



EMODnet Bathymetry - building and providing a high resolution digital bathymetry for European seas

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On behalf of EMODnet Bathymetry consortium



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EMODNet Bathymetry



- Ongoing in 3 consecutive projects since 2009 with expanding consortium (at present >30 partners)
- Consortium consisting of bathymetric and IT experts and data providers from National Hydrography Services, marine research institutes and SME's; also including GEBCO



EMODNet Bathymetry



Overall objective:

To bring together bathymetric surveys of European seas and to produce, publish and serve a harmonised and medium resolution Digital Terrain Model of all European seas



Standards are instrumental



- **Adoption** of SeaDataNet standards and infrastructure
 - **Common Data Index (CDI)** format based upon ISO 19115 – 19139 standard and INSPIRE compliant for describing **metadata** on **bathymetric data sets** (surveys)
 - **Sextant products catalogue** format based upon ISO 19115 – 19139 standard and INSPIRE compliant for describing **metadata** on **composite DTMs**
 - **Controlled vocabularies** for the marine domain (> 160.000 terms and > 60 lists), with international governance and web services
 - Common SeaDataNet **Data Policy** and SeaDataNet License



EMODnet Bathymetry process flow

Population of
SeaDataNet CDI
and Sextant
services

Common
method and
software used
by data
providers and
regional sea
coordinators

Survey data sets

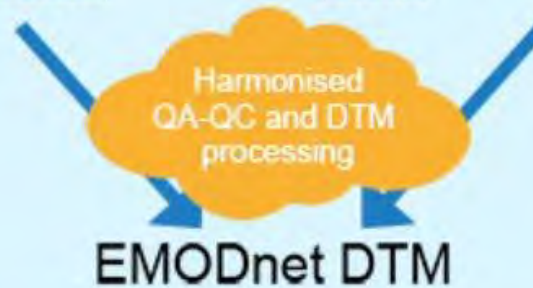


GO TO: CDI Data Discovery and Access service

Composite DTM's

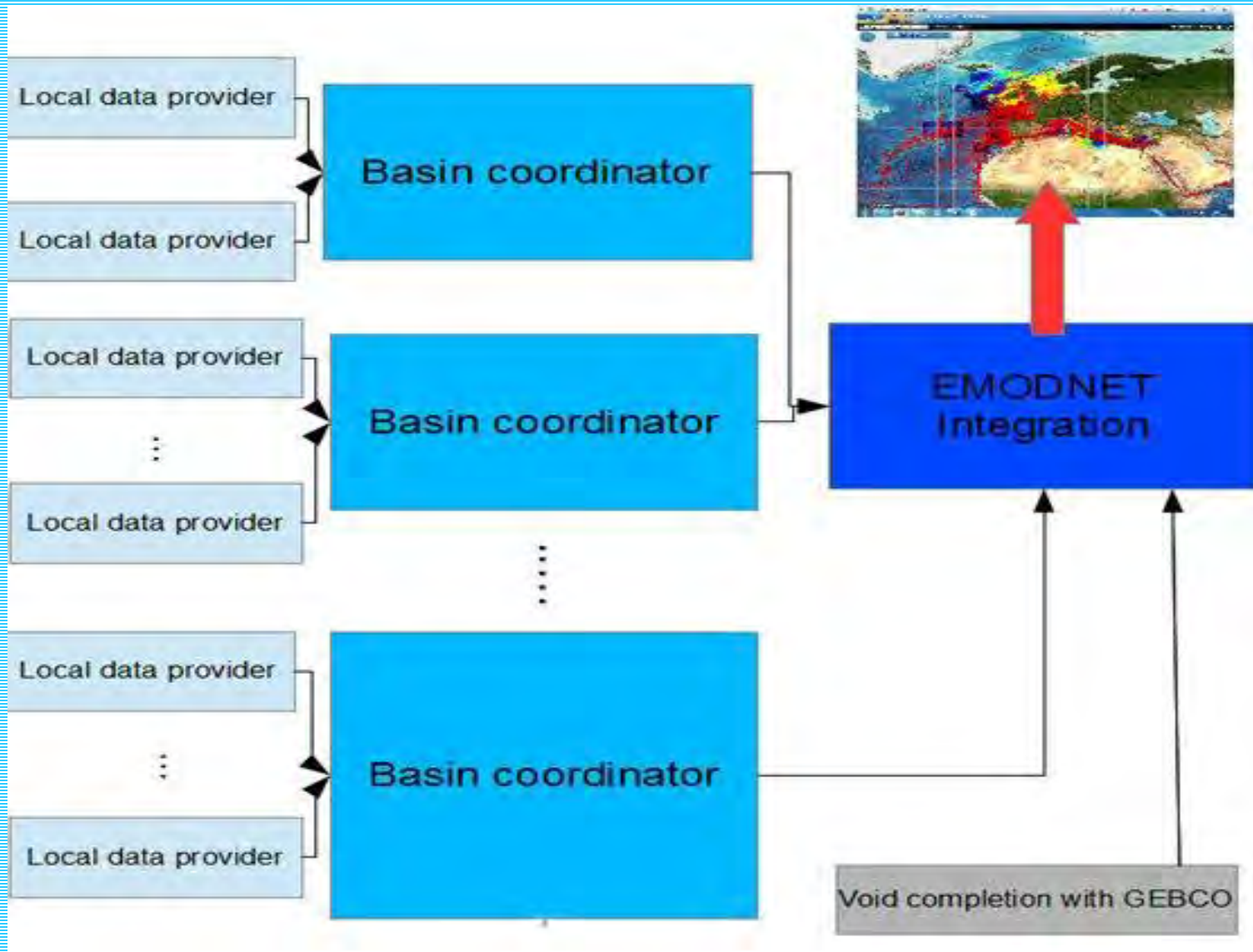


GO TO: Sextant Catalogue service



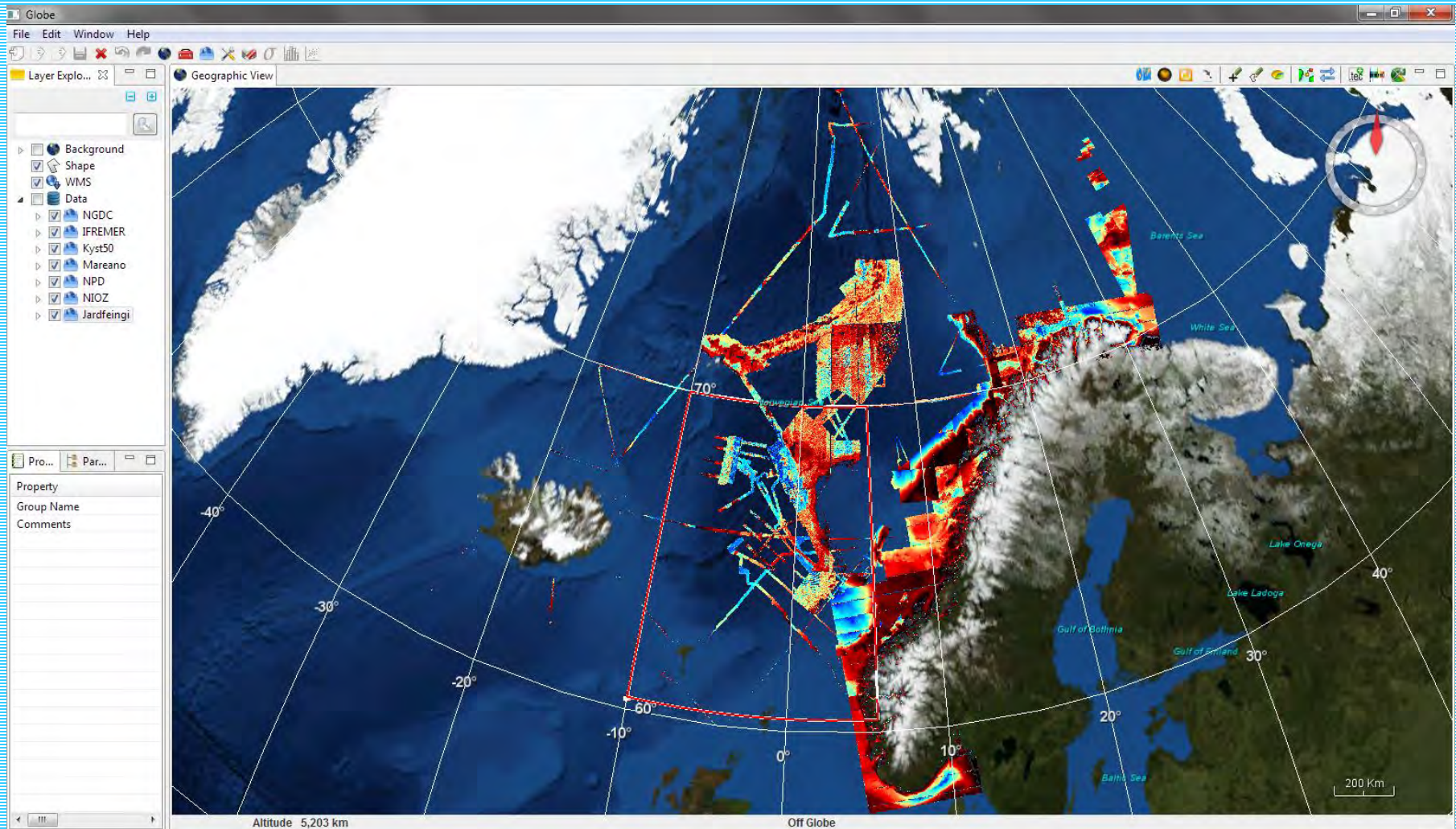
GO TO: Bathymetry Viewing and Download service

Common Methodology



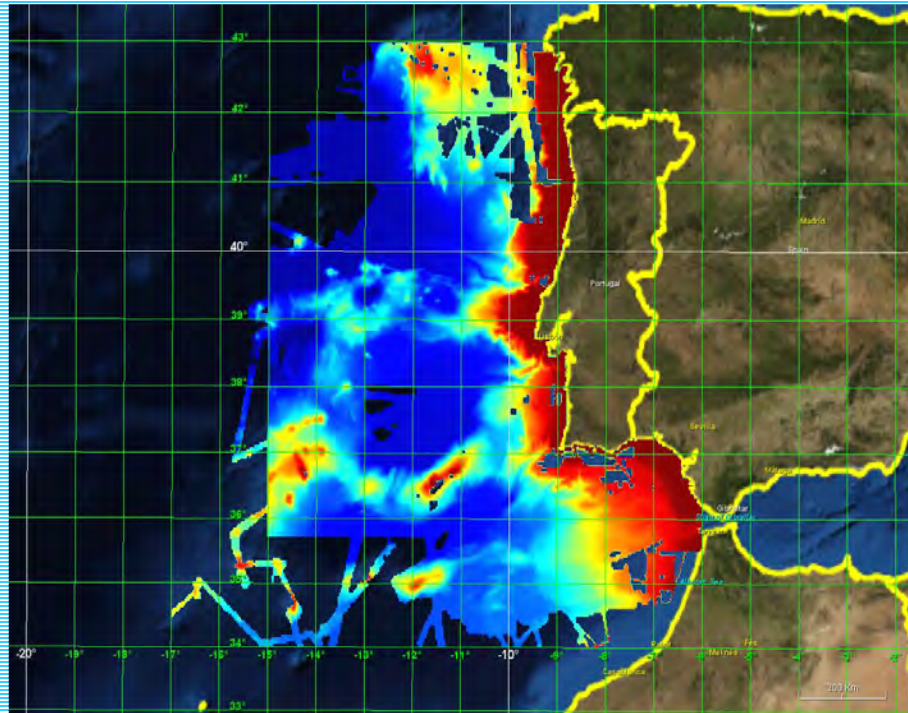
From local data to regional DTMs to EMODnet DTM

Use of GLOBE software (developed by IFREMER) by data providers and regional DTM coordinators

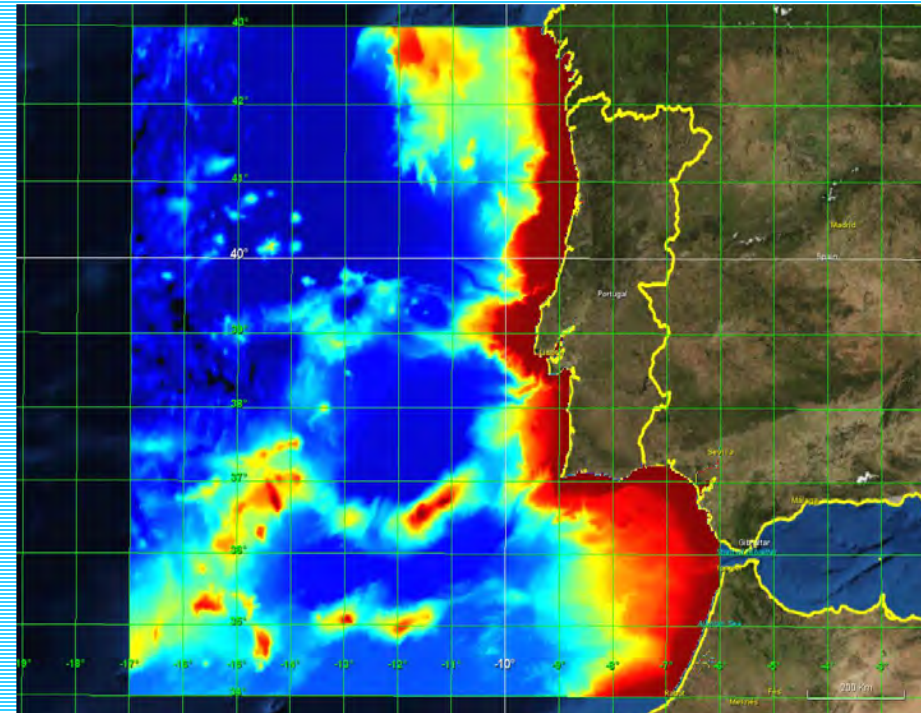


Norwegian and Icelandic seas – Arctic – example

Regional DTM production, including GEBCO for gaps – example Atlantic near Iberian peninsula



Average depth for the interpolated DTM (using survey data & CDTM's)



Resulting DTM with average depth after GEBCO integration and smoothing

Data gathering results

- Up till today, **14791** survey CDI metadata records from **27** data centres and **169** data originators **from 1816 to 2016** have been collated and imported into the dedicated EMODnet Bathymetry CDI data discovery and access service. This service was launched in May 2010 and has been upgraded over time with extra functionality
- The SeaDataNet Data Products Catalogue service (Sextant) gives **78** metadata records about composite DTMs that have been used next to survey data sets

The screenshot shows the EMODnet Portal for Bathymetry CDI Data Discovery and Access service. The interface includes a search bar, a map of Europe with red survey tracks, and a table of search results.

Data set name	Disciplines - Parameter groups	Instrument / gear type	Show
S201304900-6	Marine geology > Gravity, magnetics and bathymetry Terrestrial > Terrestrial	multi-beam echosounders	[icon]
S201306500-8	Marine geology > Gravity, magnetics and bathymetry Terrestrial > Terrestrial	multi-beam echosounders	[icon]
S201302800-3	Marine geology > Gravity, magnetics and bathymetry Terrestrial > Terrestrial	multi-beam echosounders	[icon]

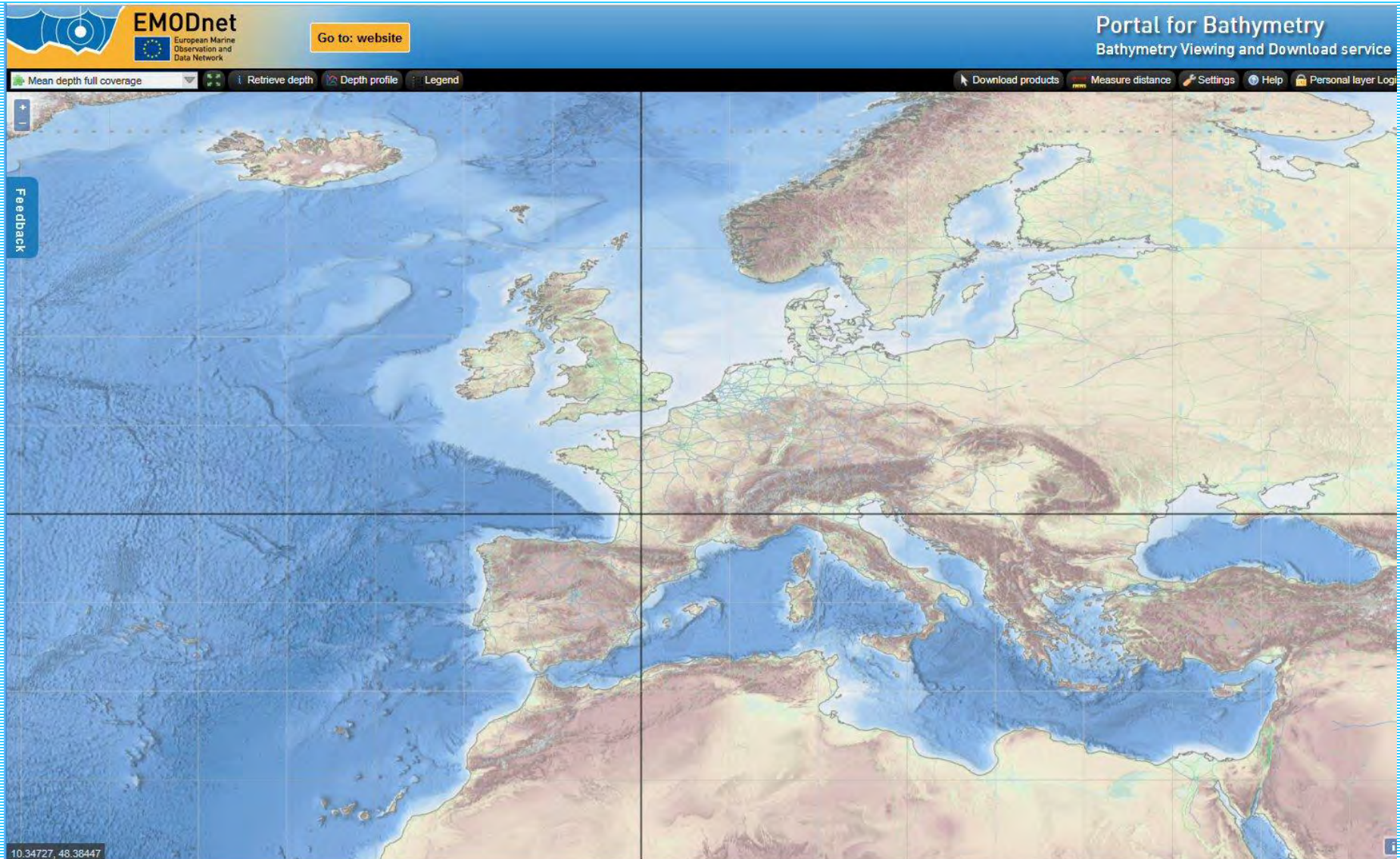
The screenshot shows the EMODnet Portal for Bathymetry Sextant Catalogue service. The interface includes a search bar, a map of Europe with yellow survey boxes, and a list of search results.

Result ID	Title	Description
353_291007	Balear Islands Margin	Composite DTM of the Balearic Islands margin, (Mediterranean Sea, East Spain).
353_291005	Strait of Gibraltar	Composite DTM Strait of Gibraltar margin, at approximately 100m of resolution
2979_EMEPC2011	West Continental Shelf, Portugal	DTM derived from hydrographic surveys performed within the scope of the Portuguese Continental Shelf Extension Project (LINCLIOS)

DTM releases in time

- **May 2010**: first release of EMODnet DTM for selected European seas - $1/4$ * $1/4$ arc minutes
- **June 2011**: second release of EMODnet DTM for more European seas - $1/4$ * $1/4$ arc minutes
- **August 2012**: third release of EMODnet DTM for more European seas - $1/4$ * $1/4$ arc minutes
- **August 2013**: fourth release of EMODnet DTM - $1/4$ * $1/4$ arc minutes
- **February 2015**: fifth release of EMODnet DTM now covering all European seas - **$1/8$ * $1/8$ arc minutes**
- **September 2015**: sixth release of EMODnet DTM now covering all European seas - $1/8$ * $1/8$ arc minutes + **3 pilot coastal areas with high resolution DTMs**
- **October 2016**: seventh release of EMODnet DTM based upon > 7700 surveys and Composite DTMs

Bathymetry Viewing and Download service with EMODnet DTM

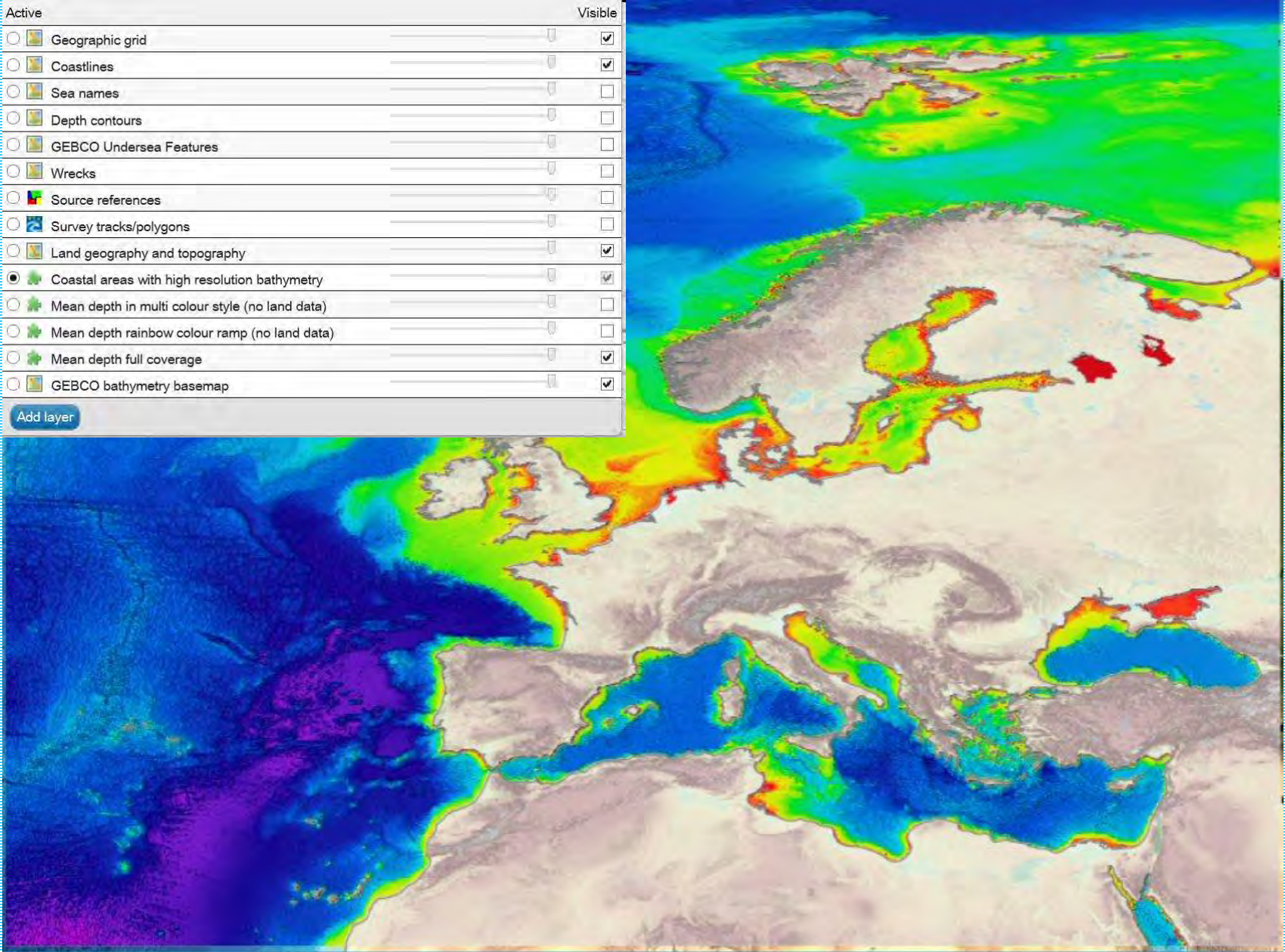


<http://www.emodnet-bathymetry.eu>



Active	Visible
<input type="checkbox"/> Geographic grid	<input checked="" type="checkbox"/>
<input type="checkbox"/> Coastlines	<input checked="" type="checkbox"/>
<input type="checkbox"/> Sea names	<input type="checkbox"/>
<input type="checkbox"/> Depth contours	<input type="checkbox"/>
<input type="checkbox"/> GEBCO Undersea Features	<input type="checkbox"/>
<input type="checkbox"/> Wrecks	<input type="checkbox"/>
<input type="checkbox"/> Source references	<input type="checkbox"/>
<input type="checkbox"/> Survey tracks/polygons	<input type="checkbox"/>
<input type="checkbox"/> Land geography and topography	<input checked="" type="checkbox"/>
<input checked="" type="radio"/> Coastal areas with high resolution bathymetry	<input checked="" type="checkbox"/>
<input type="radio"/> Mean depth in multi colour style (no land data)	<input type="checkbox"/>
<input type="radio"/> Mean depth rainbow colour ramp (no land data)	<input type="checkbox"/>
<input type="radio"/> Mean depth full coverage	<input checked="" type="checkbox"/>
<input type="radio"/> GEBCO bathymetry basemap	<input checked="" type="checkbox"/>

[Add layer](#)



EMODnet



Go to: website

Portal for Bathymetry

Bathymetry Viewing and Download service

Survey tracks/polygons

Retrieve metadata

Order survey data

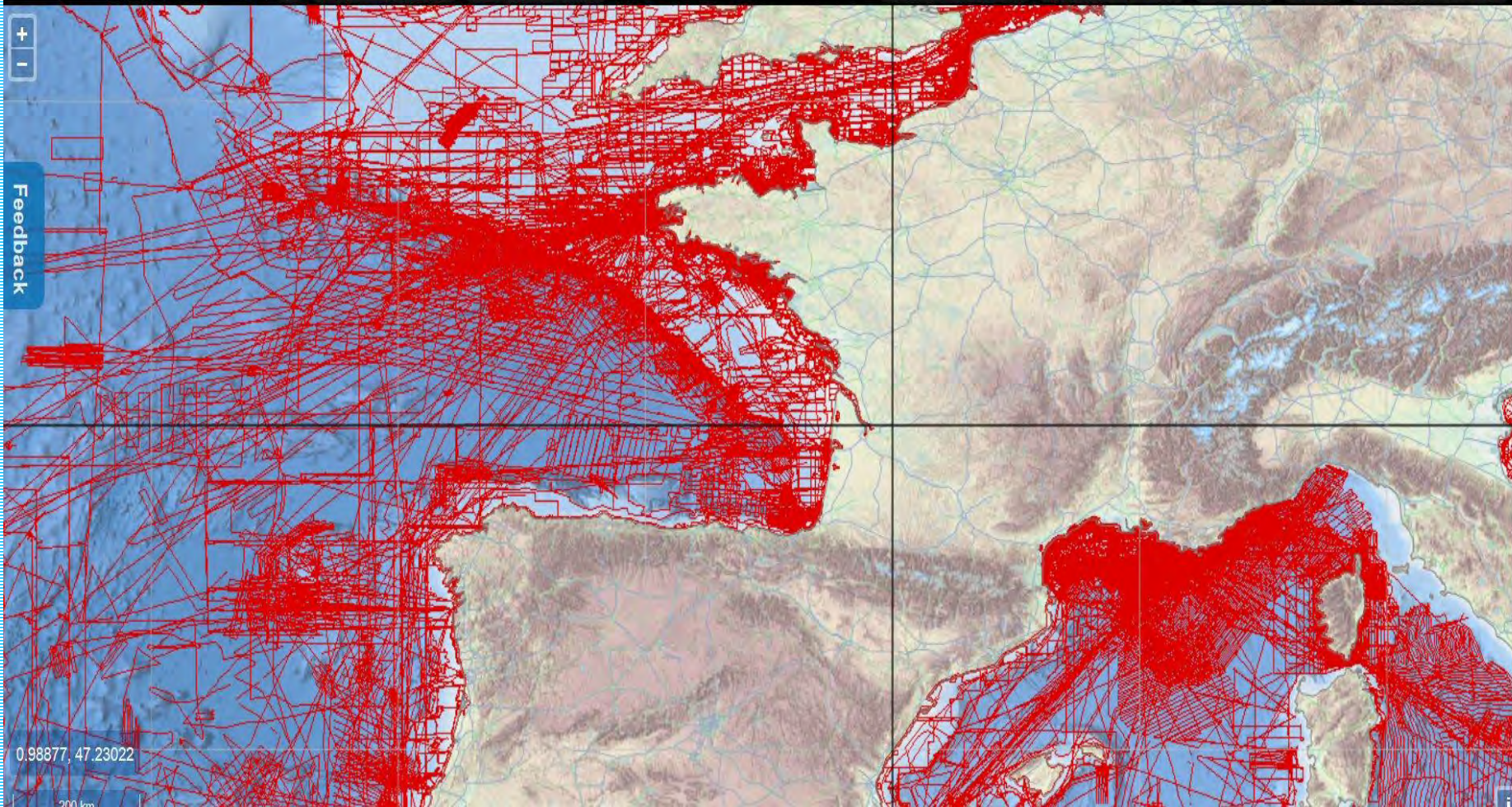
Download products

Measure distance

Settings

Help

Personal layer Login



CDI layer of survey data

Survey tracks/polygons

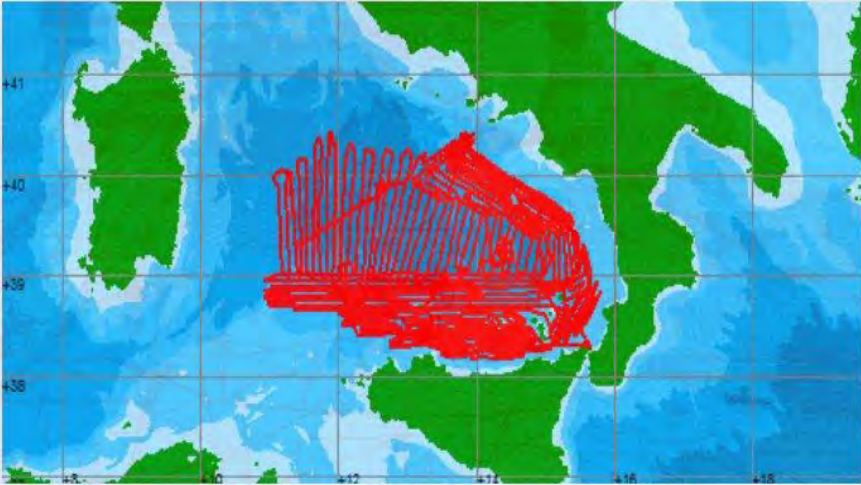
Retrieve metadata Order survey data


Survey tracks/polygons

GEMET-INSPIRE themes	Oceanographic geographical features
Abstract	The data were acquired with a Simrad EM120 S Multi Beam echosounder aboard the Russian R/V Gelendzhik in order to cover the central-southern Tyrrhenian sea for geological reconnaissance in the framework of an Italian project funded by CNR and APAT (Geological Survey Agency).
Data format	Climate and Forecast NetCDF Version 3.5
Data set creation date	20101027

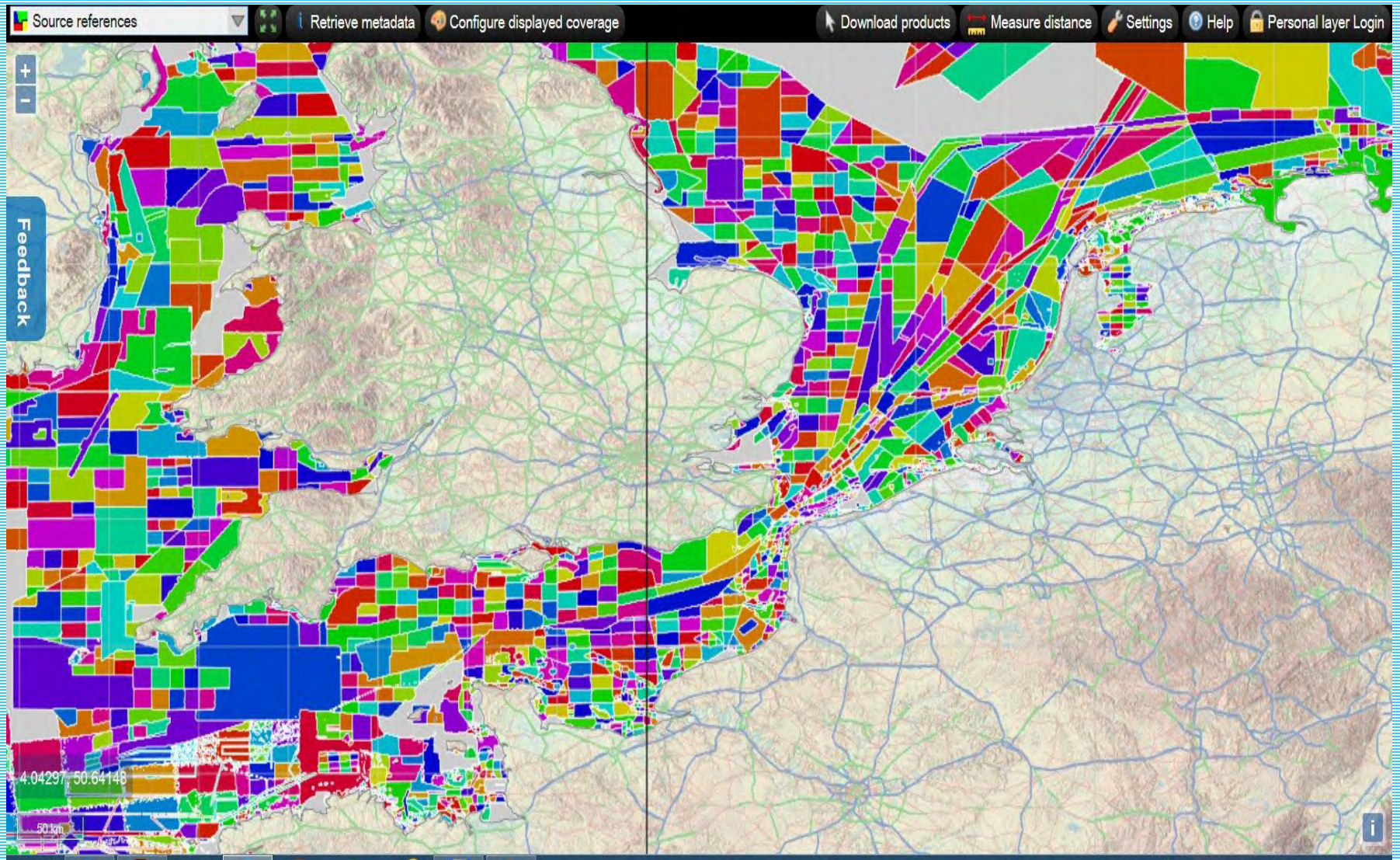
WHERE?

Map





CDI layer of survey data with metadata retrieval



Source references layer to survey data (CDI), composite DTM (Sextant) or GEBCO

The screenshot displays a GIS application interface. At the top, a dark navigation bar contains several icons and labels: 'Source references' (with a dropdown arrow), 'Retrieve metadata', 'Configure displayed coverage', 'Download products', 'Measure distance', 'Settings', 'Help', and 'Personal layer Login'. The main map area shows a colorful, multi-layered map of a coastal region, likely the Mediterranean. A 'Feedback' button is visible on the left side of the map. A 'Source references' window is open in the foreground, displaying the following information:

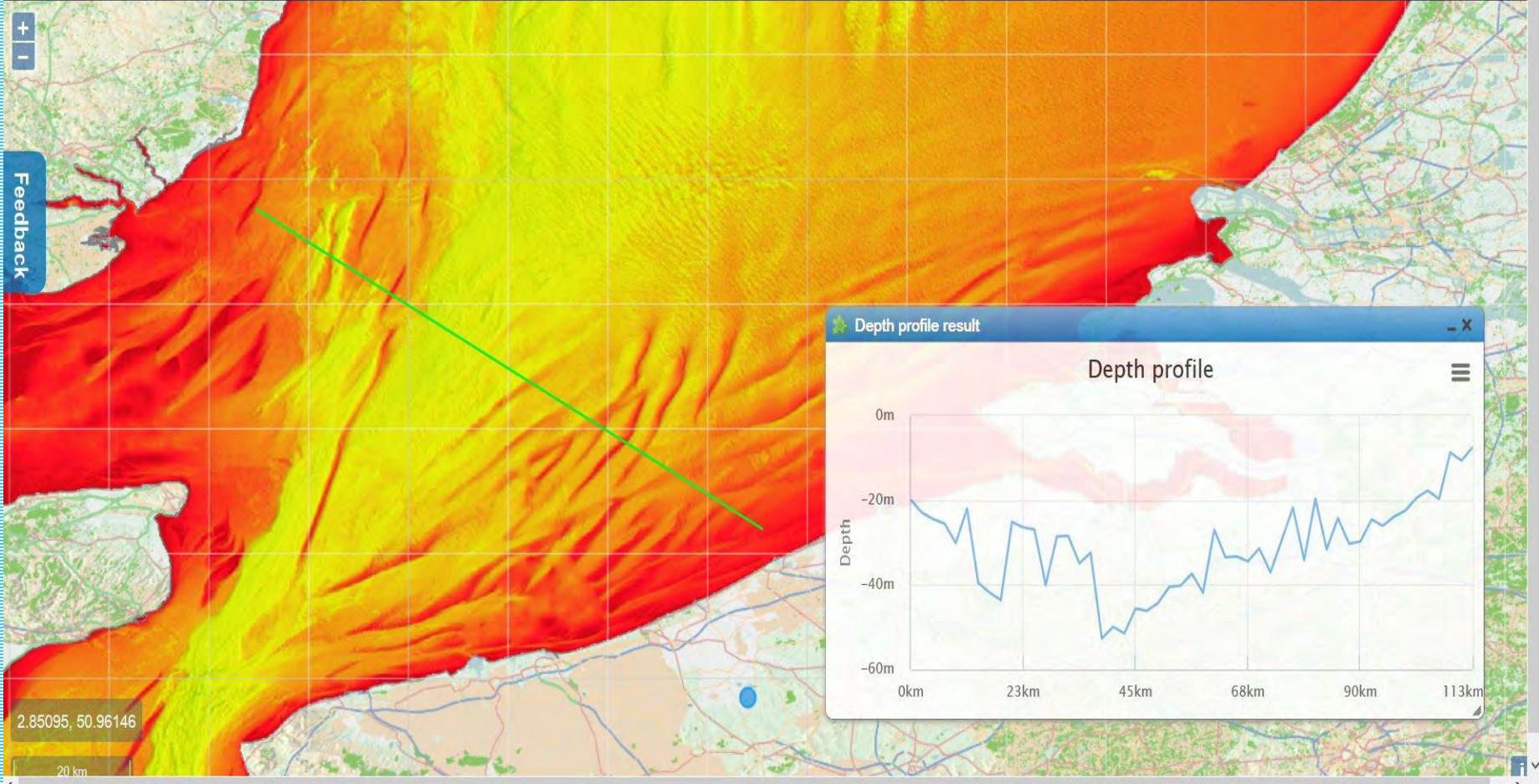
- Source references**
- Discovery parameters
- GEMET-INSPIRE themes
- Abstract
- Data format
- Data size
- Data set creation date
- WHERE?**
- Map

The metadata details for the selected source are:

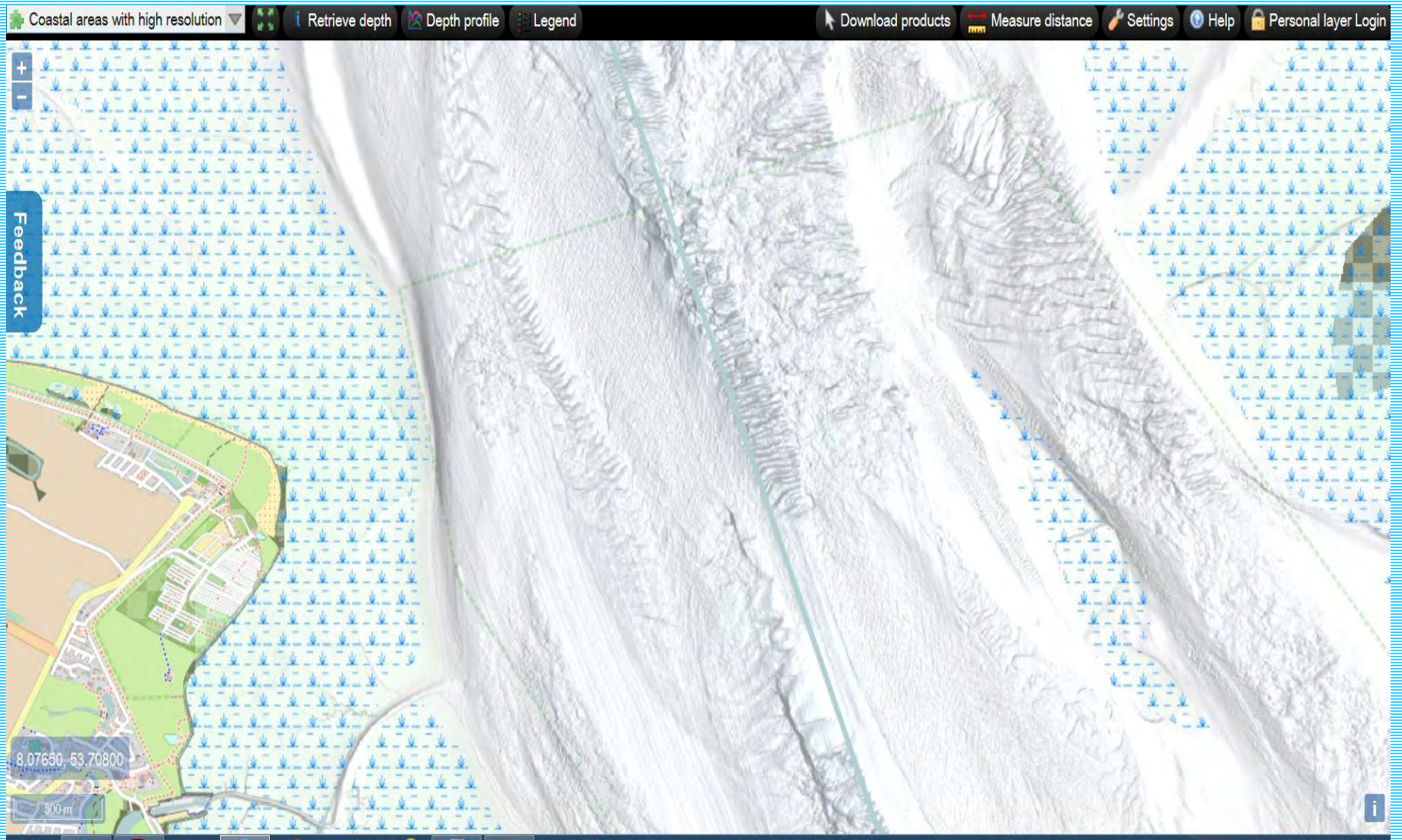
- Bathymetry and Elevation
- Oceanographic geographical features
- Bathymetric data extract from bathymetric database
- XYZ ASCII **Version 1.0**
- 0.1
- 20140613

The 'WHERE?' section includes a map view showing a red triangle indicating the location of the data source on the main map's geographic grid.

Source references layer with retrieval of metadata



Depth profile following user drawn transect



High Resolution DTMs for 3 pilot areas



Mean depth full coverage

Retrieve depth

Depth profile

Legend

Download products

Measure distance

Settings

Help

Personal layer Login

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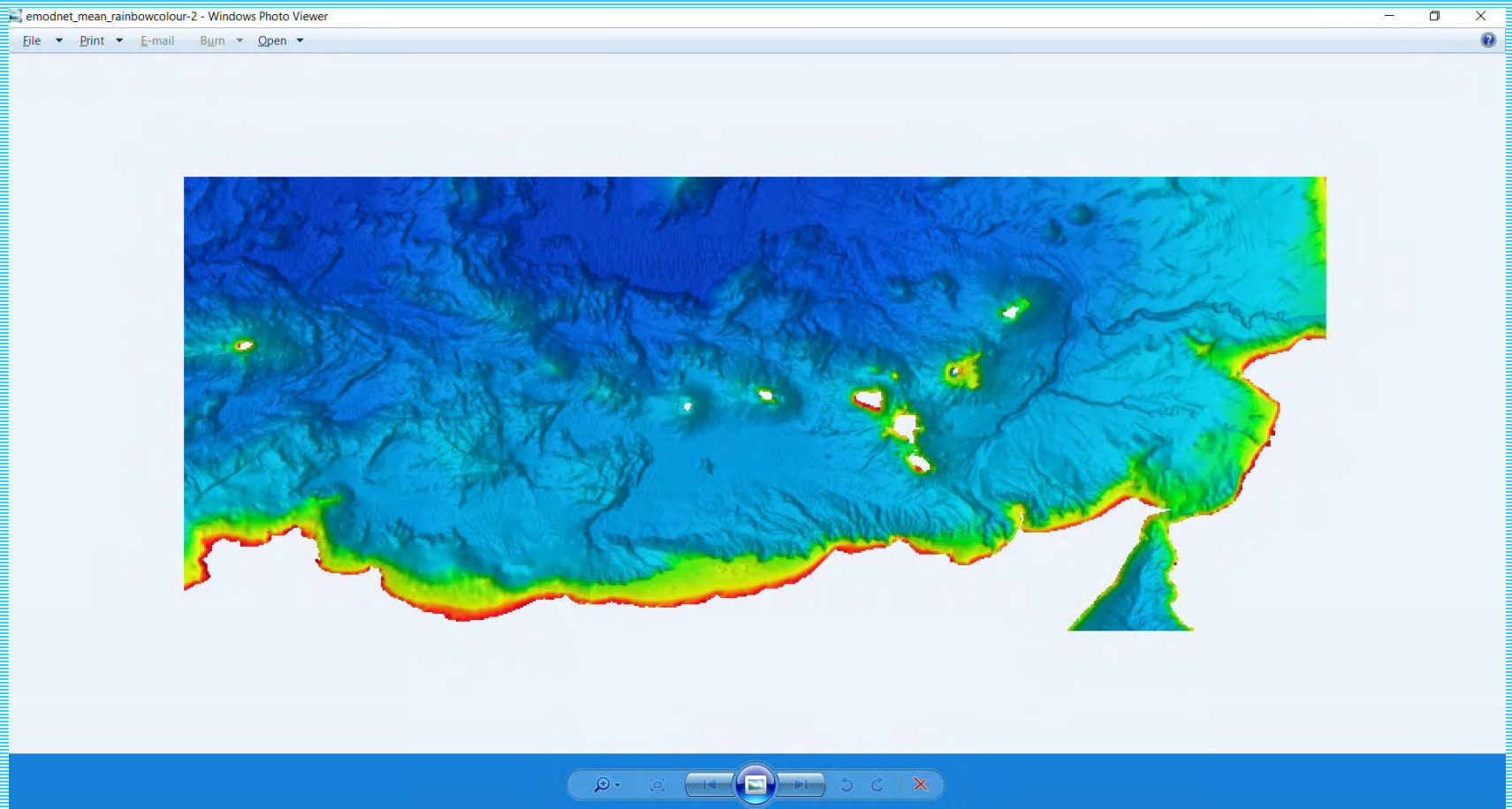
B4

- Download as EMO file
- Download as EMO (without GEBCO data) file
- Download as ESRI ASCII file
- Download as GeoTiff file
- Download as NetCDF file
- Download as NetCDF (without GEBCO data) file
- Download as SD file
- Download as XYZ file

-27.75332, 20.72090

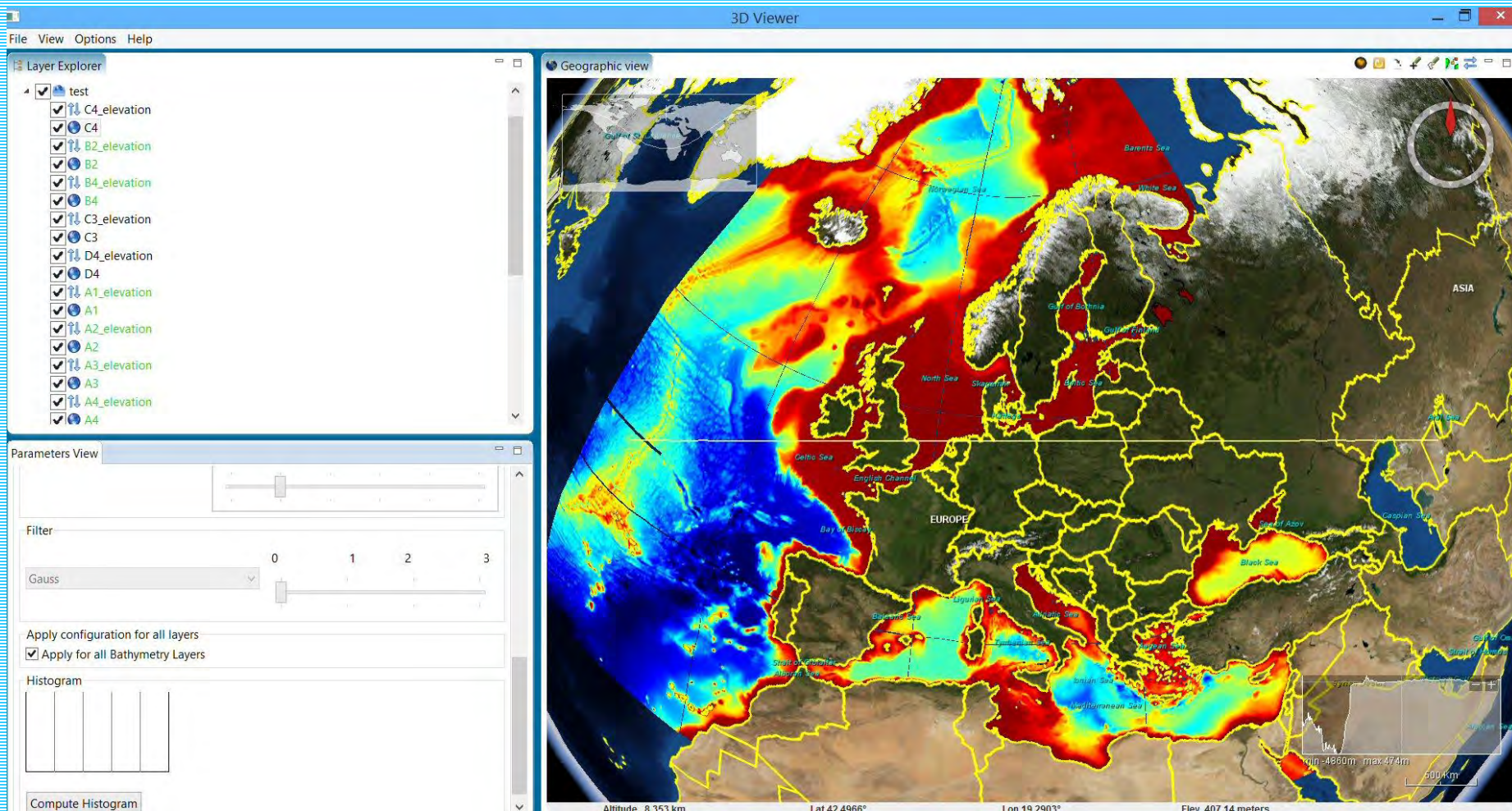
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Download DTM tiles in various formats



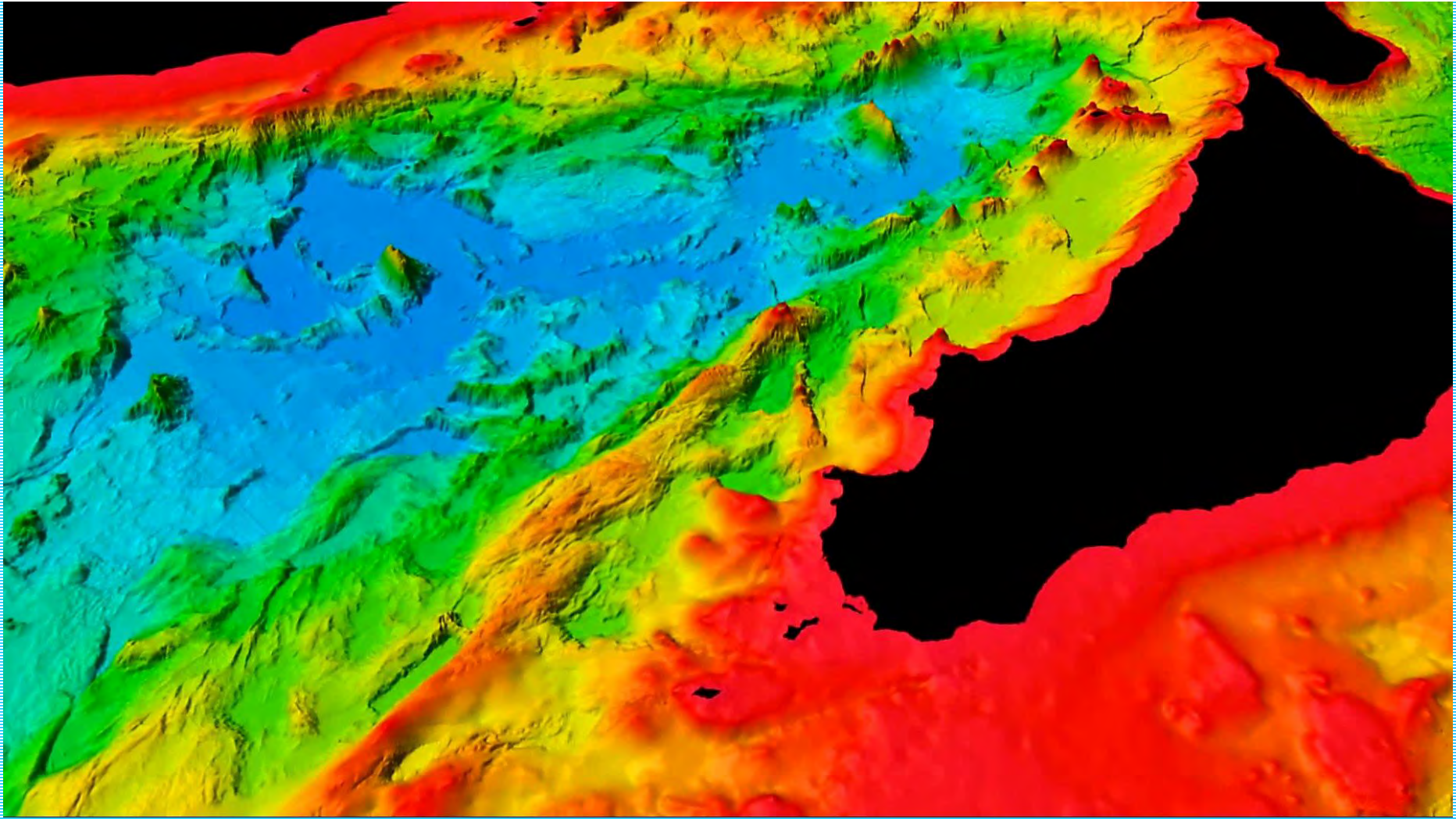
New WCS service

Bathymetric DTM – 3D-Viewer



DTM loaded into 3D-Viewer as developed and freely downloadable from Geo-Seas, based upon NASA World Wind software

Bathymetric DTM – 3D-Viewer



DTM loaded into 3D-Viewer

Comparison with GEBCO

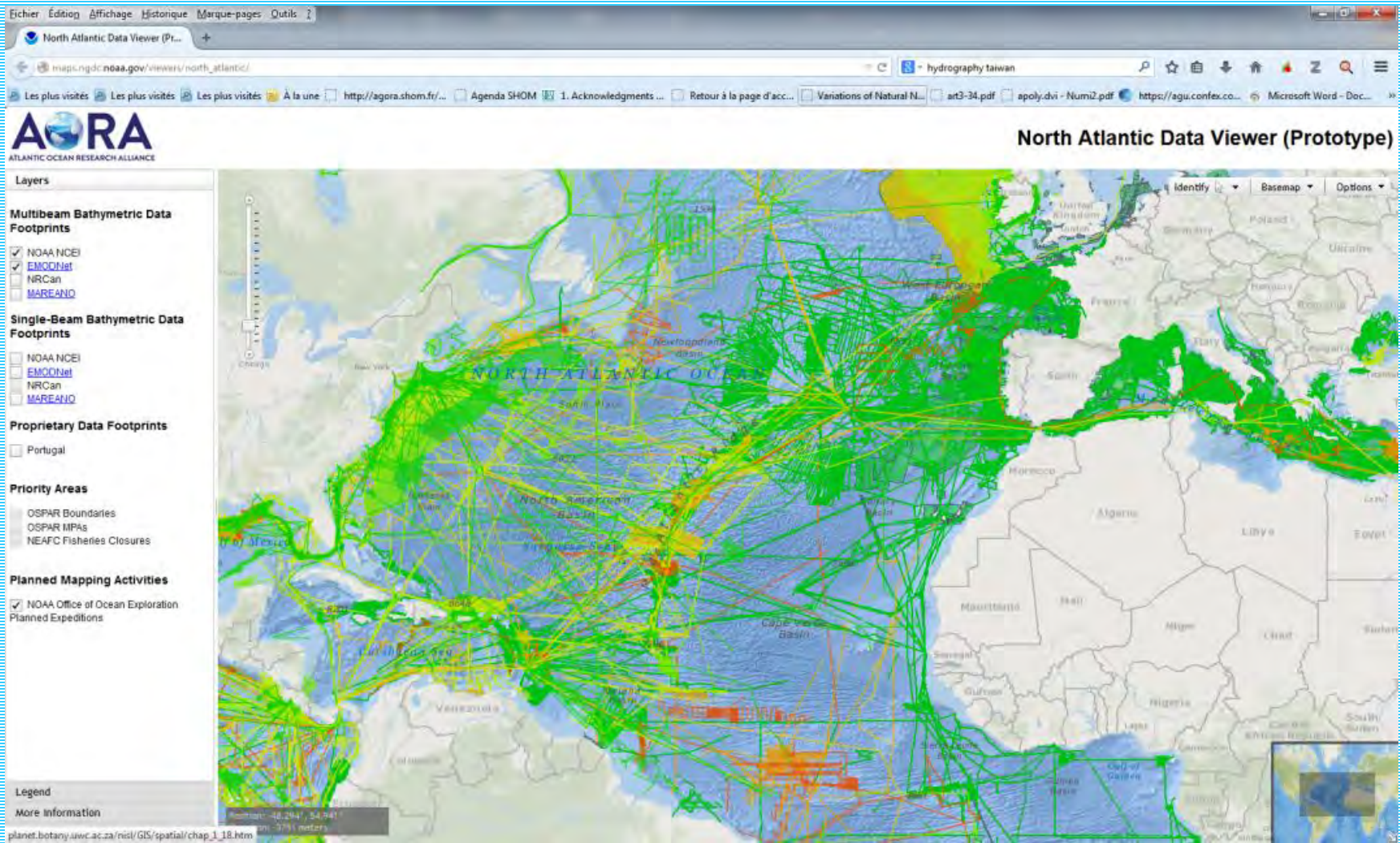


GEBCO – General Bathymetric Chart of the Oceans (IHO – IOC) and EMODnet Bathymetry DTM – example in Tyrrhenian Sea near Sicily – Italy and South Italy – resolution EMODnet is 16 times higher

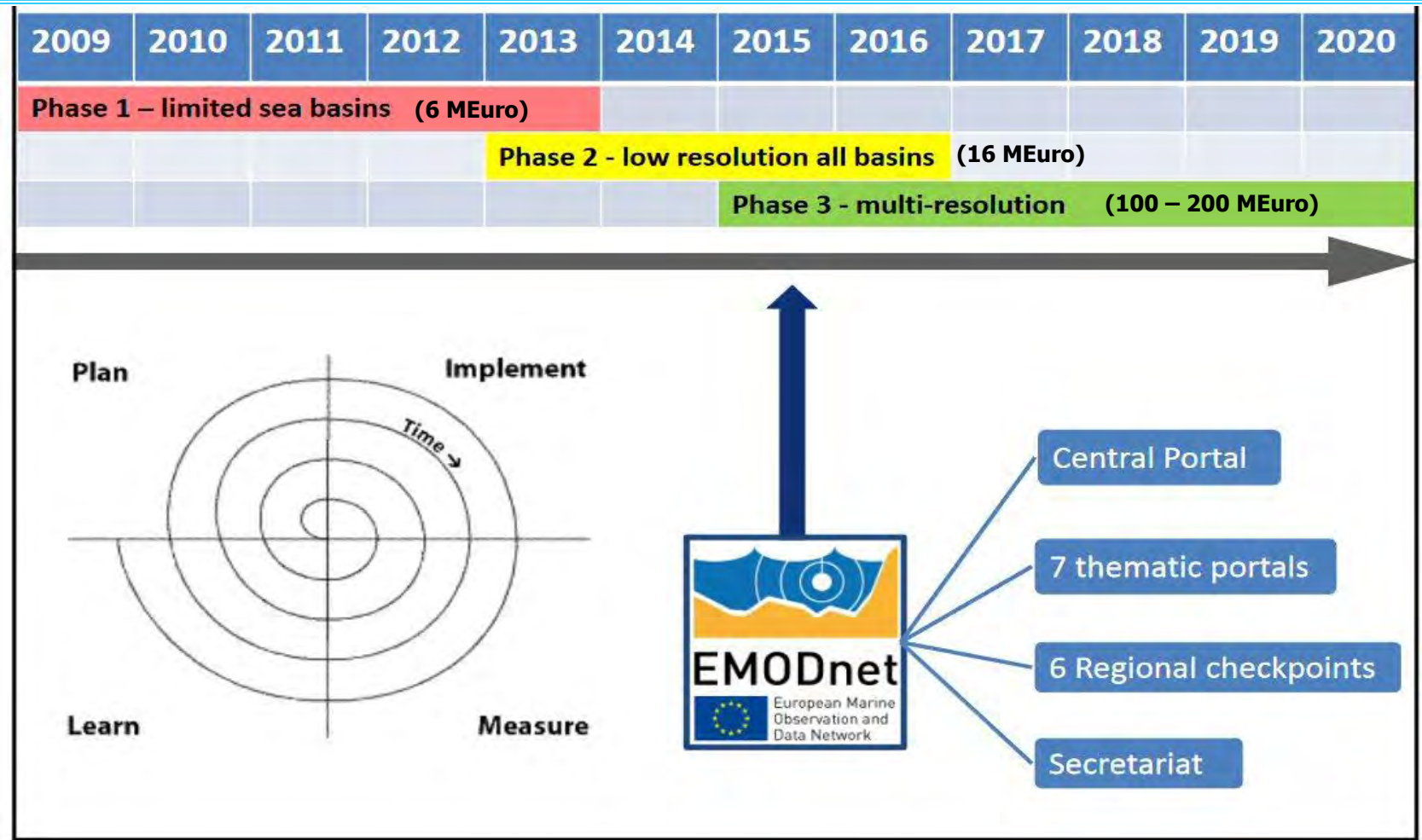
EMODnet Web Services

- **CDI Data Discovery and Access service:** WMS and WFS service:
http://geoservice.maris2.nl/wms/seadatanet/emodnet_hydrography
- GetCapabilities
http://geoservice.maris2.nl/wms/seadatanet/emodnet_hydrography?service=WMS&request=GetCapabilities
- **Bathymetry Viewing and Downloading service:**
- WMS: <http://ows.emodnet-bathymetry.eu/wms>
- WFS: <http://ows.emodnet-bathymetry.eu/wfs>
- WMST: <http://ows.emodnet-bathymetry.eu/wmts>
- WCS: <http://v7.geosrv.eu/wcs>

Atlantic Ocean Research Alliance (AORA)



European Marine Observation and Data Network – Next phase



Proposals submitted for each of the thematic portals (Early August 2016)

EMODNet Bathymetry – next phase proposal (under review)

- Expanding partnership to include more data providers (up to 40 contributors)
- Expanding North to include the Barents Sea and synergy with IBCAO
- Expanding DTM including coastal areas
- Increasing overall resolution (Multiple resolution)
- Including alternative data sources (Satellite Derived Bathymetry)
- Determining best European coastline, also using European tidal model for vertical referencing

Innovation:

- Latest DTM uses > 7.700 survey data sets and composite DTMs from 31 data providers from 18 countries and GEBCO_2015
 - Latest DTM contains 1.092.115.678 data points (28.799 rows x 37.922 columns)
- ⇒ Reaching the limit => developing cloud process and VRE around GLOBE for higher performance of computations and improved quality by more interaction between regions and extra viewing and qc services



www.emodnet-bathymetry.eu

<http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238>

