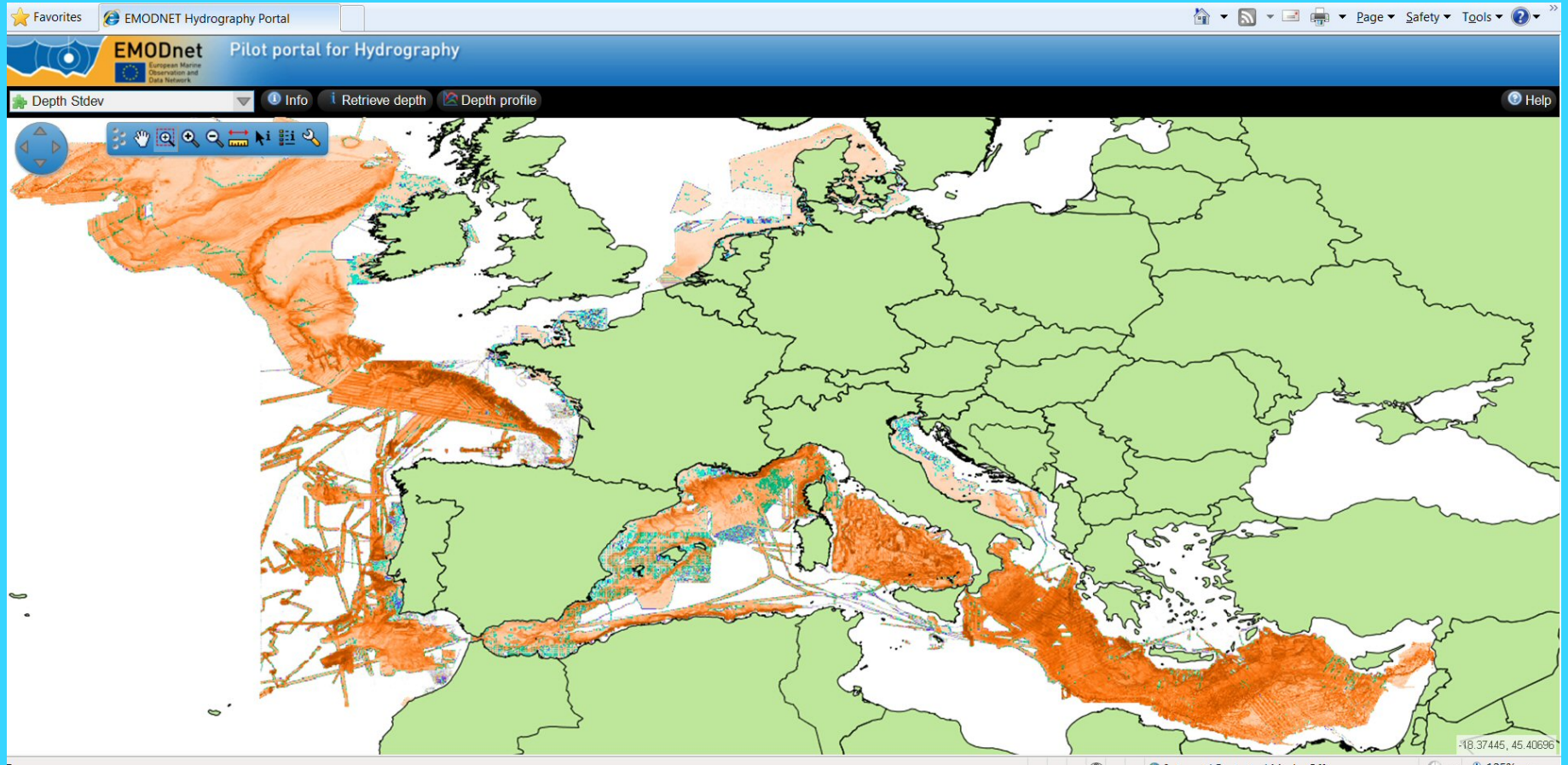
- *Retrieving parameters of an individual grid cell and retrieving CDI metadata of associated prevailing survey*

Hydrographic Data Products viewing service



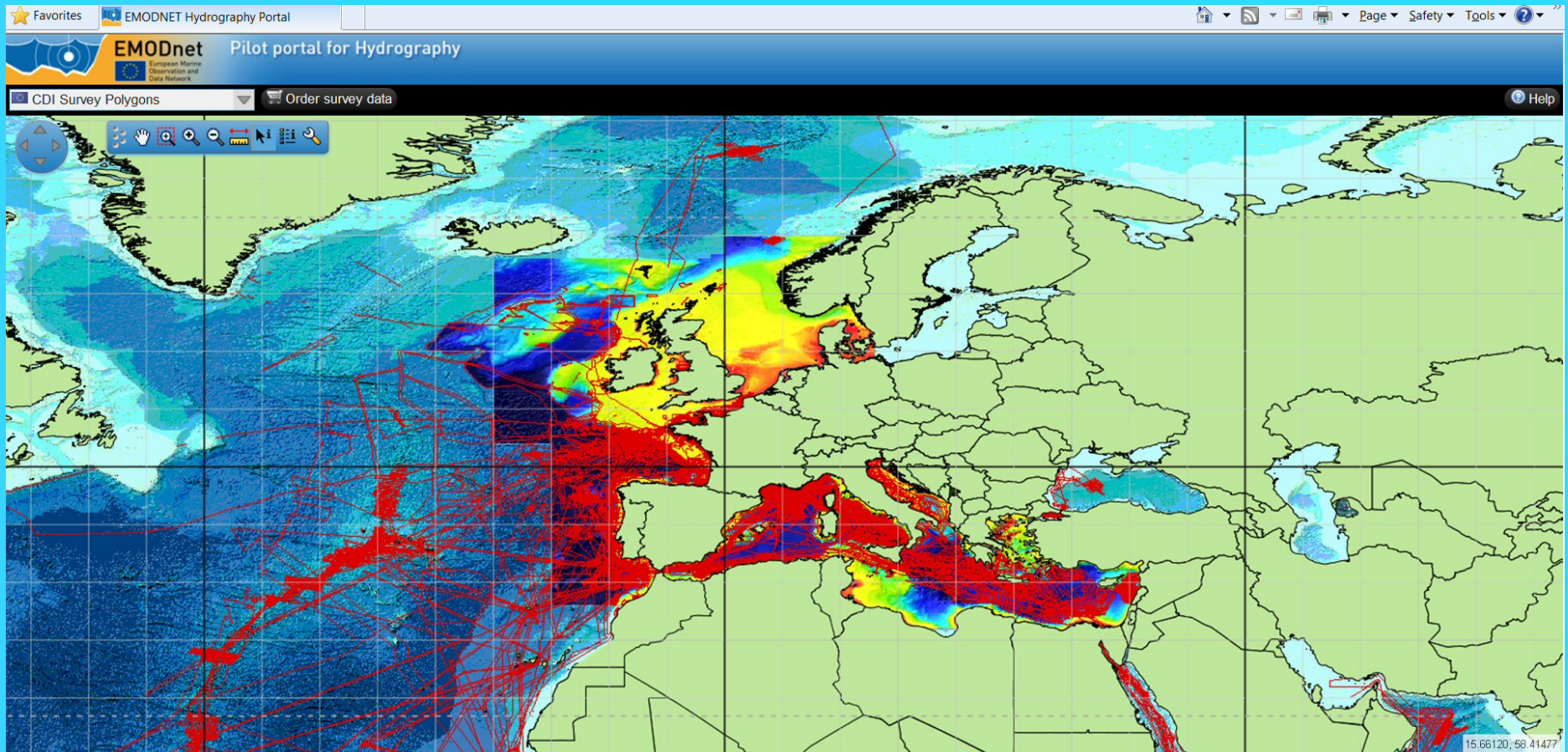
- *Retrieving depth profile along a user defined transect*

Hydrographic Data Products viewing service



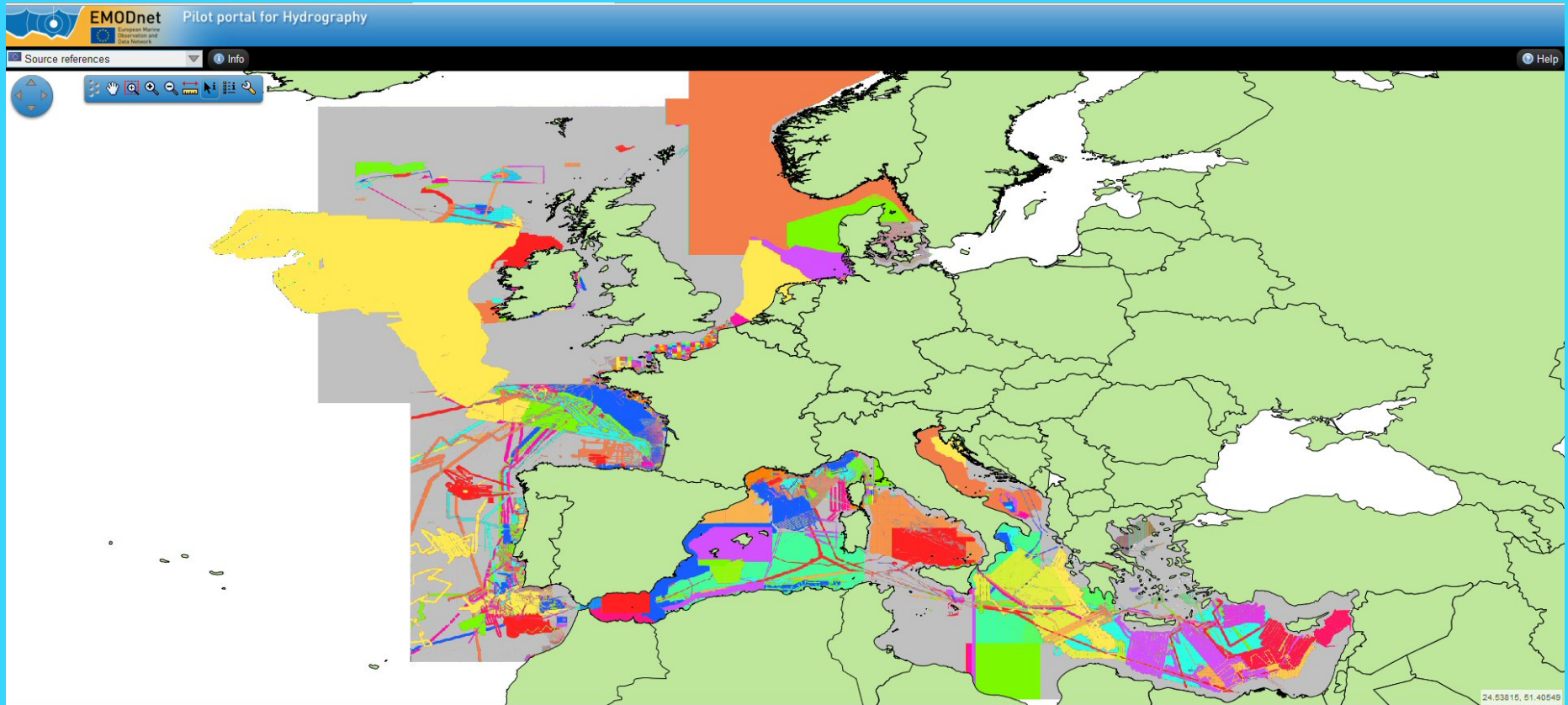
- *Depth standard deviation layer, also giving good insight in where surveys and composite DTMs (if provided with St Dev) have been used to cover the area.*

Hydrographic Data Products viewing service



- *CDI survey tracks and polygons layer, provided as OGC WMS service by the CDI service, and facility for polygon search with direct switch to the CDI service*

Hydrographic Data Products viewing service



- *Sources reference layer, indicating which source data (surveys or composite DTMs) were used as prevailing for DTM grid cells. Including identification of related source and associated metadata.*

Hydrographic Data Products viewing service

The screenshot displays the EMODnet Pilot portal for Hydrography. The main interface features a map of the North Atlantic region with a source reference layer overlaid, showing various colored polygons and lines representing different data sources. A detailed metadata window is open, providing information for a specific data set.

Source references

WHAT?

Data set name: INFOMAR INSS Bathymetry 100m WGS 84 projection Zone 3 NetCDF
Discipline: Administration and dimensions
Marine geology
Terrestrial

Category: Administration and dimensions
Gravity, magnetics and bathymetry
Terrestrial

Variables measured: Bathymetry and Elevation
Date and time

Abstract: The scientific aims of the survey were to (i) undertake a hydrographic survey to International Hydrographic Organisation (IHO) Order 1a standard, (ii) acquire sub bottom profiler and magnetometer data to investigate the sub seabed geology, and (iii) undertake marine mammal observations while adhering to National Parks and Wildlife guideline procedures for operation of acoustic equipment.

Data format: Climate and Forecast NetCDF **Version 3.5**
Data size: 685
Data set creation date: 20101207

WHERE?

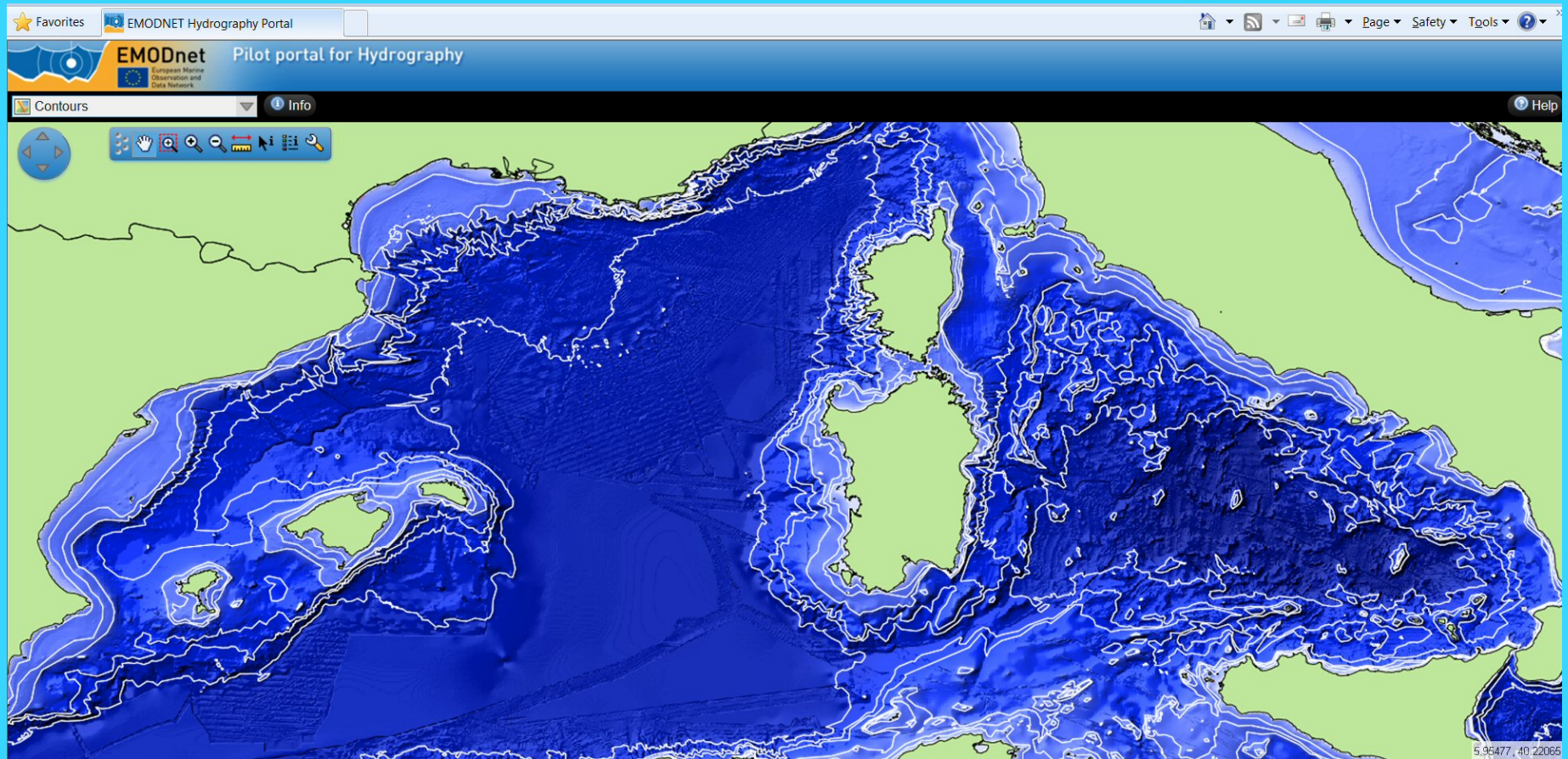
Map:

GML id: ms01

3.44440_01_96237

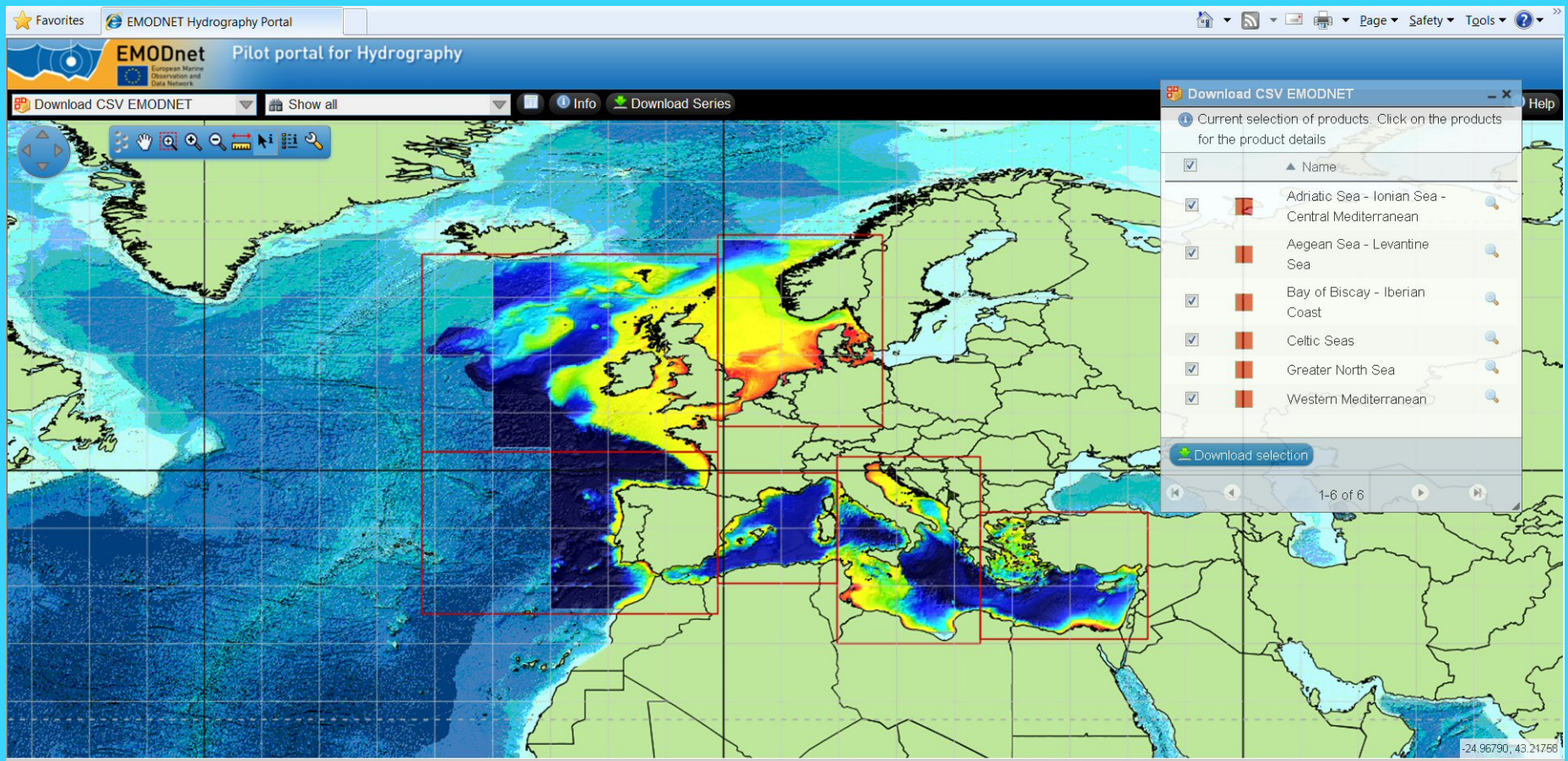
- Sources reference layer, indicating which source data (surveys or composite DTMs) were used as prevailing for DTM grid cells. Including identification of related source and associated metadata.

Hydrographic Data Products viewing service



■ *Contours*

Hydrographic Data Products viewing service



- *Downloading DTM grid as tiles in various formats (for now CSV and Fledermaus SD formats; underway are ESRI ASCII, NetCDF (CF) and Geotiff)*

Hydrographic Data Products viewing service

The screenshot displays the EMODnet Hydrography Portal interface. The main map shows bathymetric data of the Mediterranean Sea and surrounding regions. A red rectangular box highlights a specific data tile. Two windows are open over the map:

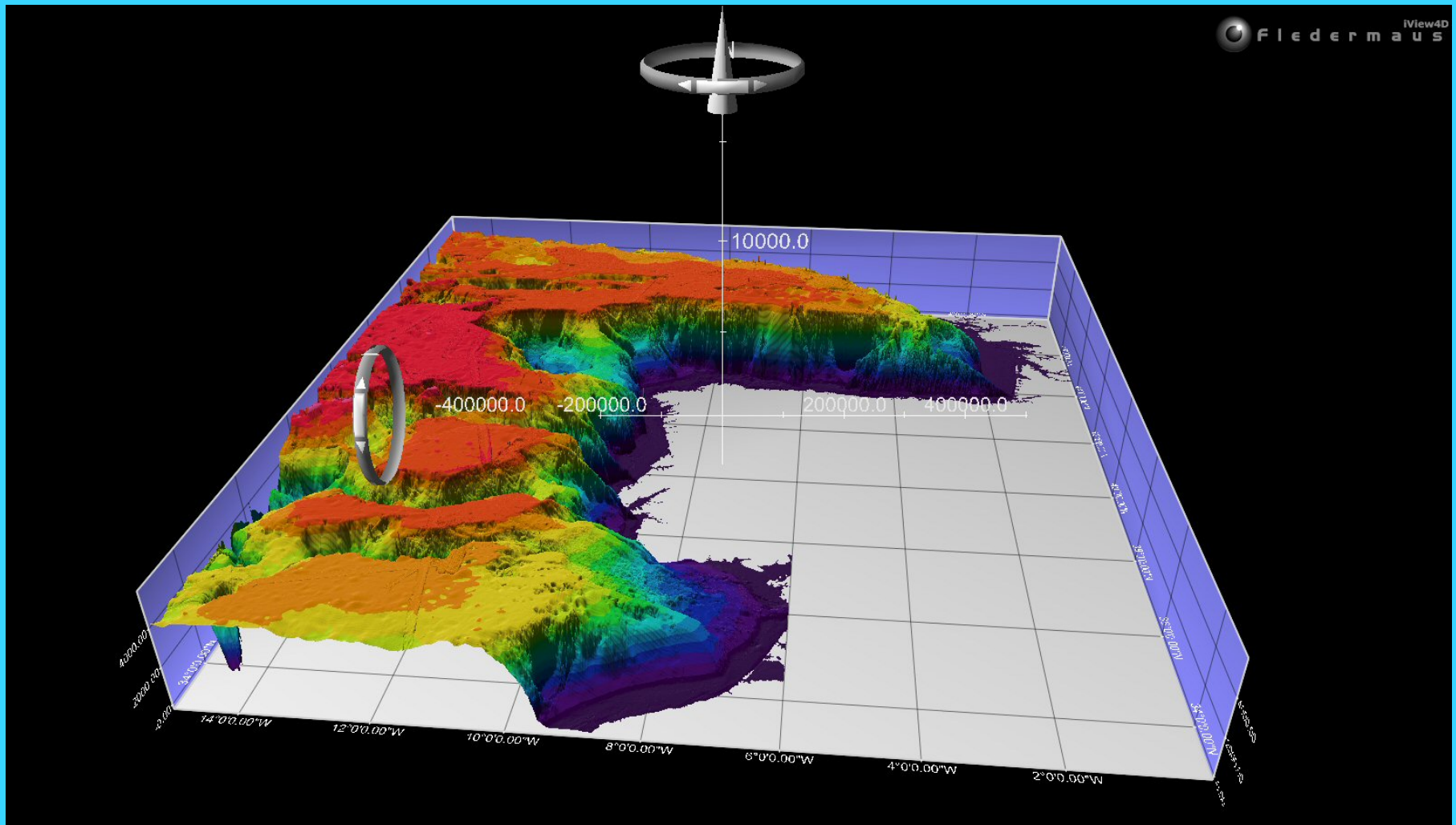
- Product Meta Data window:** Displays details for the selected tile.

Product Meta Data	
▼ Identification	
Name	Adriatic Sea - Ionian Sea - Central Mediterranean
Description	Adriatic Sea - Ionian Sea - Central Mediterranean
ProductSerie	EMODNET csv
Auto publish edition	false
Published	true
Valid	false
Active	true
- Download CSV EMODNET window:** Lists available products for download.

Download CSV EMODNET	
Current selection of products. Click on the products for the product details	
<input checked="" type="checkbox"/>	▲ Name
<input checked="" type="checkbox"/>	Adriatic Sea - Ionian Sea - Central Mediterranean
<input checked="" type="checkbox"/>	Aegean Sea - Levantine Sea
<input checked="" type="checkbox"/>	Bay of Biscay - Iberian Coast
<input checked="" type="checkbox"/>	Celtic Seas
<input checked="" type="checkbox"/>	Greater North Sea
<input checked="" type="checkbox"/>	Western Mediterranean

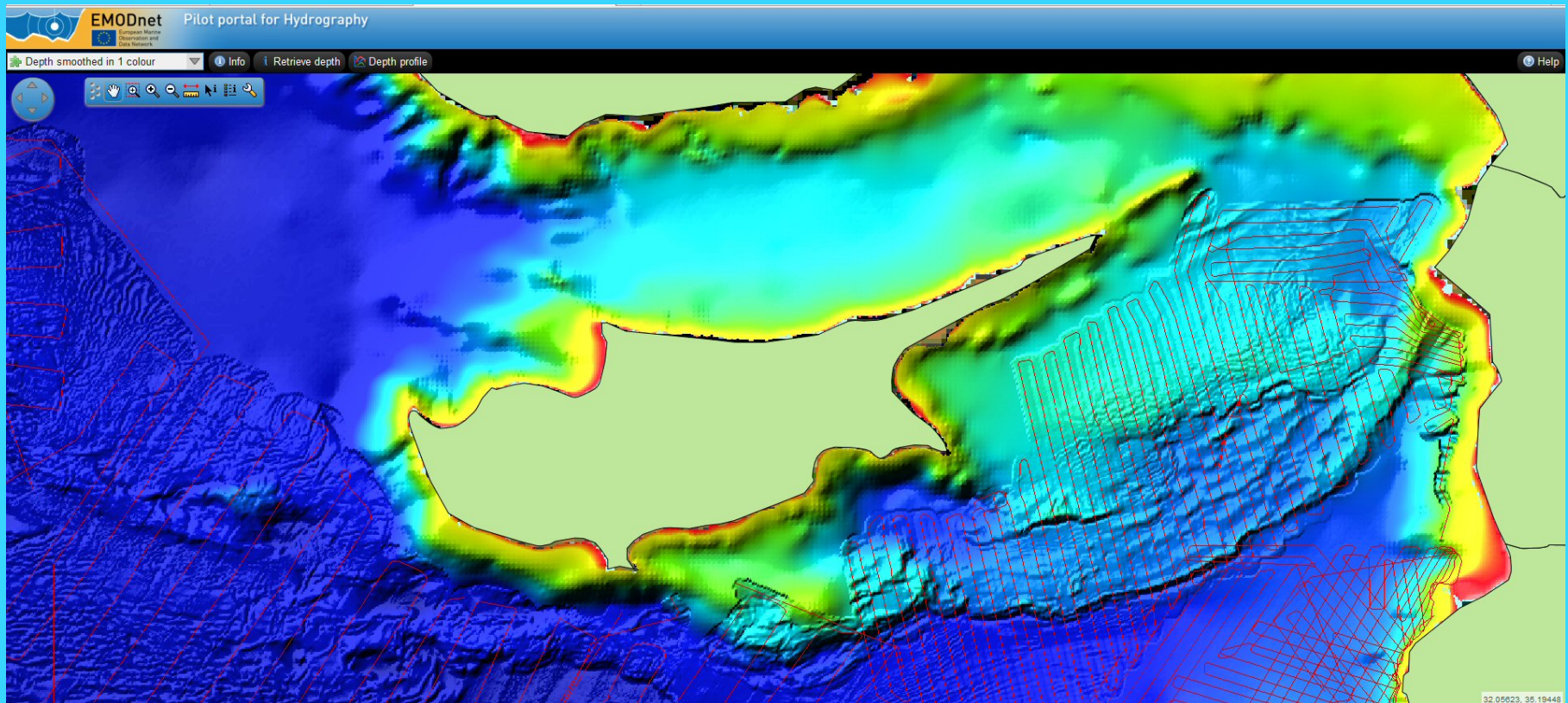
■ Selected tile for downloading including extra information

Hydrographic Data Products viewing service



- *3D Visualisation of Fledermaus SD file with free Fledermaus viewer*

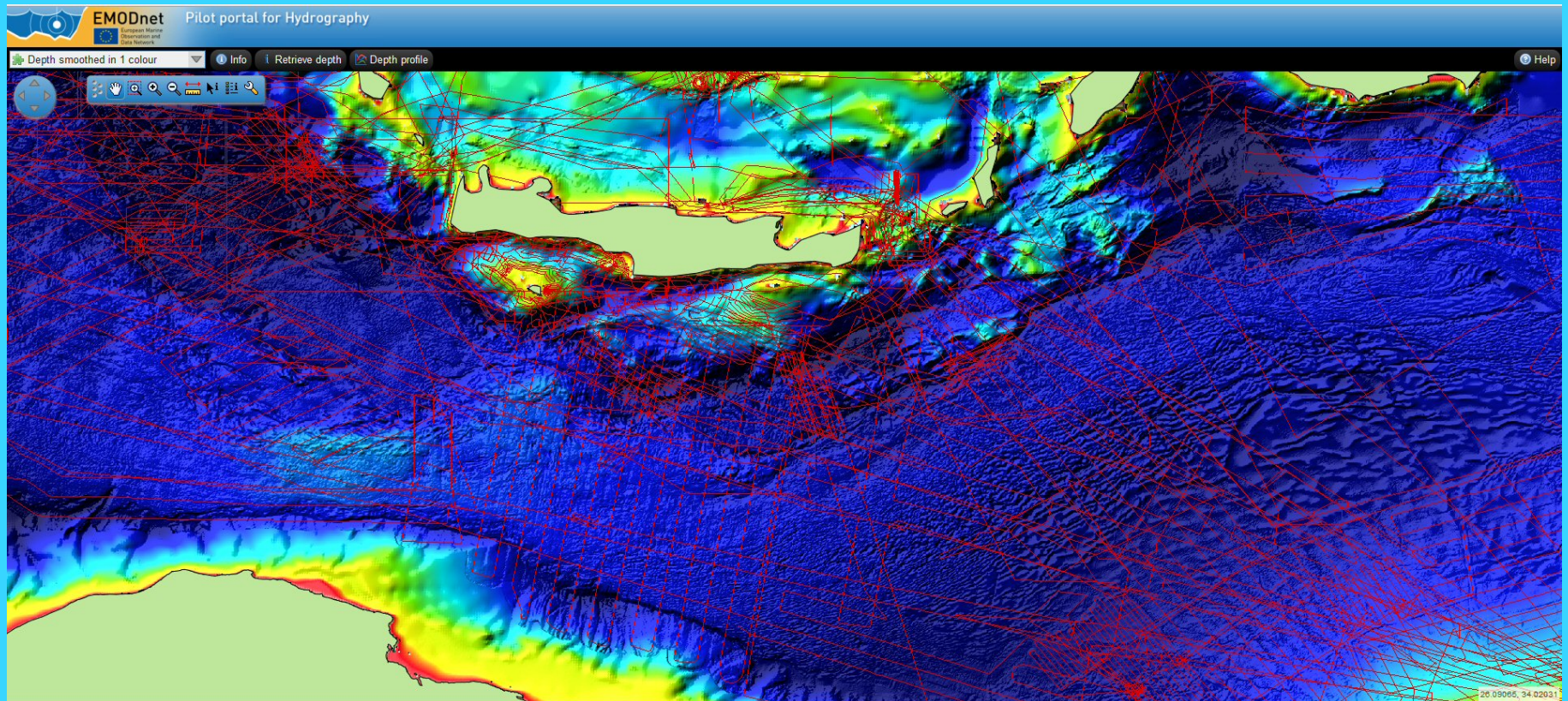
Hydrographic Data Products viewing service



Around Cyprus

- *Detailed zoom of digital bathymetry - examples*

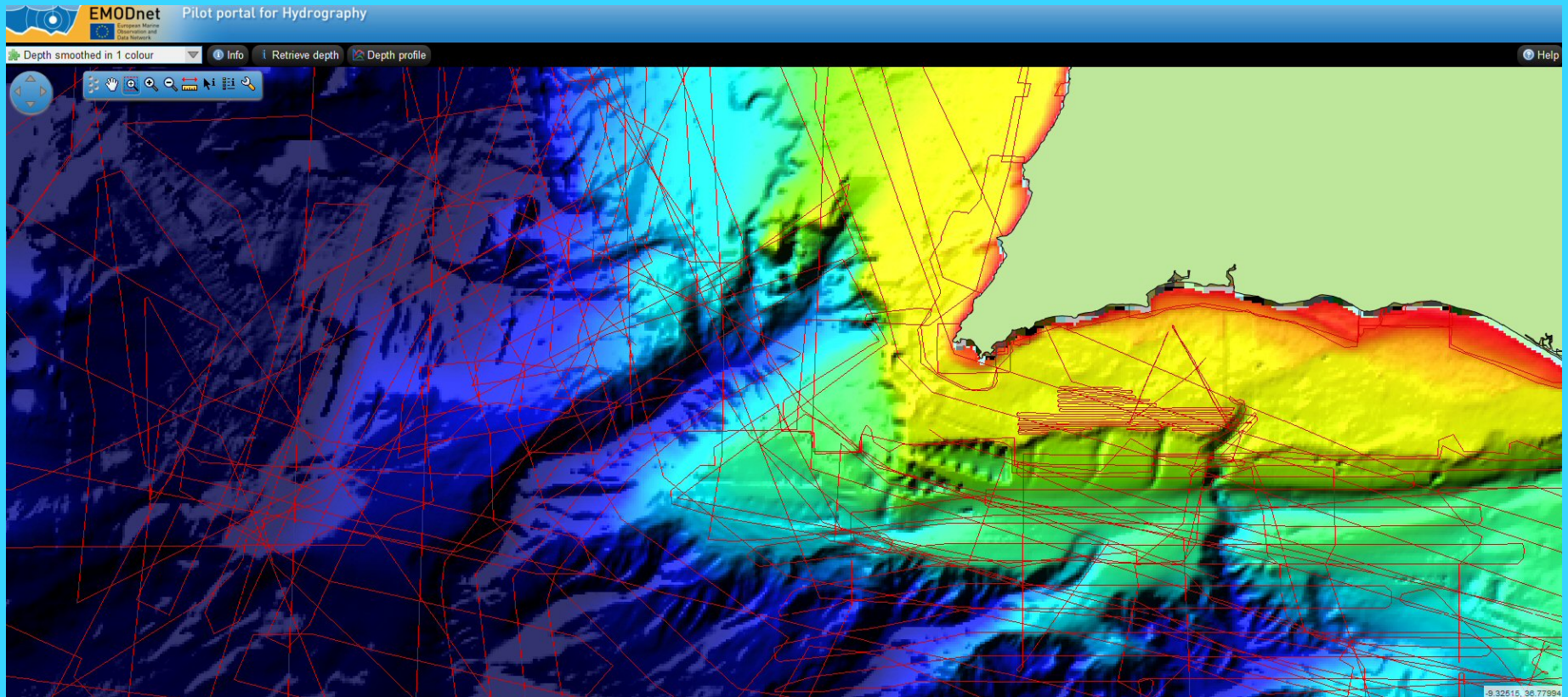
Hydrographic Data Products viewing service



Near Crete

- *Detailed zoom of digital bathymetry - examples*

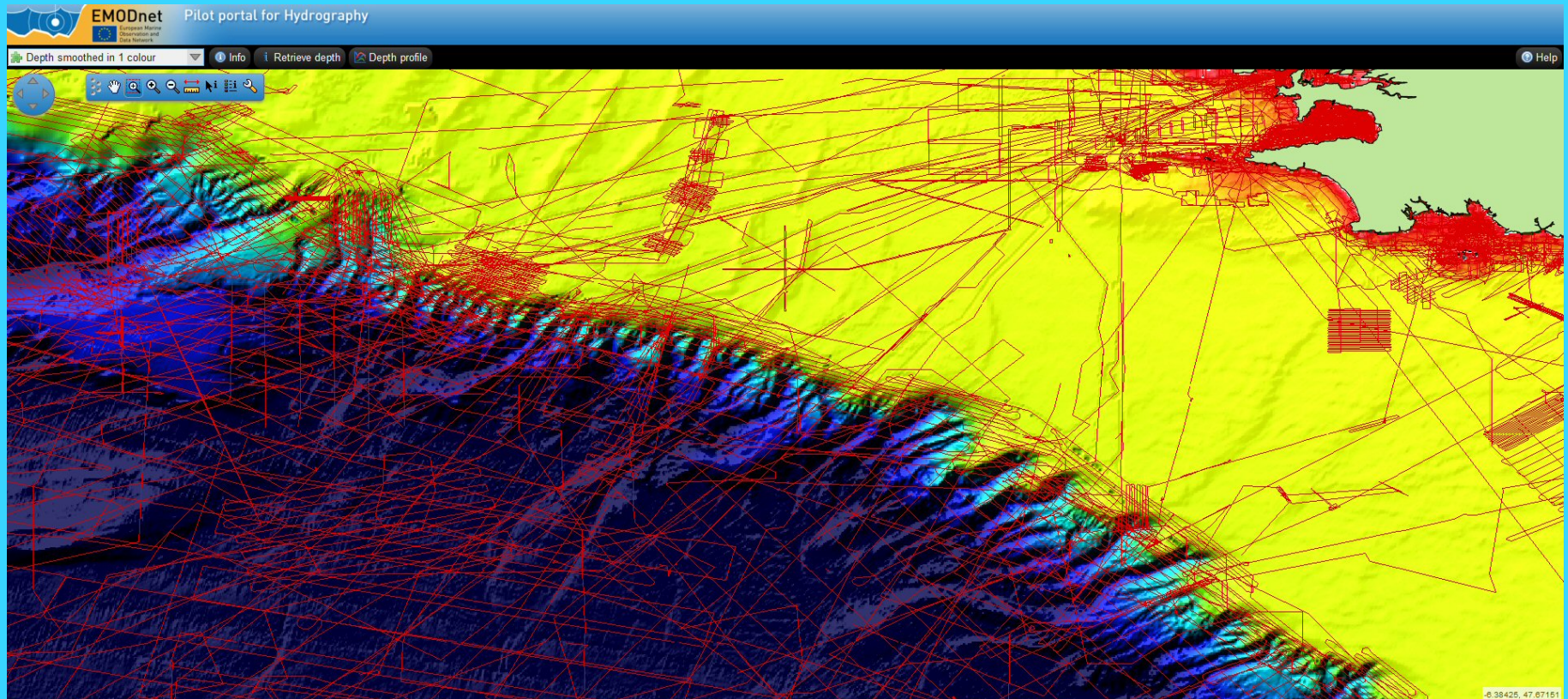
Hydrographic Data Products viewing service



Near Gulf of Cadiz

■ *Detailed zoom of digital bathymetry - examples*

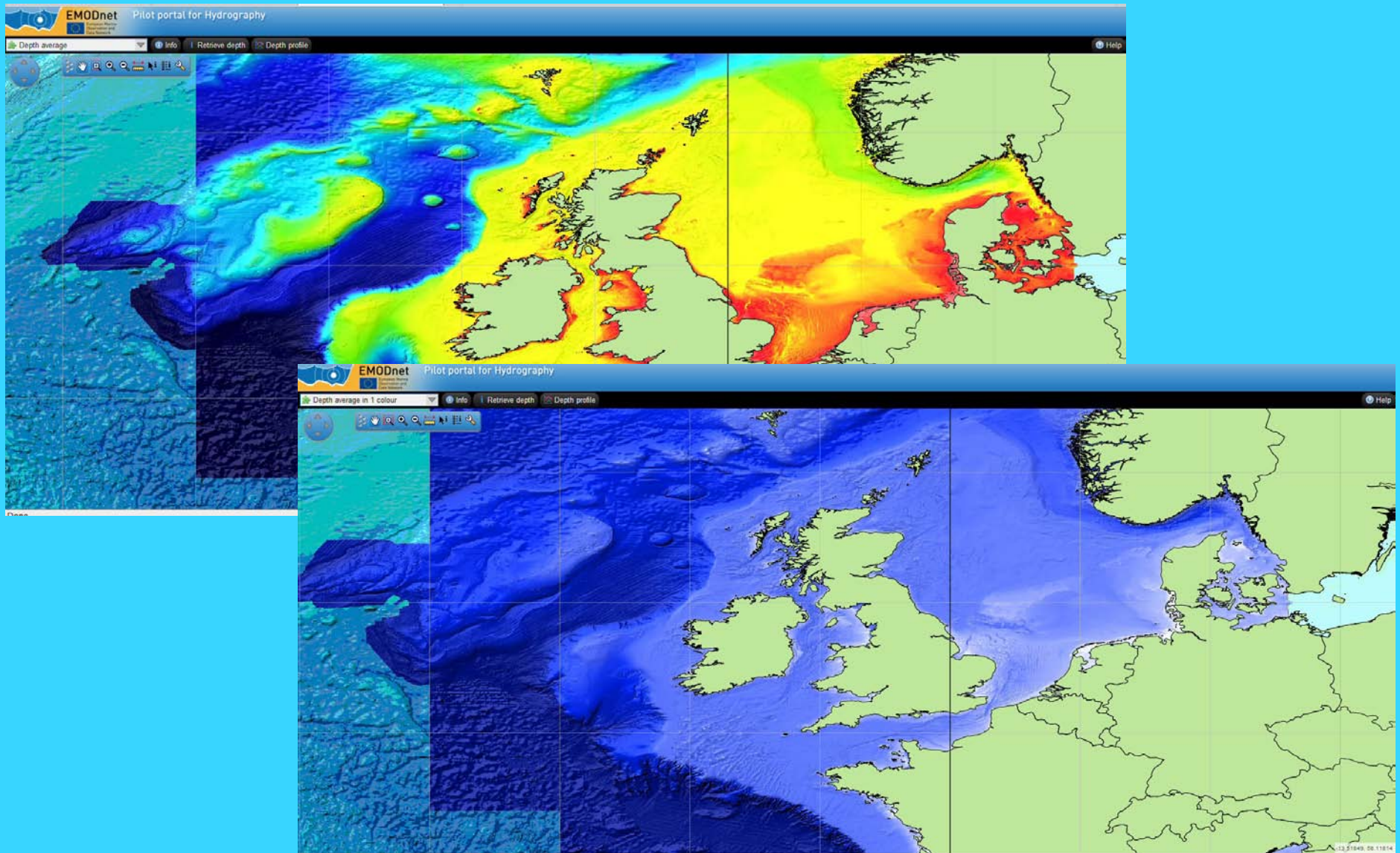
Hydrographic Data Products viewing service



Dropping off the shelf

- *Detailed zoom of digital bathymetry - examples*

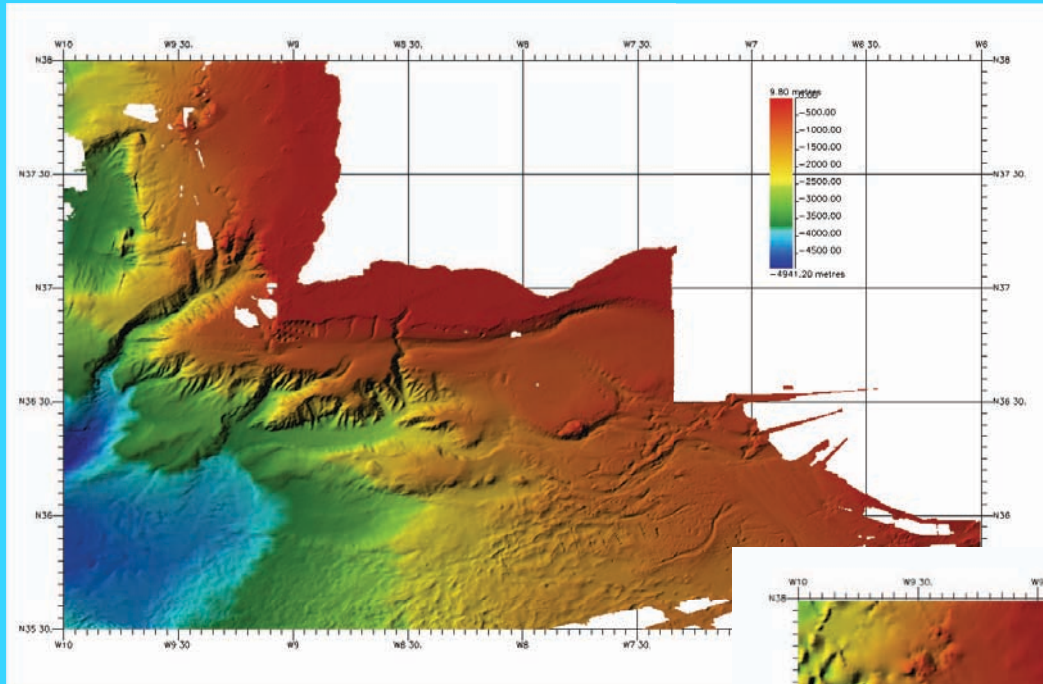
Hydrographic Data Products viewing service



■ *Celtic Sea – North Atlantic in 2 colour palettes*

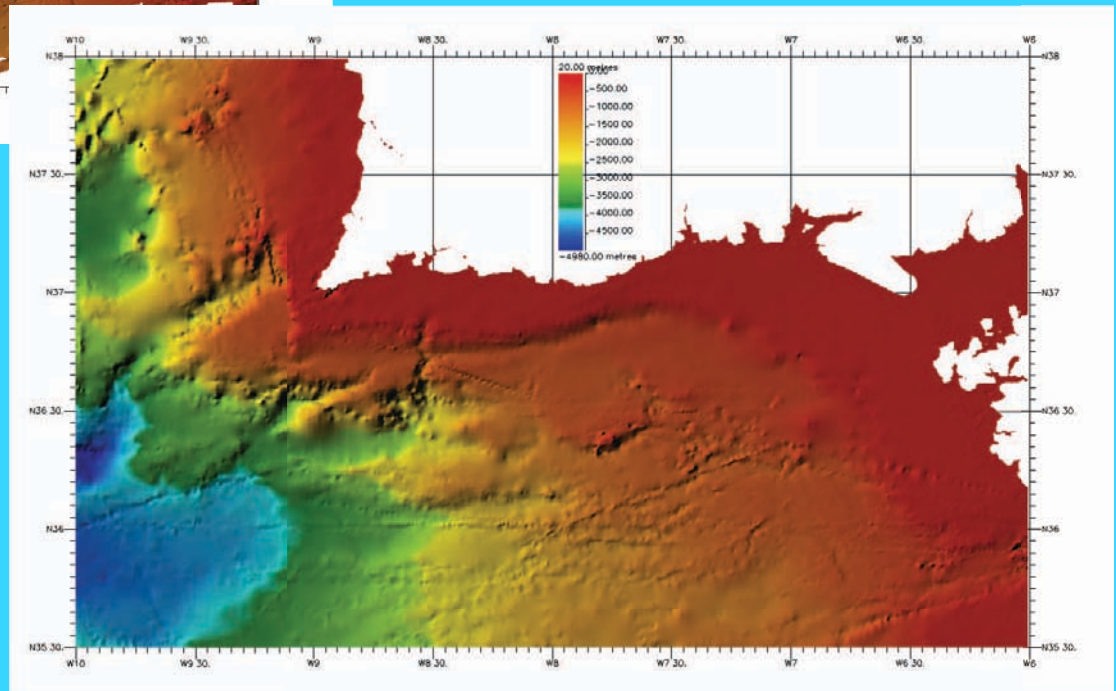
Quality – comparison with GEBCO - example

EMODnet
bathymetry



GEBCO
bathymetry

Gulf of Cadiz



Interoperability

SeaDataNet Common Data Index (CDI) V2

Tools

Enlarge Help
Position Index

Datasets 0
Basket Reset

SeaDataNet

Layer control Expand Add layer

World
Grid Lines
bathymetry_average_multi colour
contours
Regional sea
Regional sea labels
Main sea
Main sea labels
Bathymetry
Blue Marble

Lat/long
Upper-left Lower-right

Search Search Clear ?

Free search
Variable groupings
Sampling interval
Cruise/Station name
Projectname
Datasetname
Waterdepth (m) from
Country

Date (yyymmdd) from
Instrument type
Measuring area type
Platform type
Instrument depth (m) from
Originator
CDI partner

- The Hydrography DTM WMS layers can be shared with other EMODnet portals and beyond (e.g. WISE-Marine, European Atlas of the Seas, SeaDataNet)
- Example: DTM WMS added to SeaDataNet CDI service



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