EMODnet Preparatory Actions Hydrographic and Seabed Mapping and new EMODnet Bathymetry

By
Dick M.A. Schaap – Coordinator

Varna – Bulgaria, 18th September 2013, MARES2020 Conference

EMODNet Hydrography and Seabed Mapping

- Compiled an inventory of available bathymetric surveys (plummets, single and multibeam surveys), including links to associated survey data sets, adopting the SeaDataNet Common Data Index (CDI) Data Discovery and Access service

- Produced a higher resolution digital bathymetry of 0,25 minute by 0,25 minute, by processing data sets as input, for the following 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 Mediterranean Sea
  - Iberian Coast, Bay of Biscay (Atlantic Ocean) incl Madeira and Azores
  - Adriatic Sea (Mediterranean)
  - Aegean - Levantine Sea (Mediterranean).

- Compiled an overview of coverage of European waters by hydrographic surveys and assessed the costs for overall high resolution mapping

www.emodnet-hydrography.eu
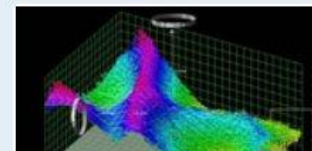
Hydrographic and Seabed Mapping – partnership

- 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)
  - **GGSGC – 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 Data provider agreements with **HO's from Germany, Norway, Denmark, Netherlands and Belgium**

  - Plus Associate partners: **ISMAR-CNR –IT, OGS-RIMA – IT, LNEG – PT, UTM-CSIC – ES, NIOZ - NL** (Research Institutes) + **IHPT – PT** (HO) **+ OceanWise (UK) + Israeli Government, Ministry of National Infrastructures (Israel)**

Followed approach

- Involve research institutes, monitoring authorities, and HO's, in providing hydrographic data sets (both survey data sets and composite DTMs) to generate **Digital Terrain Models (DTM)** for each geographical region and load these into a spatial database at the Portal

- Develop and adopt a common methodology and tools for QA/QC and processing of the input data sets into regional DTMs

- Outfit the spatial database with a **dedicated data products viewing** that is complemented with DTM download services and WMS services (OGC) to serve users and to provide map layers for e.g. the other EMODnet portals

- 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 portal with the SeaDataNet portal, which includes a shopping mechanism for requesting access to basic measurements data.

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

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
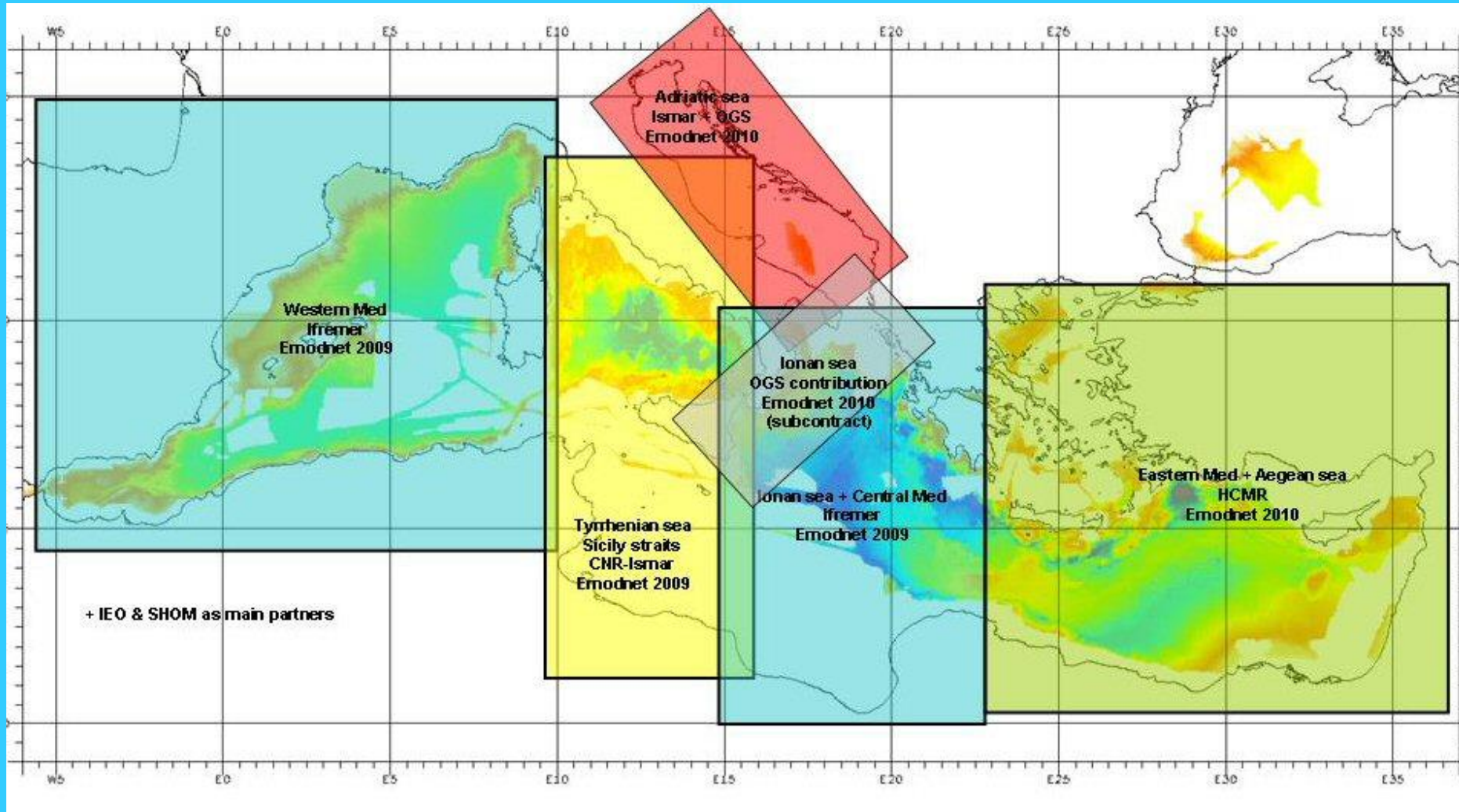
Example for the Mediterranean Sea

Hydrographic lot – Data contributing and coverage
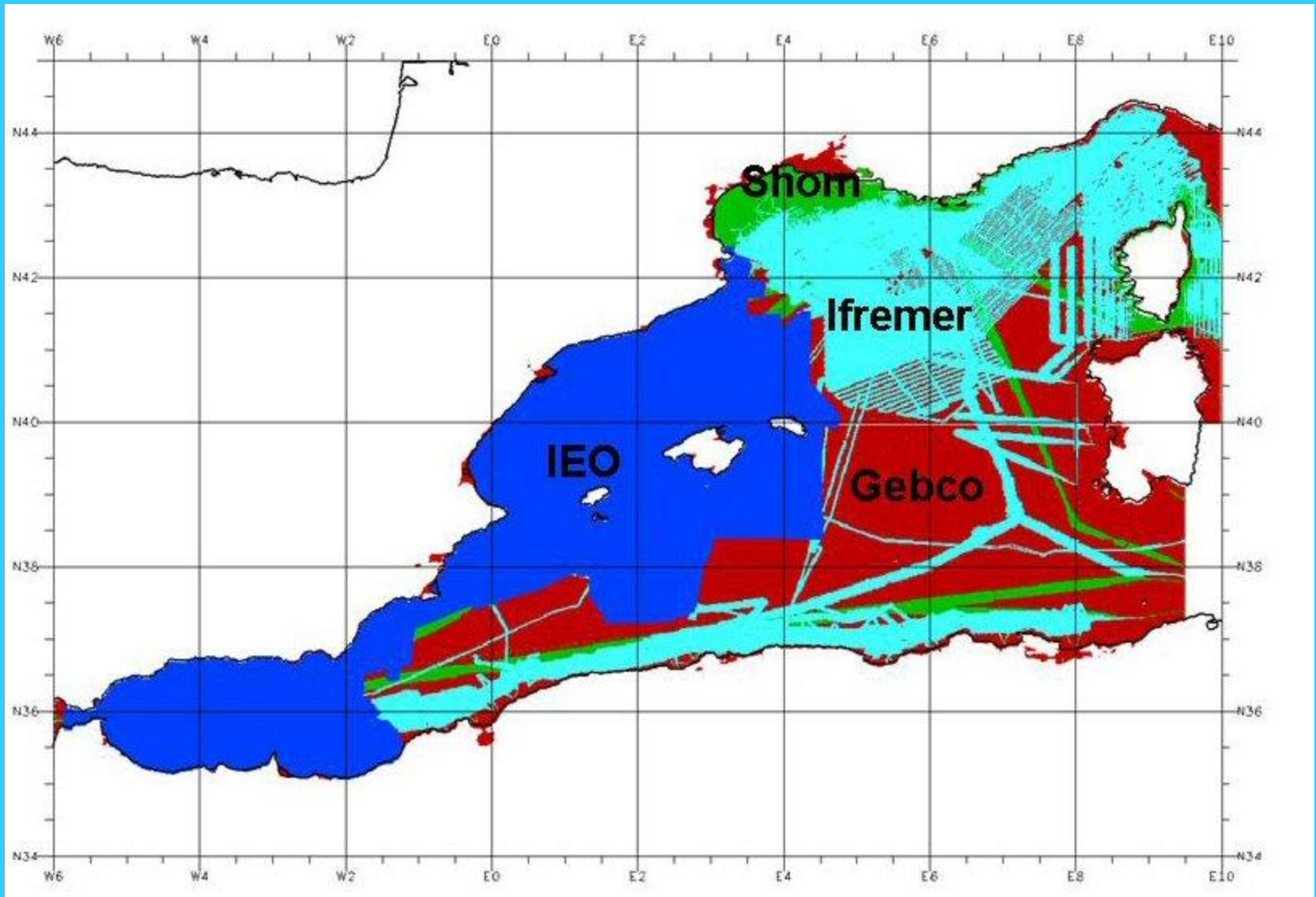
Example for the Western Mediterranean Sea

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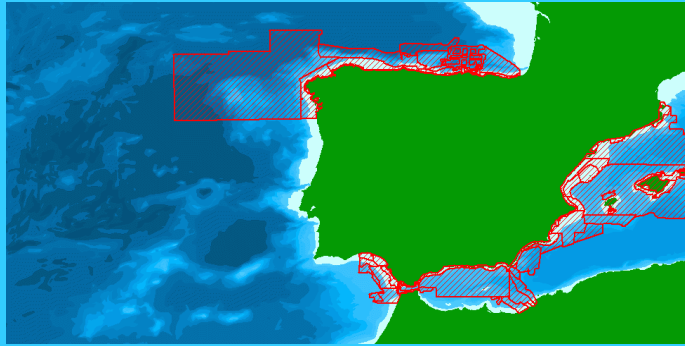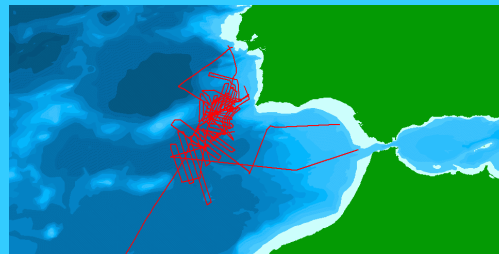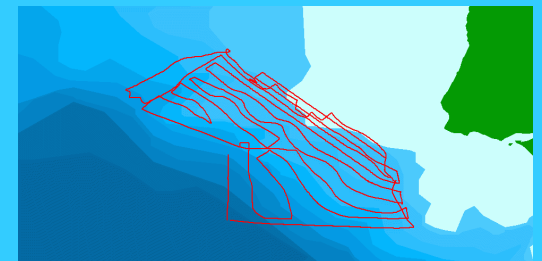

IEO data
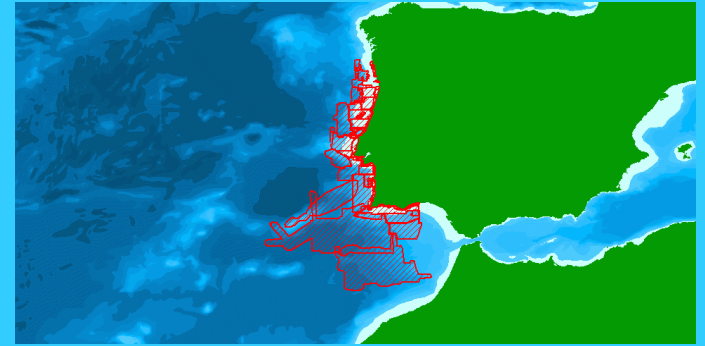
IHPT data
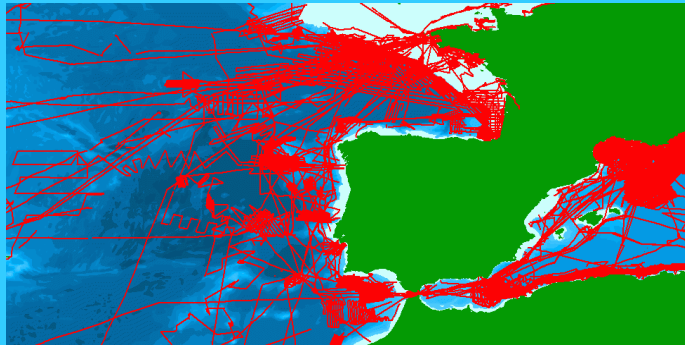

IFREMER data
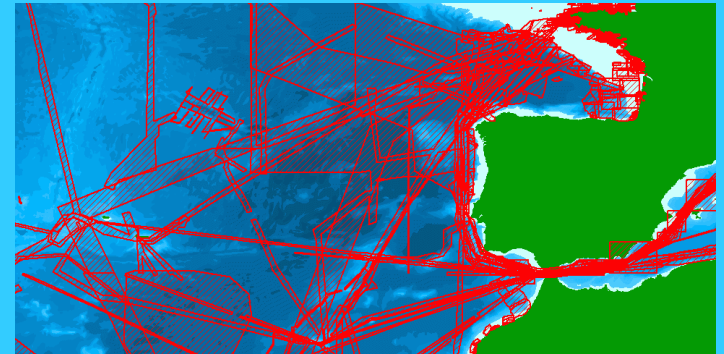
SHOM data
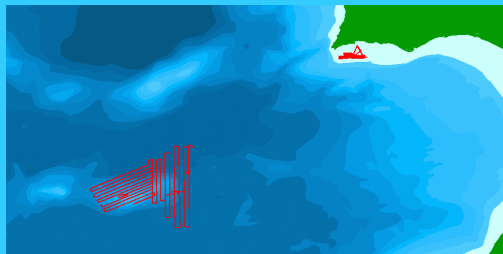
CNR – ISMAR data

UTM-CSIC data

LNEG data

Results

- Up till today, **9236** survey CDI metadata records from **15** data centres and **127** data originators from **1816 till 2013** 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 and increasing number of entries

- These survey data and other gathered composite DTMs have been collated into regional EMODnet DTM's that are available for viewing and downloading in several formats via the Hydrography Products portal service.

- 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

- Later also the Sextant Data Products service has been added to give metadata about the composite DTMs that have been used next to survey data sets.

Hydrographic portal

http://www.emodnet-hydrography.eu
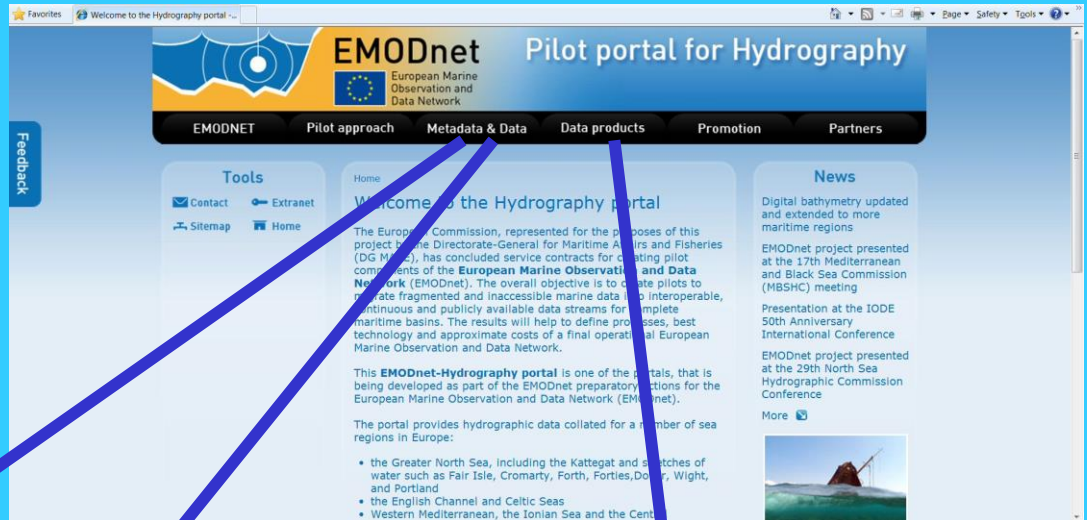
CDI metadata service
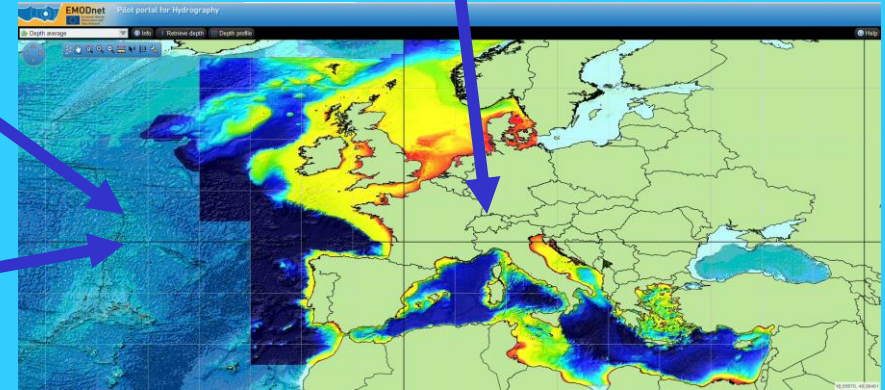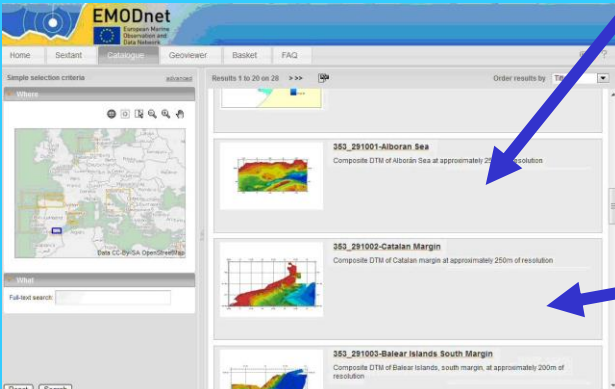
Sextant metadata service

Data products service

CDI Data Discovery and Access Service

Discovering and requesting access to bathymetric survey data sets (single and multibeam) (9100+)
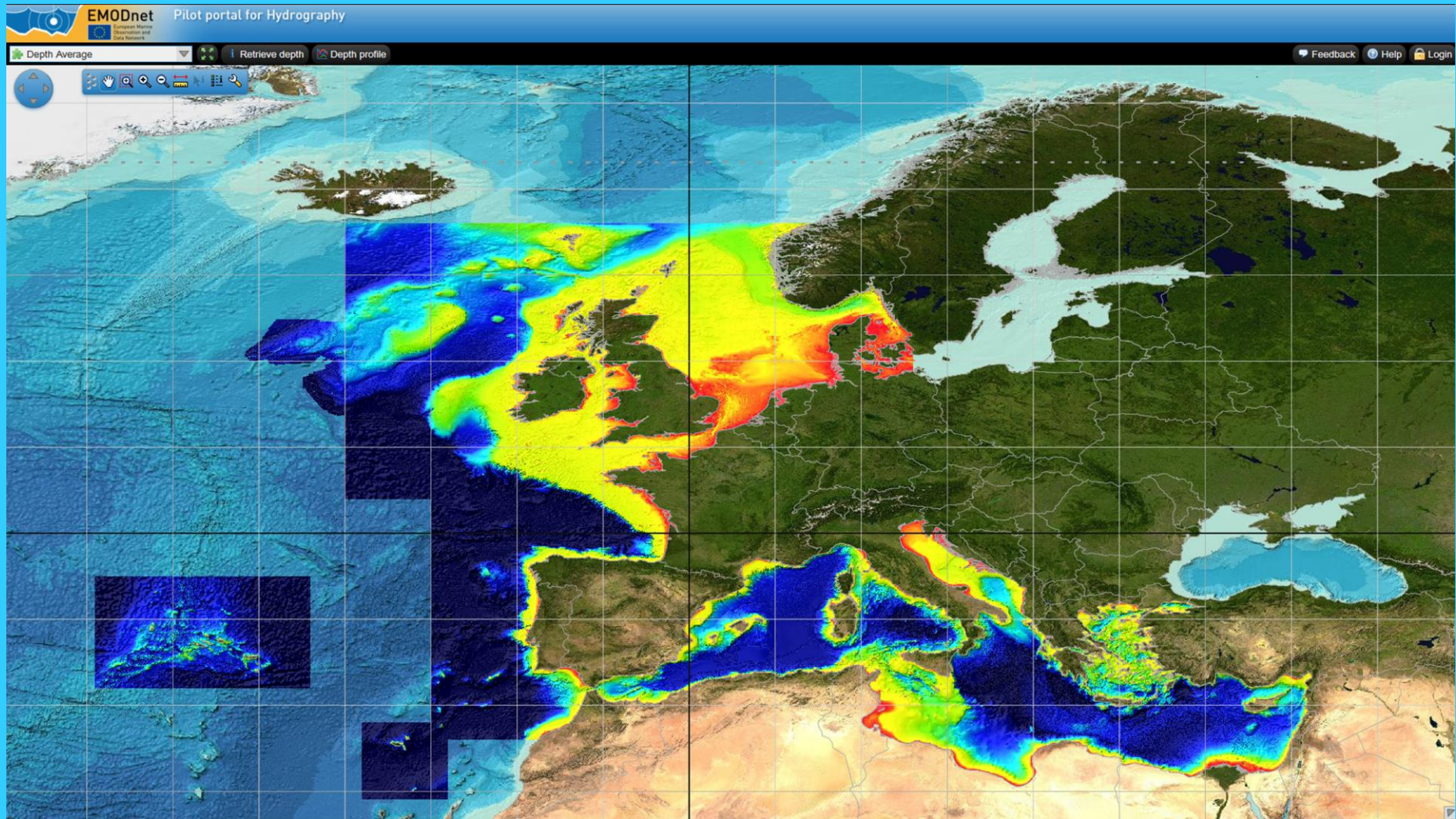
CDI Data Discovery and Access Service
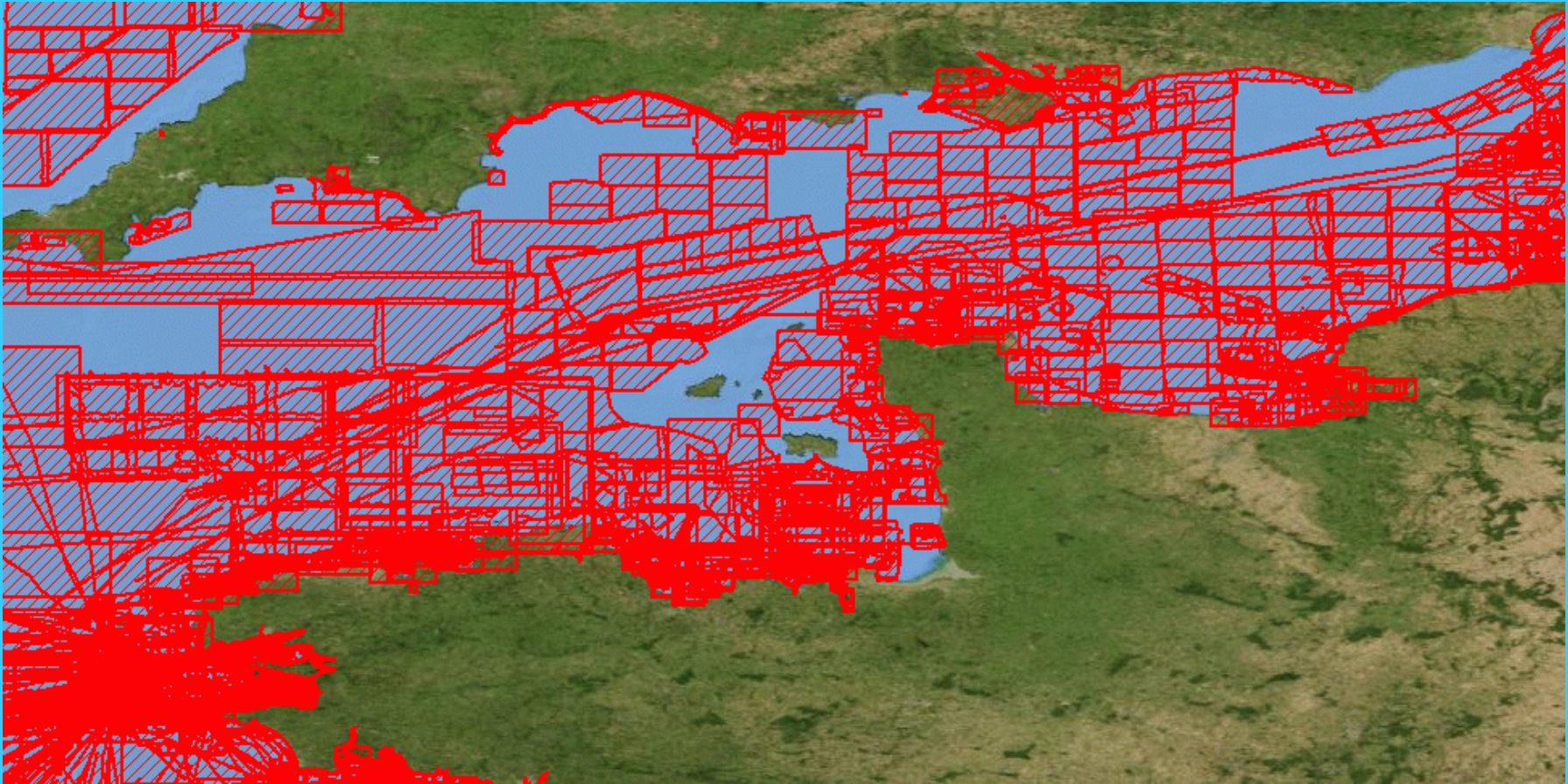
Discovering and requesting access to bathymetric survey data sets (single and multibeam) for the Channel
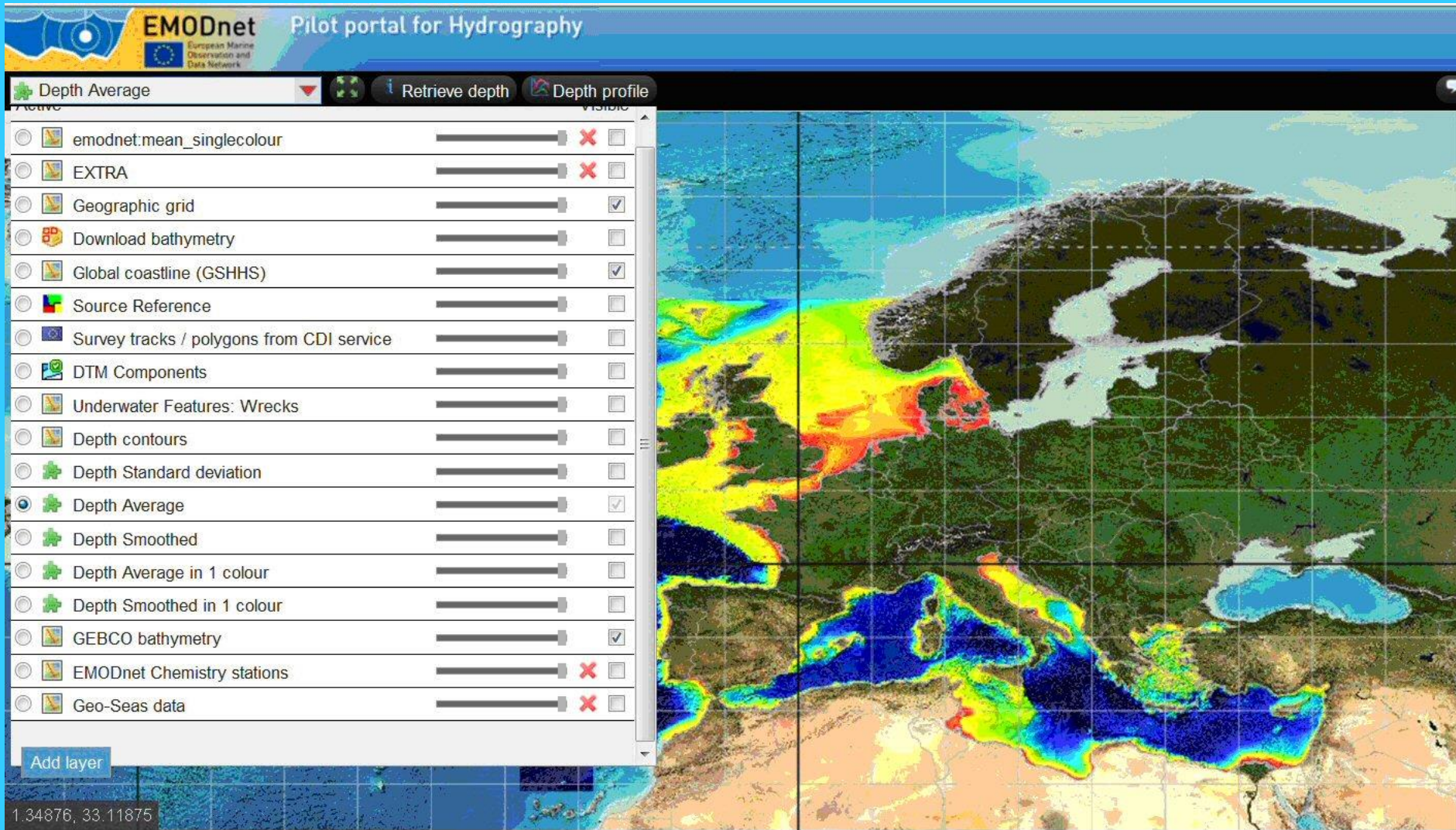
Hydrographic Data Products viewing service

*DTM for European sea basins (0,25 * 0,25 minutes grid)*
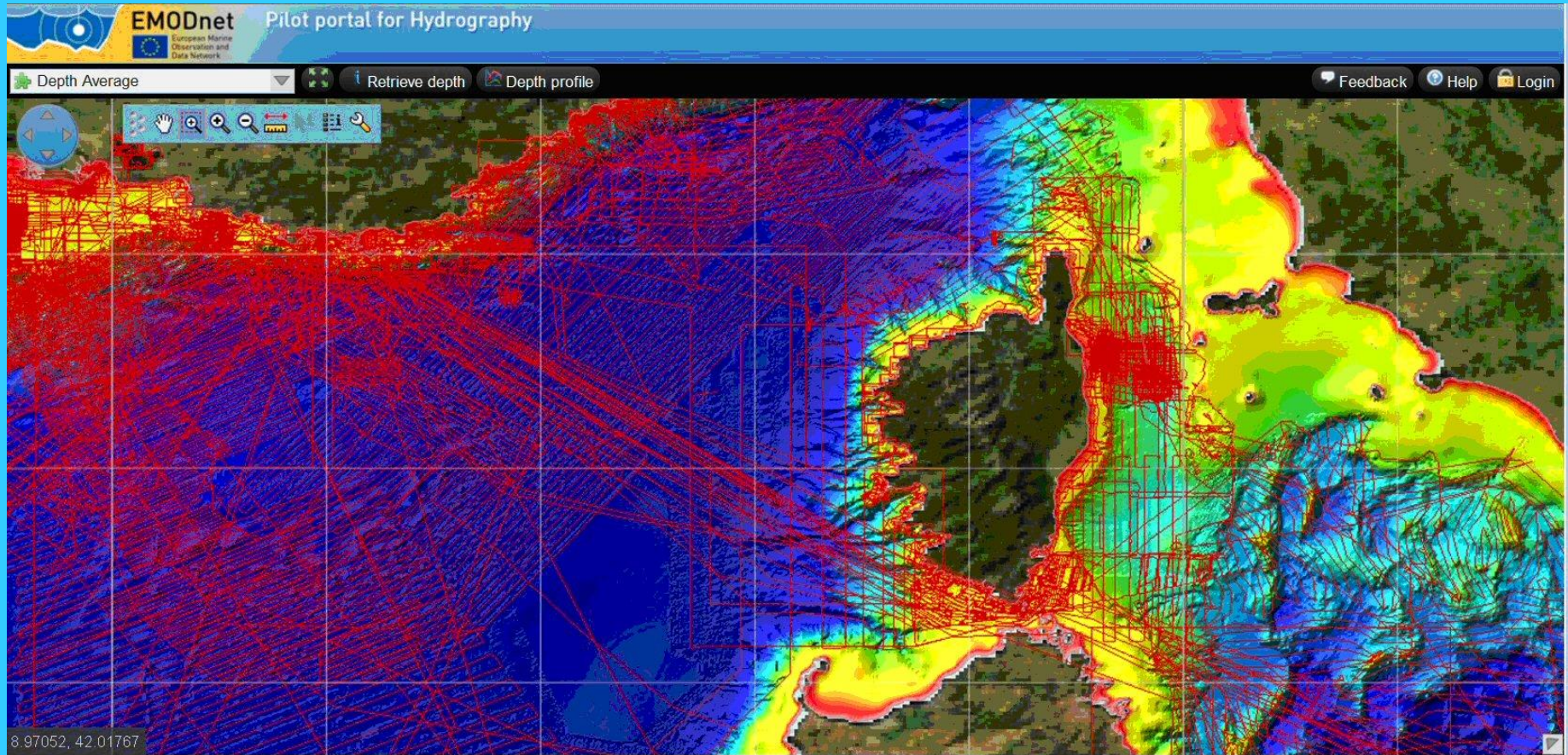
Hydrographic Data Products viewing service

New DTM for European sea basins with layer menu

Hydrographic Data Products viewing service

New DTM for European sea basins with CDI overlay to indicate surveys

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

Contours
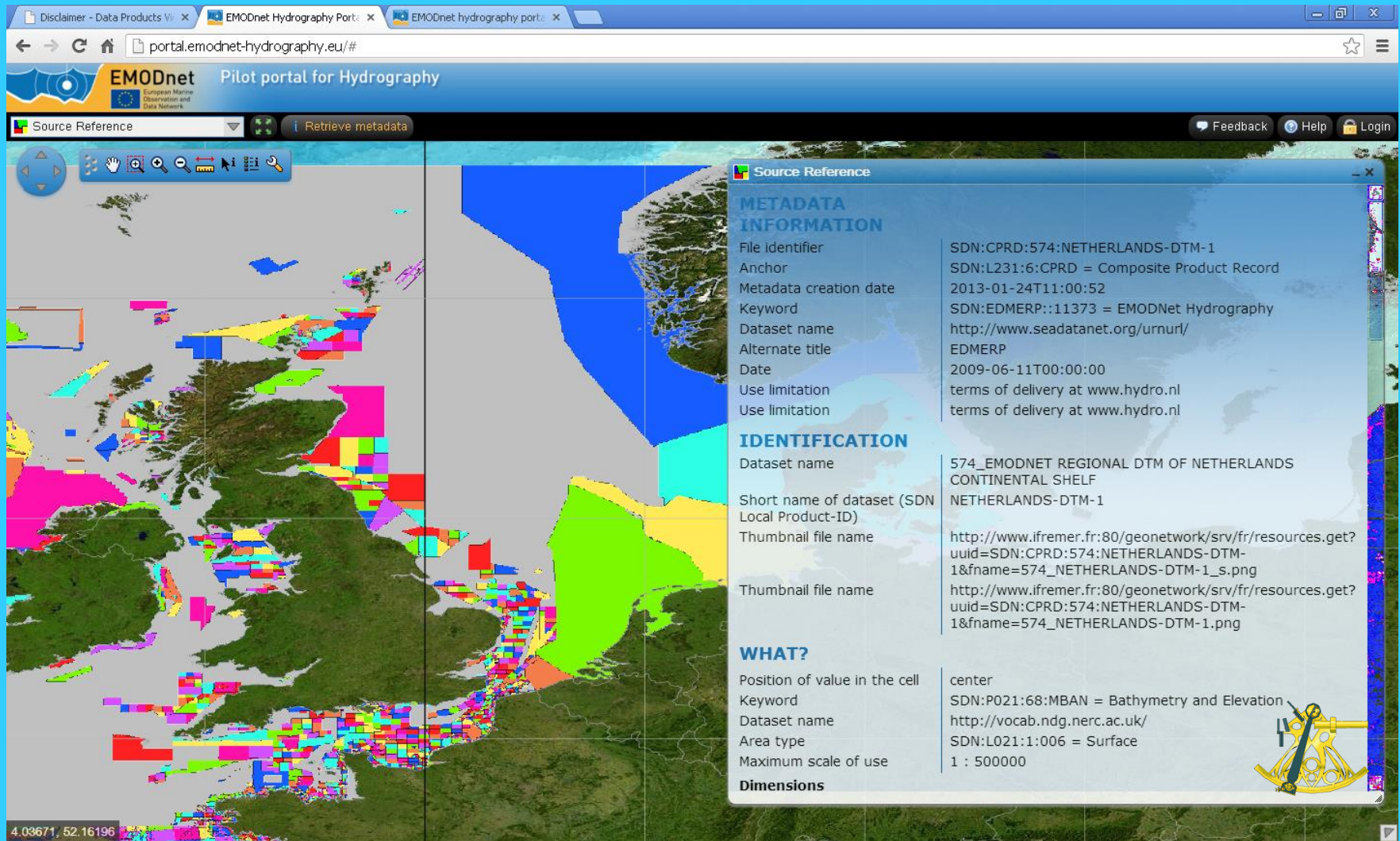
Hydrographic Data Products viewing service
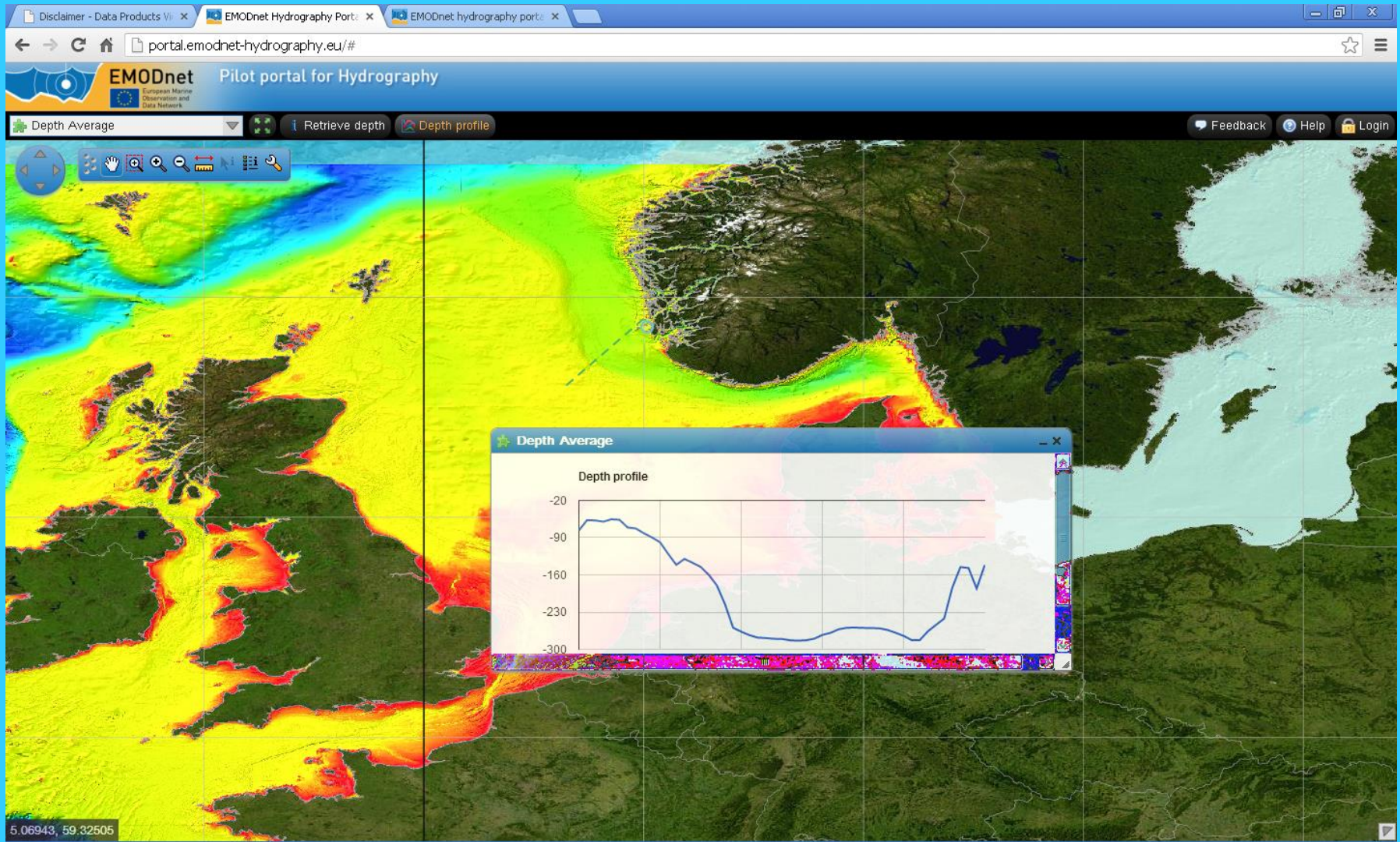
Retrieving depth profiles

Hydrographic Data Products viewing service

Retrieving Sextant metadata of associated composite DTM

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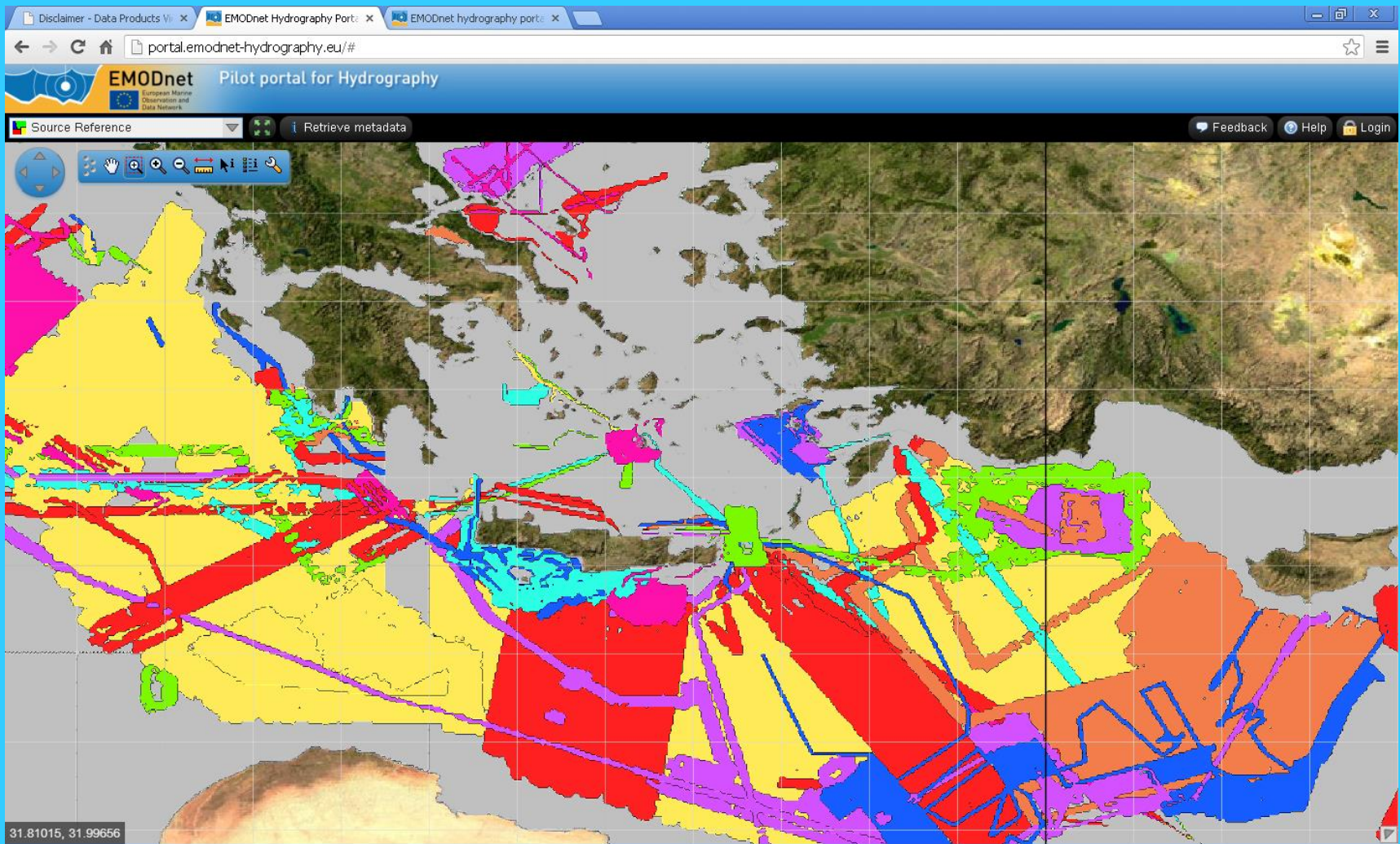
Sources reference layer, indicating which source data (surveys or composite DTMs) were used as prevailing for DTM grid cells. Including identification of related source and associated metadata.

Hydrographic Data Products viewing service
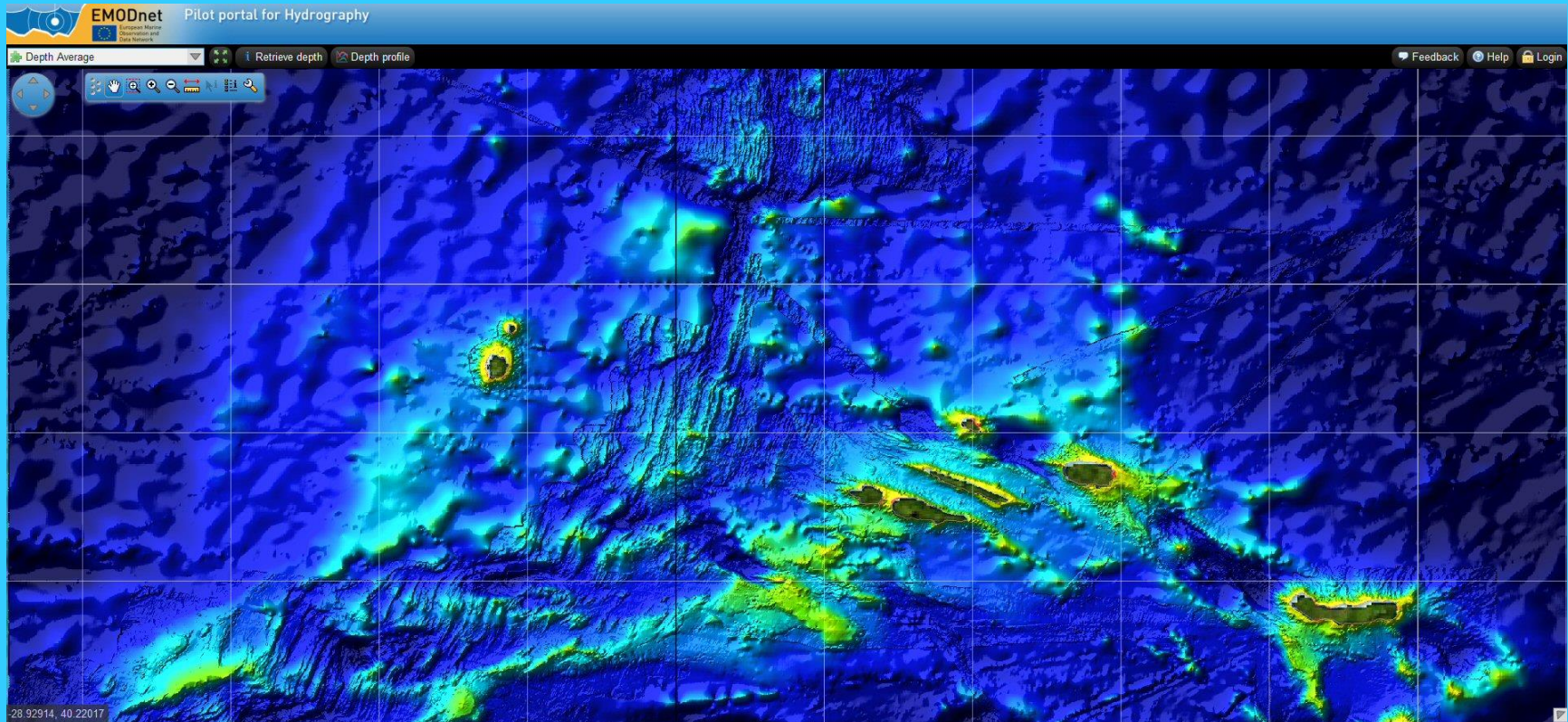
DTM for the Azores

Hydrographic Data Products viewing service
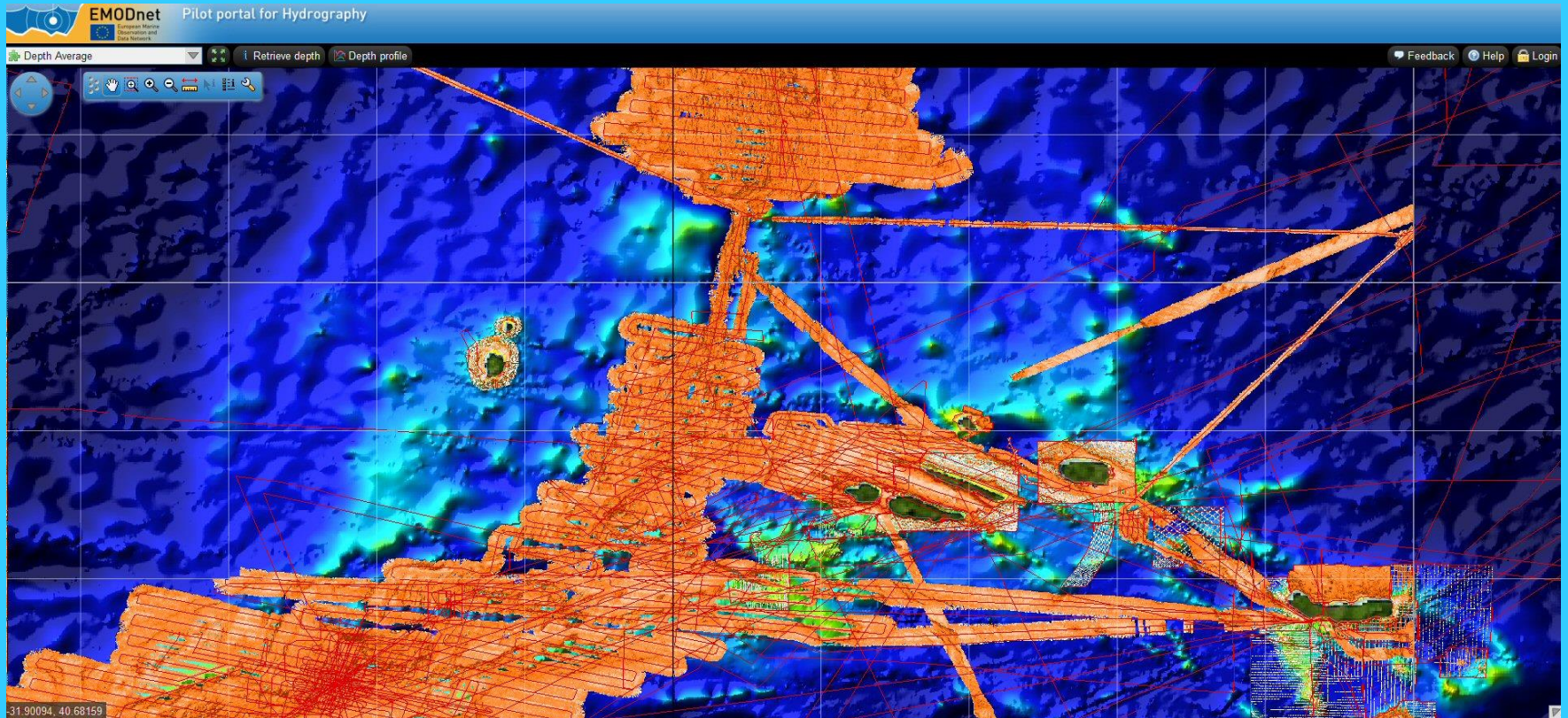
Azores: Depth standard deviation layer, also giving good insight in where surveys have been used to cover the area.

Hydrographic Data Products viewing service
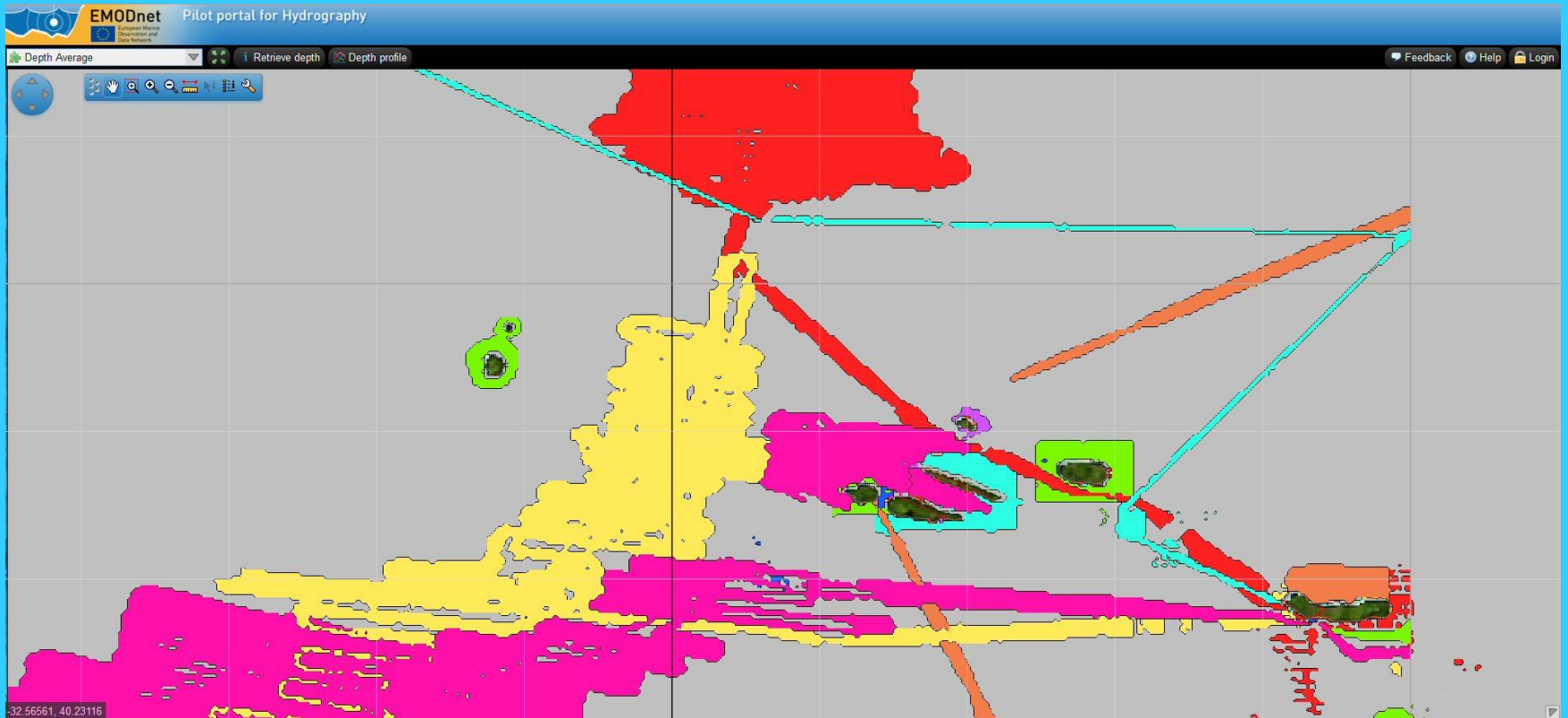
Azores: Sources reference layer, indicating which source data (surveys or composite DTMs) were used as prevailing for DTM grid cells.

Hydrographic Data Products viewing service
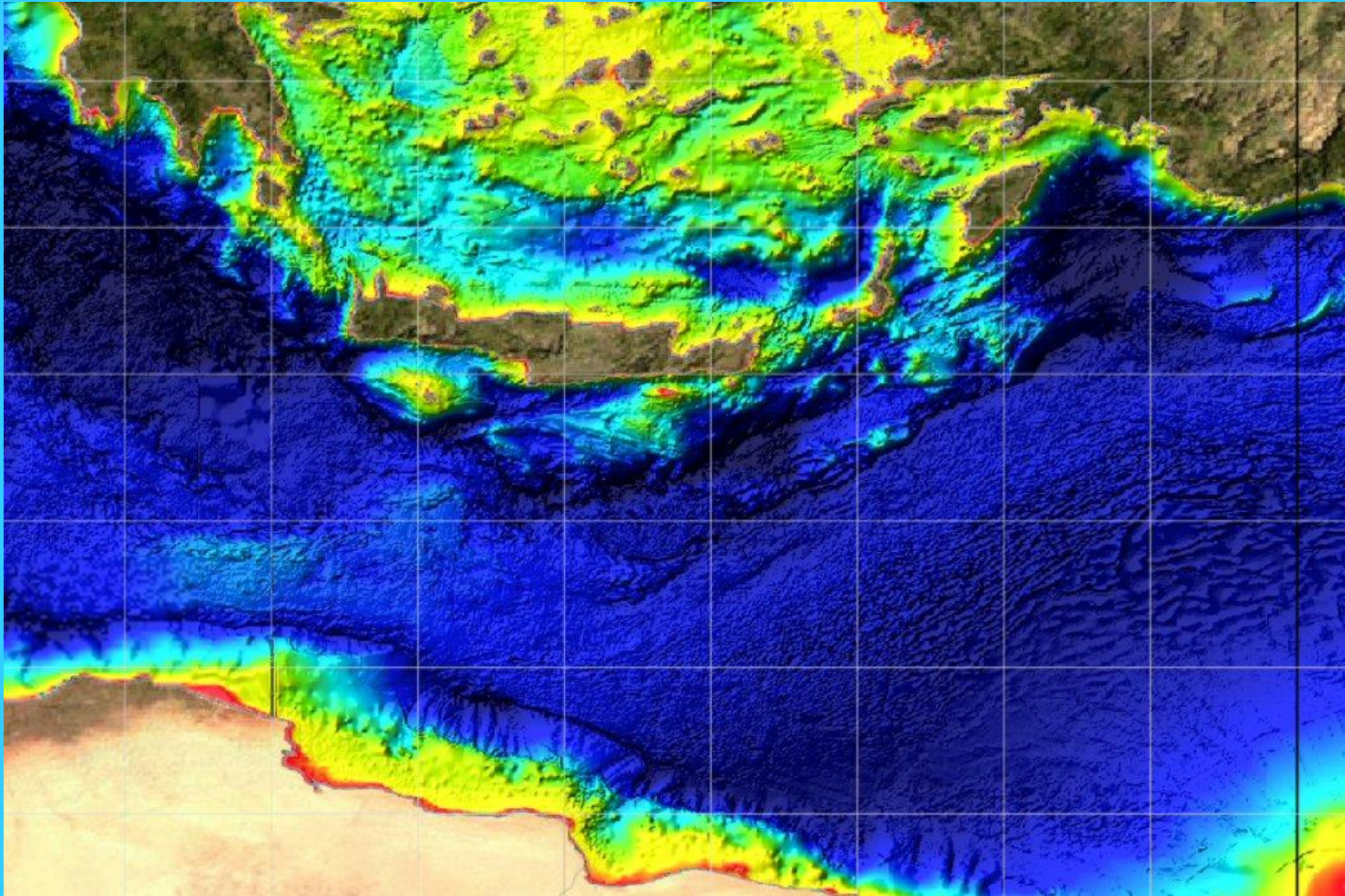
Near Crete

Detailed zoom of digital bathymetry - examples

Hydrographic Data Products viewing service
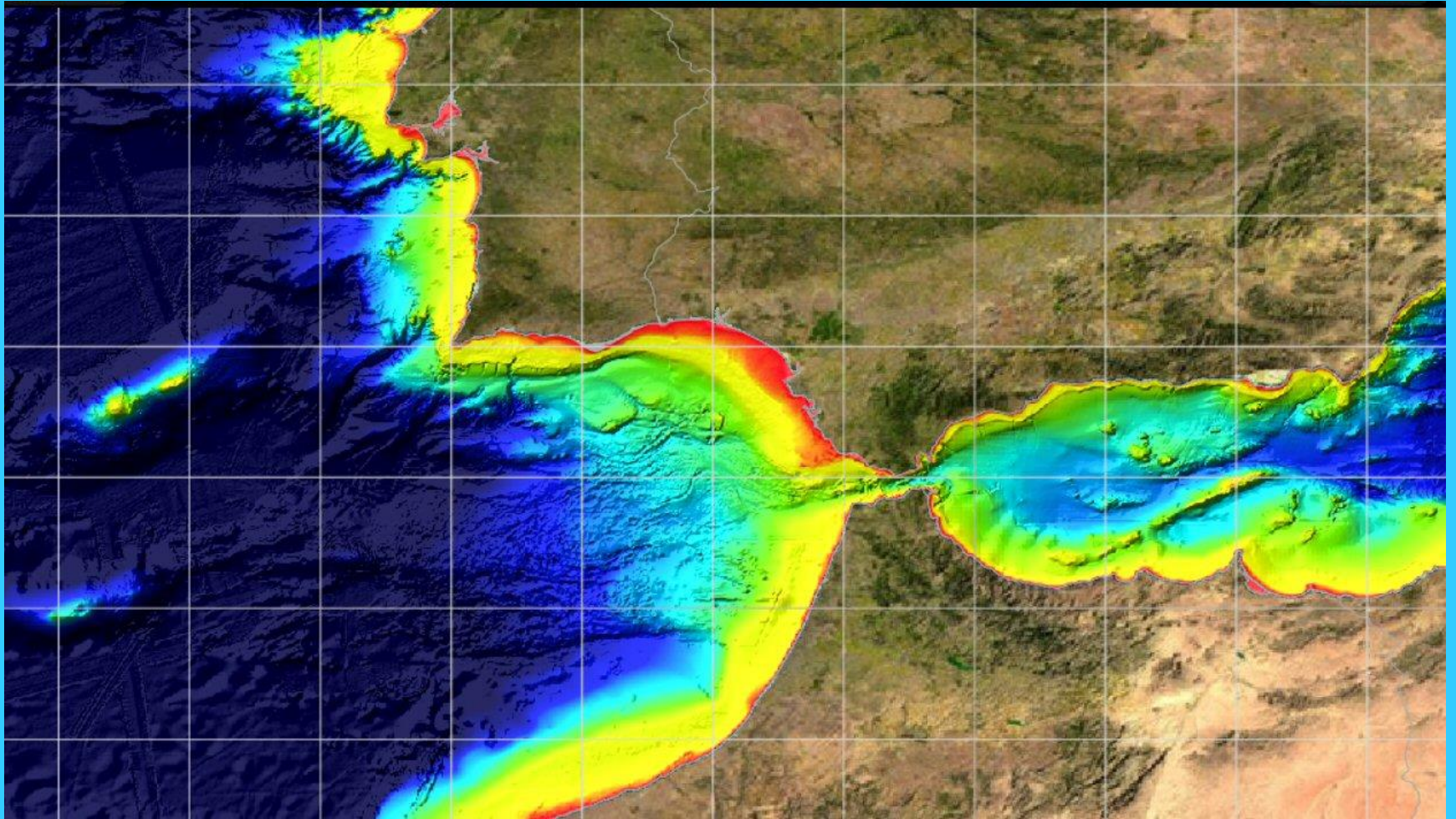
Near Strait of Gibraltar

Detailed zoom of digital bathymetry - examples

Hydrographic Data Products viewing service
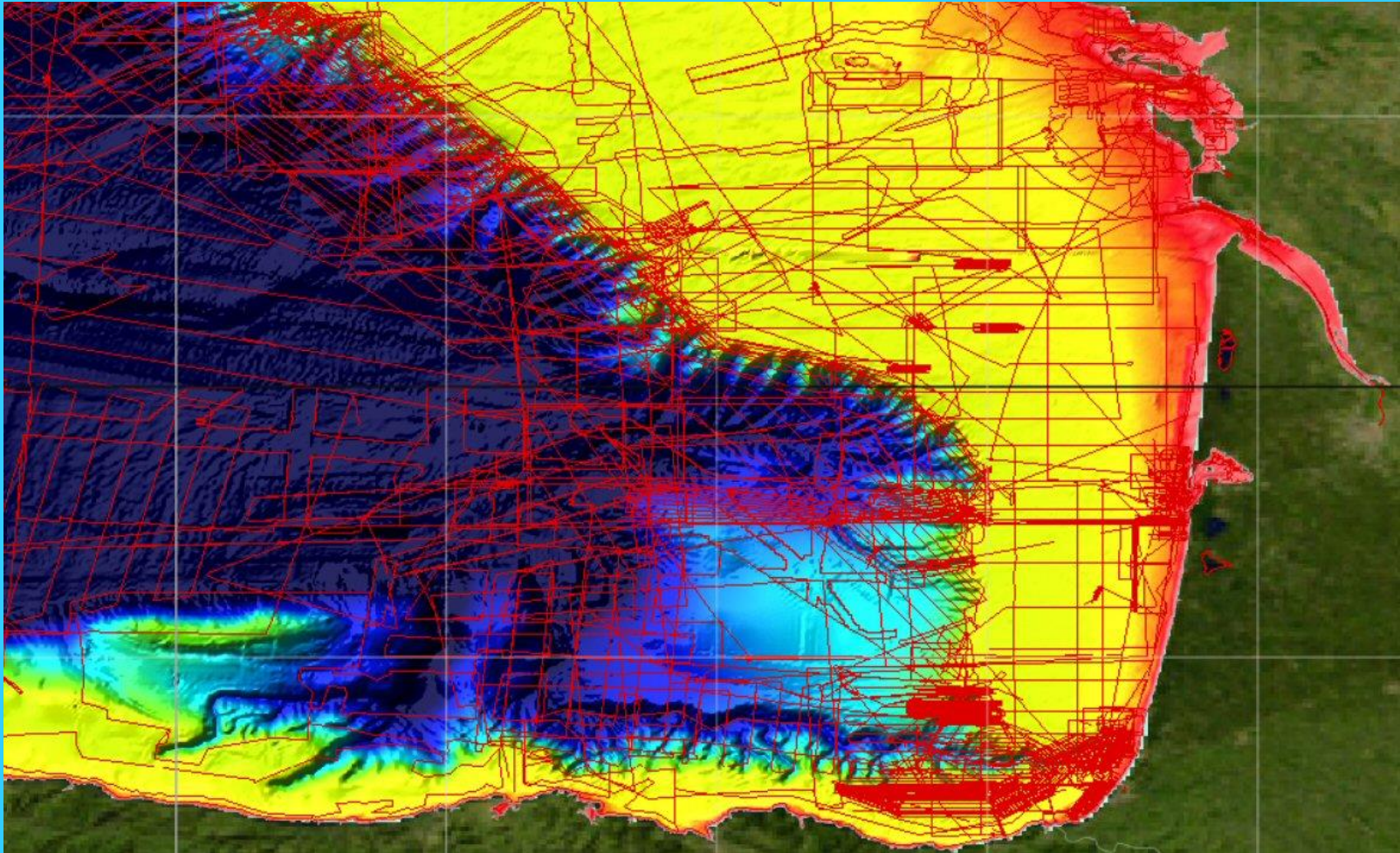
Gulf of Biscay – North Atlantic

Detailed zoom of digital bathymetry – examples, incl CDI surveys

Hydrographic Data Products viewing service
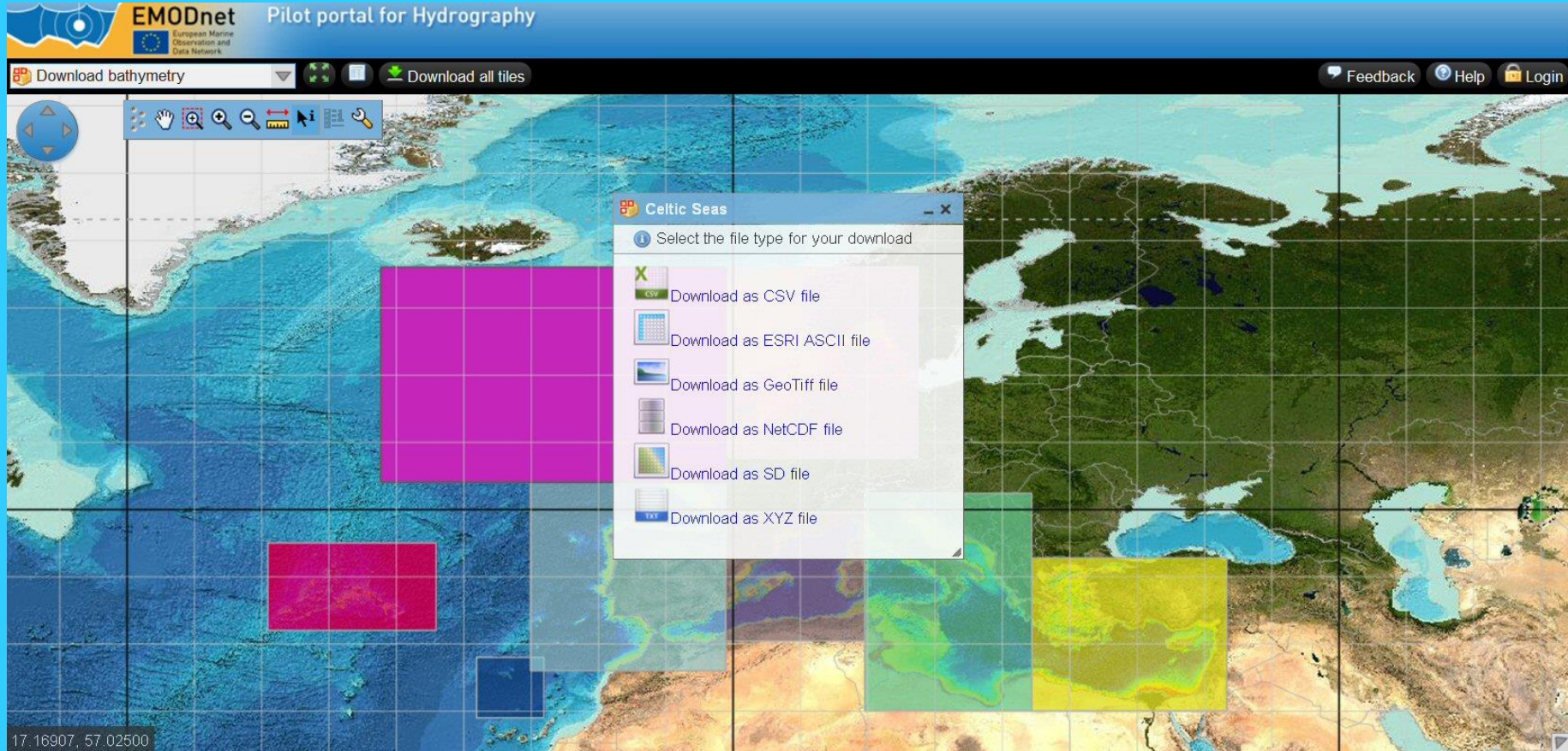
Selecting DTM tiles for downloading in various formats

Hydrographic DTM – 3D-Viewer
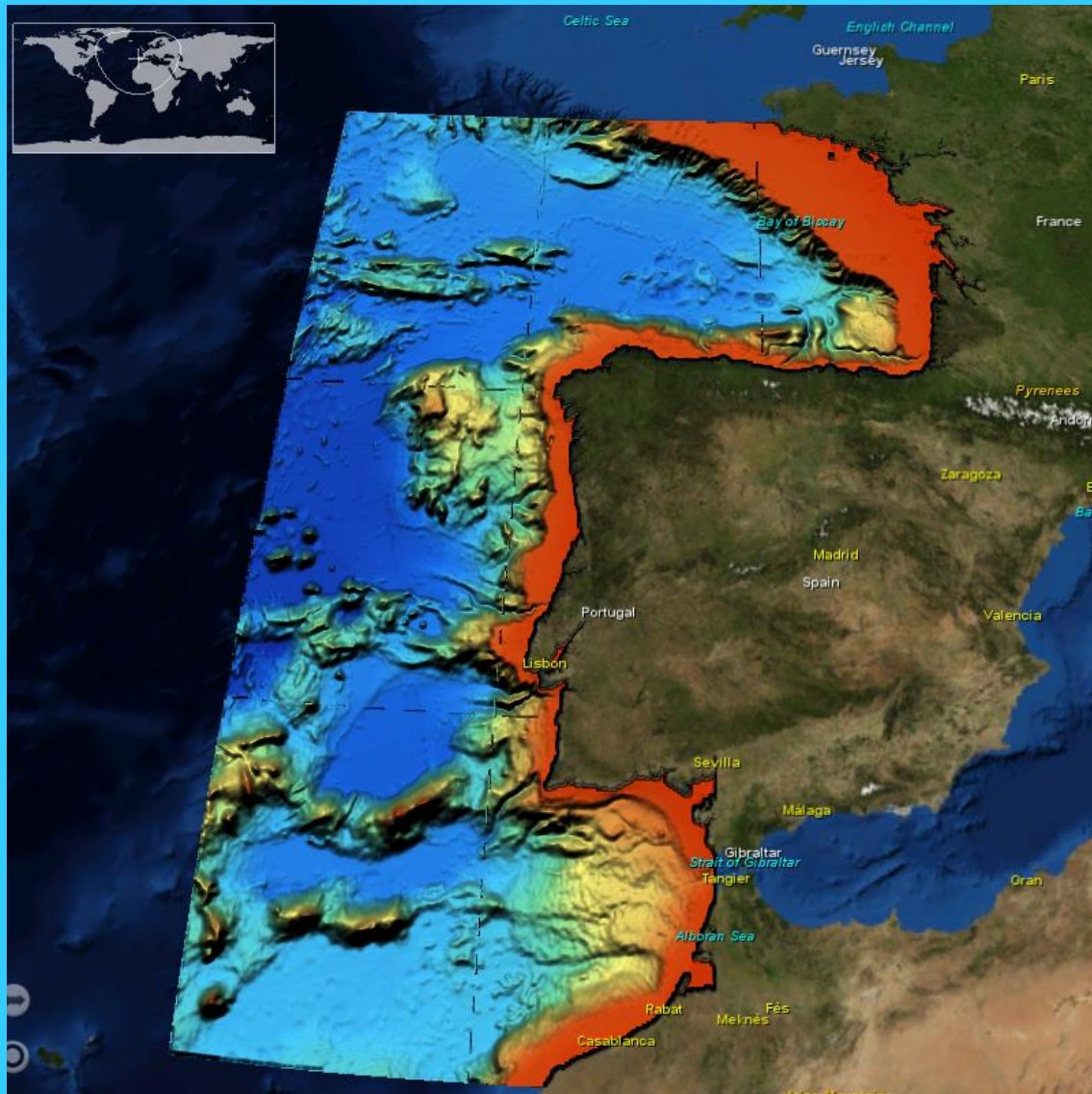
DTM loaded into 3D-Viewer as developed in Geo-Seas

Hydrographic DTM – 3D-Viewer
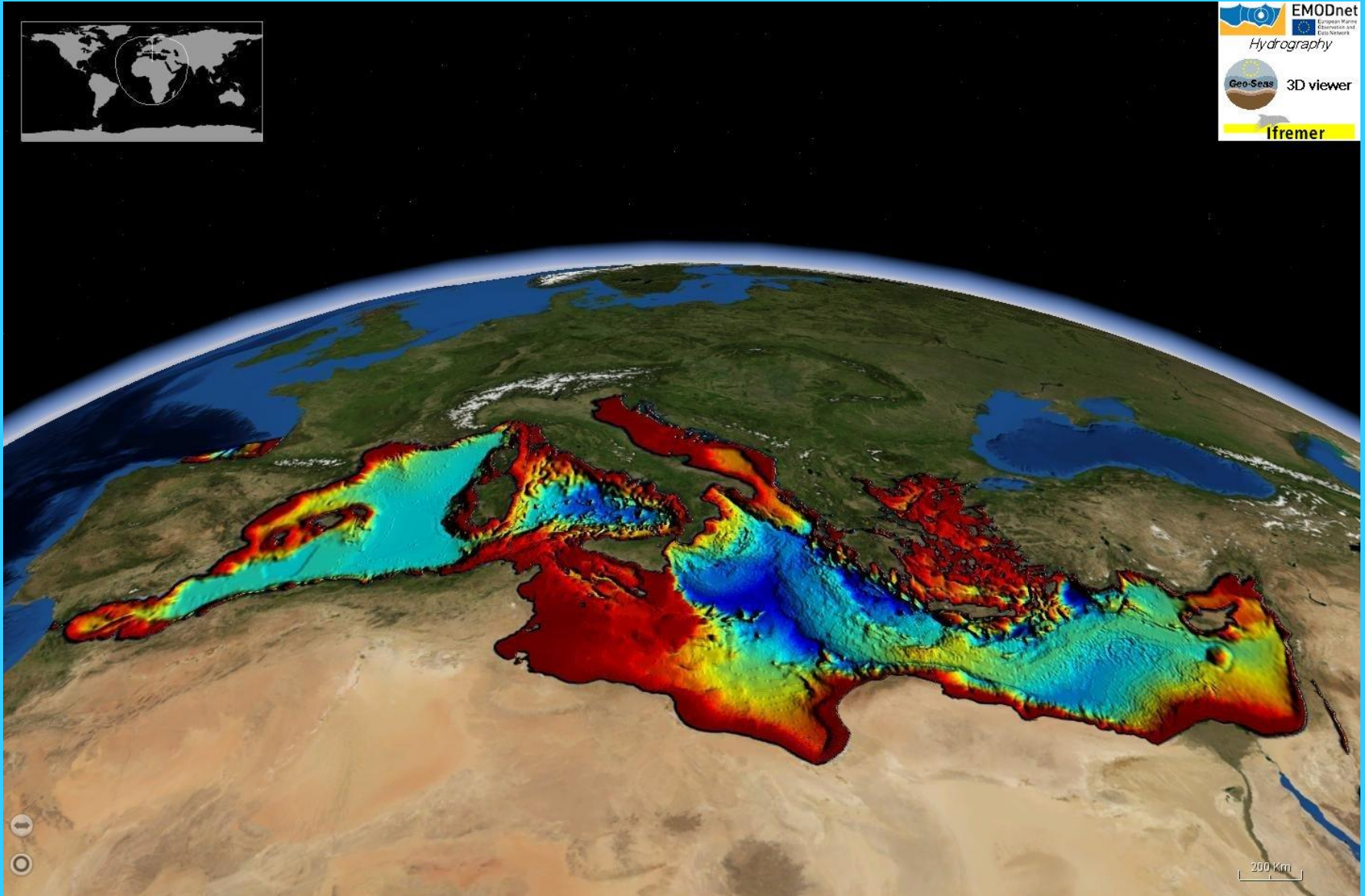
DTM loaded into 3D-Viewer as developed in Geo-Seas

User feedbacks: Statistics of web portal http://www.emodnet-hydrography.eu

Month	Unique visitors	Number of visits	Pages	Hits
Jul 2012	541	941	14293	37020
Aug 2012	524	985	16488	40917
Sep 2012	867	1369	20229	58759
Oct 2012	644	972	14208	37671
Nov 2012	766	1255	15185	41319
Dec 2012	600	1017	11315	30498
Jan 2013	745	1148	12996	37687
Feb 2013	981	2450	76071	97861
Mar 2013	1206	2974	25974	54814
Apr 2013	945	1996	18973	47649
May 2013	706	1275	14942	40762
Jun 2013	648	1320	13381	40393

User feedbacks: Statistics of Hydrographic Product Service

Activity by Month
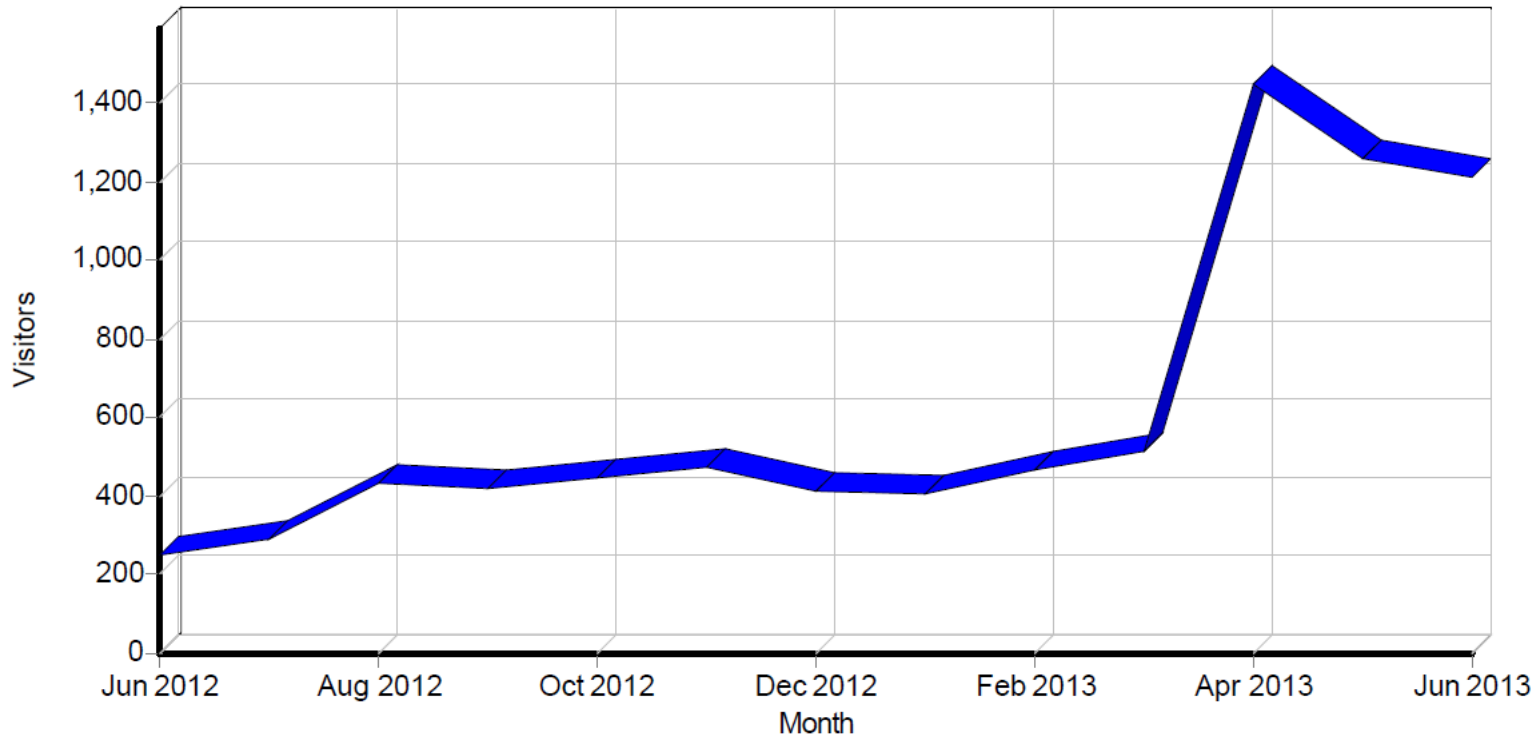
Visitors to the DTM viewing service;
last year in total 8031 visitors

User feedbacks: Statistics of Hydrographic Product Service

Celtic Seas	1393
Adriatic-Ionion Sea - C.Mediterranean	1392
Aegean-Levantine Sea	1373
Greater North Sea	1369
Bay of Biscay - Iberian Coast	1337
Western Mediterranean	1337
Azores	1048
Madeira	1025

10274

Number of DTM downloads in last year

User feedbacks: Statistics of Hydrographic Product Service

Format	Downloads
ESRI ASCII	2898
GeoTiff	2252
XYZ	2074
CSV	1477
NetCDF	1080
SD	493

	10274

Number of DTM downloads in last year

Successful approach

- Providers of bathymetric data sets understand and are welcoming the applied approach

- Data sets are gathered for internal use by regional consortium groups to compile the DTM product which can be downloaded without any registration

- Data sets are described and included in the CDI Data Discovery and Access Service and composite DTMs in the Sextant Data Products Service providing traceability of data

- Each cell in the DTM product gives information about the data sets used with CDI / Sextant references and gives statistical info

- This works as a shop window and results in more data providers coming forward

EMODNet Bathymetry – scope of new project

- Increasing the resolution of the DTM from ¼ to 1/8 of a minute of lat – lon (ca 225 m* 225 m) for all sea regions

- Including missing sea basins:
    - **Black Sea**
    - Baltic Sea
    - Norwegian + Icelandic Sea
    - Canary Islands as part of Macaronesia

- Including new data sets, also for existing regions and partners

- 3 coastal digital terrain models at higher resolution

Bathymetry – partnership

- MARIS – NL (Coordinator)
- NERC – NOC – UK
- GGSGC – NL
- GSI – IE
- SHOM – FR
- OGS – IT
- HCMR – GR
- DdH - NL
- HO - Norway – NO
- OGS – IT
- IHPT – PT
- NIOZ – NL
- **IO-BAS – BG**
- EMEPC – PT

IFREMER – FR
NERC – BODC / GEBCO - UK
IEO – ES
IHM - ES
UNEP-GRID Arendal – NO
CNR – ISMAR - IT
BSH - DE
MOW - BE
HO - Denmark – DK
IPMA – PT
ICM-CSIC – ES
OceanWise - UK
HO Faroes – FO
NPD – NO (only data provider)

- Consortium expanded with new partners and associate partners, including GEBCO

EMODNet Bathymetry – Workplan

- Continue with and refine the **methodology and use of dedicated software packages**; this also includes involving regional groups of experts;

- New challenge of producing DTMs with an even **higher resolution**, wider coverage and more regional data providers;

- Improve and expand the functionality of the EMODnet **CDI Data Discovery and Access service** for handling data requests in an efficient way and also for machine-to-machine interaction;

- Extend the **hydrographic viewing service** for handling also high resolution coastal DTMs and develop further the facilities for uploading data sets and DTMs posted by external providers;

- Develop further the **Sextant data products catalogue service,** used for documenting composite DTMs with product metadata, in functionality and coverage and establish further integration with the Hydrographic viewer.

EMODNet Bathymetry – Black Sea challenge

- So far limited survey data
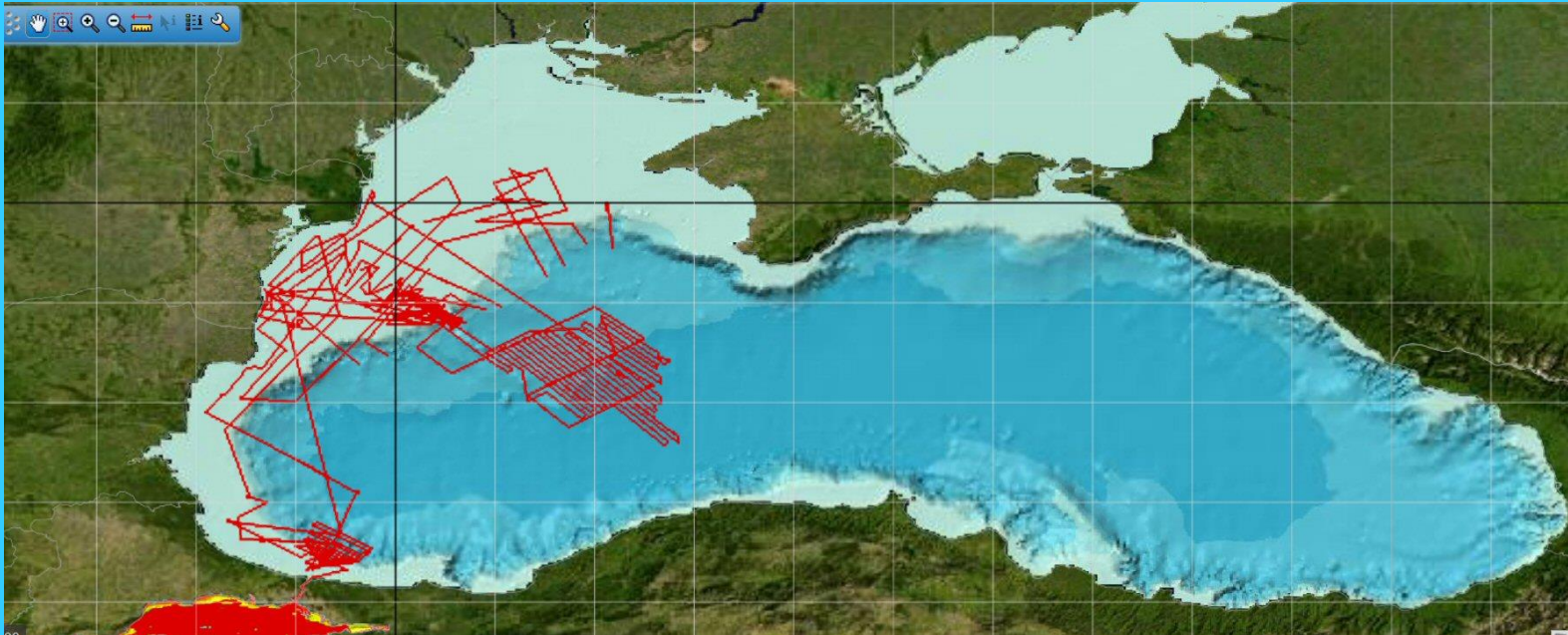
- Image shows surveys from IFREMER
- Additional surveys will be contributed by IO-BAS, while extra surveys identified from German cruises

- **More data needed!!** approaching possible Russian, Romanian, Ukrainian and Turkish data holders for the Black Sea; plus analysing research cruises in the Black Sea as part of EU RTD programmes

www.emodnet-hydrography.eu